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All correspondence may be made at the following address:

Chief Editor

Journal of Community Mobilization and Sustainable Development

Office of Joint Director (Extension), Indian Agricultural Research Institute, New Delhi-12 (India)

E-mail: journalmobilization@yahoo.com

Website: www.mobilization.co.in

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ABOUT THE SOCIETY

MOBILIZATION Society was established in 2003 as a non-profit professional society aimed at sensitizing and mobilizing development partners and community for sustainable development. The Society, during these ensuing years has successfully mobilized researchers, academicians, planners, grass root mobilizers and student and created conducive intellectual atmosphere for introspective deliberations and conducted National seminars/ workshop to address the emerging problems experienced by the agrarian mass. Presently the Society has more than 1200 Life Members. The recognition of the Society in the efforts for strengthening the forum for scientific communication is growing among the related professionals and concerned agricultural stakeholders rapidly. The Society works on following objectives-

1. To document the on-farm and adaptive research experiences in multi- disciplinary agri-bio sciences and extension education.
2. To offer a platform for sharing the empirical experiences of development professionals, community mobilizers, academicians, multi-sectoral researchers, students etc. for the benefit of ultimate users.
3. To facilitate close and reciprocal linkage among the institutions for sustainable rural development.
4. Promoting potential and practicing entrepreneurs.
5. To disseminate the documented knowledge to the global partners through approach abstracting and indexing.

ABOUT THE JOURNAL

Journal of Community Mobilization and Sustainable Development (print ISSN 2230 – 9047; online ISSN 2231 – 6736) is published by Society for Community Mobilization for Sustainable Development twice a year. The Journal of Community Mobilization and Sustainable Development has NAAS rating 5.30. The Journal of Community Mobilization and Sustainable Development, is also available on our website www.mobilization.co.in and it has been registered with www.indianjournal.com for national and global abstracting and indexing. MOBILIZATION envisages reorienting the young professionals and researches for imbibing the values of community participation in research, training and extension efforts.

The aim and scope of the journal are:

1. Sharing the relevant experiences and issues related to agriculture and allied fields at the grass root level and global forum to create the necessary academic and development climate.
2. Sensitizing the different stakeholders about the knowledge and innovation management system in pluralistic agri-rural environment.
3. Developing network among the related partners for convergence of their efforts for sustainable academic development of extension education discipline.

Editorial

Knowledge creation, integration and information sharing are inevitable processes for the progression of any scientific discipline. Being socially committed and scientifically responsible entities, scientific communities and the innovation systems in different disciplines are constantly engaged in these knowledge cycles. The Society for Community Mobilization for Sustainable Development (MOBILIZATION), being a multidisciplinary and pragmatic professional society has always showed its keen interest and participation in this knowledge-value chain- partnership. The latest addition from our society to this was the 9th National Seminar on "Doubling Farmers Income by 2022: Challenges, Opportunities and Way Forward" held during February 15-17, 2020 at Career Point University, Bhoranj Hamirpur, Himachal Pradesh with the partnership of Participatory Rural Development Initiatives Society (PRDIS), Indian Social Responsibility Network (ISRN) and Lakshya SPS Vijayawada. More than 200 participants representing academicians, innovative farmers, policy makers, social constructivists, research scholars were participated in this. The society has succeeded in reflecting its research novelty and social commitment through dialogues and discussion on the multi-dimensional strategic themes to double the farmers' income in the seminar. I am proud to say that, the enthusiastic scientific inclination of our society in organising all the nine magnificent national seminars and a couple of international seminars on nationally important themes for agricultural development, is always cherished and admired by its, more than 1200 active life members.

With immense pleasure, I welcome all our beloved readers to the January-April 2020 edition of MOBILIZATION journal. The research outputs included in this issue covers wide range of topics like occupational health hazards and drudgeries, fisheries resources and habitats, dairy sector research and development, value addition and marketing, nutrition and nutri-sensitive agriculture, adoption behaviour, opinion leadership or para extension workers, entrepreneurship development, social media mediated extension, consumer behaviour, perception on government schemes, group dynamics, content analysis, impact analysis of training, gender studies, alternate energy resources in processing sector, ICT in agricultural communication etc. I am sure that, the content richness of the present issue of journal with corss-India representation will definitely give the readers a panoramic view of multidisciplinary researches undertaken in these areas. Alas, the world scenario has changed in a quiet unhealthy manner due to the spread of Novel Corona Virus (COVID 19) from November 2019 and we in India are now undergoing four phases of its lockdown from March 24th 2020. The agriculture sector and research system need to be more adaptive and responsive to meet the output demand and resource scarcity created by the pandemic. In the current issue of the journal, we tried to include some of the COVID-19 impact studies conducted in agriculture sector.

The editorial team members Drs. Souvik Ghosh, S. K. Dubey, R. Roy Burman, Nishi Sharma, S.R.K. Singh, Reshma Gills, Sudipta Paul and Sujit Sarkar definitely deserve my sincere thanks and appreciation. Their constant and committed works and efficacious editorial process helped in timely publication of the journal without compromising any of its quality, norms and publication standards. My sincere thanks go to Ms. Subhashree Sahu and Dr. Hema Baliwada for their unequivocal supervision and support in shaping this issue of the journal as on-line editors. Most importantly, I thank our valuable readers for their constant contribution and intellectual support which help our journal to bag respectable and appreciable position among the other scientific publications.

I wish healthy, safe, and happy future for all of our sincere readers, contributors and members.

J.P. Sharma
Chief Editor

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Occupational Health Hazards and Drudgeries Perceived by the Women Farmers in Western Zone of Uttar Pradesh

Sadhna Pandey[1], S.K. Dubey[1]*, Atar Singh[1], U.S. Gautam[1], Kirti M. Tripathi[2], Saurabh[3], Anuradha Ranjan Kumari[4], Archana Singh[5] and Nimisha Awasthi[6]

[1]ICAR-ATARI (Agricultural Technology Application Research Institute), Zone III, Kanpur, Uttar Pradesh

[2]KVK, Bulandshahar, U.P.; [3]KVK, Sitapur II, U.P.; [4]KVK, Nawada, Bihar; [5]KVK, Unnao, U.P.; [6]KVK, Kanpur Dehat, U.P.

ABSTRACT

Study was conducted to find out the extent and magnitude of drudgery and gender gap perceived by farmwomen of the western zone of U.P. Investigation was carried by eight KVKs namely Pilibhit, Sahjahanpur, Baghpat, Muzaffarnagar, Bulandshahar, Meerut, GB Nagar and Agra. Further, from the selected KVKs' operational areas, two villages from each KVK in which KVK was implementing the activities since last two years were selected. Twenty farm women/ village from each enterprise i.e. crop production, livestock and post harvest were selected for the study purpose comprising total sample of 960 respondents from 16 selected villages. It was found out that more than ninety per cent of the respondents possessed sickle (96.15%) and hand plough (*Phawda*) (95.83%) followed by Khurpi (46.04%) and Fertilizer sprayer/Broad Caster (45.52%). Other improved hand tools like maize sheller, chaff cutter, sprinkler, manual chaff cutter (*gandasa*) and fruit harvester were found with very less number of respondents. Maximum work were performed by women in all the operations pertaining to crop production, post harvest handling and dairy related activities whereas males were more involved in ploughing and making of fields, seed purchase, irrigation, fertilizer purchase, helps in harvesting, loading of bags for transportation, arrangements for thresher, threshing, helps in winnowing, selling of produce, sell and purchase of animals, fodder cultivation, vaccination and medication of animals and selling of milk. Paddy transplanting was found to be very difficult, it used standing and bending posture. Harvesting, plucking, uprooting, detopping, field cleaning and weeding activities were perceived maximum drudgery. These activities were accomplished in every season and for every crop it took 5-6 hours on an average. About 90.73 per cent faced injuries during multiple operations, the majority expressed that existing tools do not help in reducing force (61.67%) and they felt tired after performing the work (74.58%). The majority of the respondents facing joint problems (76.56%), feel difficulty in bending (83.13%) and got scratches /cuts/ injuries problems (62.19%) in farm/ allied activities. Most of them faced very severe pain in backbone (78%), shoulder (72%), wrist (61%) and waist (45%) while performing different works related to crop production, post-harvest handling, and livestock activities.

Keywords: Agriculture, Dairy, Drudgery, Farmwomen, Hand tools and implements, Livestock production, Post harvest handling

INTRODUCTION

The rural women play a significant role in agriculture and other agro based activities. The daily work schedule of rural women is very demanding and arduous. It is estimated that during peak period women work every day for about 8-9 hours in agriculture and 4 hours in household activities and there are certain agricultural operations in which female agricultural workers are considered better than male workers (Bhople and Pattai, 1998). Most of the works performed by farmwomen are tedious as well as time consuming. As most of these operations like weeding, harvesting, digging, seed separation from pods, winnowing, threshing, seed shelling, cleaning and preparation etc. are done manually or by traditional tools, which are slow and cause considerable fatigue and drudgery. Many of these operations are traditionally done in varying body postures, some of which if done for long duration are not only inconvenient but also cause serious health hazards. All these factors result in drudgery by causing physical and mental fatigue, monetary hardships, exploitation, pain, economic stress etc. Majority of the

*Corresponding author email id: skumar710@gmail.com

farmwomen perceived farm activities as either moderately difficult or difficult. The farmwomen are employed in the operations which are either not mechanized or least mechanized and involve a lot of drudgery (Singh *et al.,* 2001).

Several authors like Verma and Sinha (1991); Gite and Singh (1997); Bimla *et al.* (2001) and Mohanty *et al.* (2008) experienced in their studies that many believe that women's involvement in agricultural tasks is a source of heavy burden of drudgery on them. Tripathi *et al.* (2016) in their study reported that when the training need of farm women was assessed in district Bulandshahr it was found that almost all respondents were curious to know about the new and improved drudgery reduction tools followed by time management techniques.

Singh *et al.* (2016) highlighted that occupational health hazards have been a widespread problem in agriculture in more than a decade. With women predominant at all levels production, pre harvest, post harvest, processing, packaging, marketing- of the agriculture value chain, to increase productivity in agriculture, it is imperative to adopt gender specific interventions. There is need to initiate women oriented researches in agriculture. As woman has different ergonomical characteristics than man, design of women friendly tools and equipment would be of greater help in reducing their occupational health hazards.

Against the above background, therefore, the present study was planned with the specific objective to quantify the extent of drudgery experienced by the women farmers in various farm-related activities in the western districts of Uttar Pradesh

MATERIALS AND METHODS

All the nine agro-climatic zones of Uttar Pradesh (UP) were grouped into three zones of western, central and eastern zones and from western UP, 8 KVKs namely Pilibhit, Sahjahanpur, Baghpat, Muzaffarnagar, Bulandshahar, Meerut, GB Nagar and Agra were selected purposively on the ground of availability of SMS (Home Science) in those KVKs for execution of the study and also because of prominence of crop, livestock and post harvest handling related activities in these districts. Further, from the each selected KVKs' operational areas, two villages in which KVK was implementing the activities since last two years were selected. Thus, there were 16 villages for the study from each selected village, group of farm women performing crop production, dairy and livestock production and post harvest handling related activities were grouped. In each group, there were 20 farm women making a sample of 60 farm women from each village were chosen. Thus, from all the selected villages, there were 960 women farmers who acted as the subject of the study.

The study envelopes the assessment of the drudgery experienced by the farm women in the different areas namely crop production, dairy production and post harvest handling. Major aspects studied were time spent by women farmers in various drudgery prone activities, comfortability and drudgery experienced by them with various equipments handled by them and also the extent of pain experienced by them in different parts of their body.

RESULTS AND DISCUSSION

Distribution of respondents on social indicators: Maximum respondents (53.65%) fell under the age category 35-50 years followed by range 20-35 years (35.63%). 34.17 per cent of respondents were illiterate whereas, 27.40 per cent acquired primary education. In the survey, it was found that 65.73 per cent were housewives involved in agricultural work and animal husbandry. It was assessed that 69.38 per cent women started working in early morning till late night whereas, 23.33 per cent women followed morning and evening patterns. The majority of the respondents 63.85 per cent, had their mode of payment of wages monthly-cash/In kind. While 17.81 per cent of this zone had Daily-cash/In kind payments (Table 1).

Possession of tools and equipments: On assessing the possession of farm tools, implements, and livestock acquired by respondents, it was found out that respondents possessed more than one type of farm tools, implements, and livestock. This fact was when graduated it was found out that more than ninety per cent of the respondents possessed sickle (96.15%) and hand plough (*Phawda*) (95.83%). Other improved hand tools like maize sheller, chaff cutter, sprinkler, manual chaff cutter (*gandasa*) and fruit harvester were found with very less number of respondents. If we look at the farm implements, engine was found with more than fifty per cent of the respondents (52.29%) followed by tractor + trolly (28.44%) and harrow (25.83%) for agriculture use. Buffalo was possessed maximum in this zone (74.27%). Cattle acquired second place (40.63%) when it came to livestock possession (Table 2).

Table 1: Details of female respondents engaged in farm activities (N=960)

Parameters	Western Zone	
	Frequency	Percentage
Age of the respondents		
20-35	342	35.63
35-50	515	53.65
Above 50	103	10.73
Education		
Illiterate	328	34.17
Primary	263	27.40
Junior High School	176	18.33
High School	69	7.19
Intermediate	87	9.06
Graduate/Post Graduate	37	3.85
Occupation		
Housewife (HW)	130	13.54
Housewife and Agri work (AW)	69	7.19
HW+Ag Labour/ Labour	130	13.54
HW+ AW+ AH	631	65.73
HW+ AW+ Bussiness/ Service	0	0
HW+ Dairy Farming	0	0
The duration of work		
8 am to 6 pm	70	7.29
Morning and Evening Pattern	224	23.33
Early Morning till Late Night	666	69.38
Mode of payment of Wage		
Daily-cash/In kind	171	17.81
Weekly-cash/In kind	147	15.31
Fortnightly/Cash	29	3.02
Monthly-cash/In kind	613	63.85

Major area of work participated by men and women farmers:: As graduated in Table 3 maximum work were performed by women in all the operations pertaining to crop production, post harvest handling and dairy related activities whereas males were more involved in ploughing and making of fields, seed purchase, irrigation, fertilizer purchase, helps in harvesting, loading of bags for transportation, arrangements for thresher, threshing, helps in winnowing, selling of produce, sell and purchase of animals, Fodder cultivation, vaccination and medication of animals and selling of milk (Table 3).

Table 2: Possession of Farm Tools, Implements and livestock (N=960)

Parameters	Western Zone	
	Frequency	Percentage
Farm tools and implements		
Sickle	923	96.15
Hand Ridger	226	23.54
Hand Weeder/ Khurpi	442	46.04
Hand Hoe	139	14.48
Hand Plough (*Phawda*)	920	95.83
Maize sheller	10	1.04
Chaff Cutter	34	3.54
Sprinkler	2	0.21
Manual Chaff cutter (*Gandasa*)	16	1.67
Fertilizer sprayer/Broad Caster	437	45.52
Fruit Harvester	14	1.46
Farm Implements		
Tractor + Trolly	273	28.44
Tractor	0	0.00
Trolly	0	0.00
Thresher	131	13.65
Engine	502	52.29
Cultivator	117	12.19
Harrow	248	25.83
Seed Drill	18	1.88
Winnowing fan	10	1.04
Others (Sprayer)	10	1.04
Livestock possession		
Bullock	57	5.94
Cattle	390	40.63
Buffalo	713	74.27
Goat	0	0
Sheep	0	0
Ducks	0	0
Poultry	0	0
Pigs	0	0
Pigeon	0	0

Time spent pattern by women farmers: While summarizing the average time spent on major activities where women perceived maximum drudgery it was depicted in Table 4 that level of drudgery perceived was difficult in most activities. It was found to be very difficult during paddy transplanting, it used standing and bending

Table 3: Major area of work participation of women and men farmers

Category	Operations/activities performed by women	Operations performed by men
Crop Production	• Cleaning of field: Removal of Stalks & stubbles • Nursery bed preparation • Seed Sowing/ Dibbling • Vegetable Sapling Transplanting • Paddy Transplanting • Sugarcane Seed Cutting and planting • Gap filling • Field Cleaning & Weeding • Harvesting/Plucking/Uprooting/ Detopping etc. • Bundling and carrying to threshing place	• Ploughing and making of fields • Seed purchase & Nursery sowing • Irrigation, fertilizer purchase & application • Helps in harvesting etc.
Post-Harvest Handling	• Crushing • Helps in threshing • Decortication/ Shelling • Winnowing and Sun Drying • Sieving, Grading & Cleaning • Bagging and stitching of bags for Storage	• Arrangements for thresher • Threshing • Helps in winnowing • Loading of bags for transportation
Dairy and Livestock Production	• Milking of animals • Fodder cutting/ carrying • Feed preparation and feeding to animals • Cleaning of animal shed • Carrying of animal waste for disposal	• Selling of produce • Sell and purchase of animals • Fodder cultivation • Vaccination and medication • Selling of milk

posture. Harvesting, plucking, uprooting and detopping, field cleaning and weeding activities were also perceived maximum drudgery. These activities were accomplished in every season and for every crop it took 5-6 hours on an average. In post harvesting management activities like, decortications, winnowing, sun drying, sieving, grading and cleaning were very difficult to perform. They acquired sitting, squatting and bending postures.

Livestock related activities were performed daily and average range of working hours were 4-5. Daily ranging the work from milking of animals to carrying the animal waste for disposal. Respondents found most of the activities very difficult and difficult.

Distribution of respondents on drudgery indicators: About 90.73 per cent faced injuries during multiple operations, the majority expressed that existing tools do not help in reducing force (61.67%) and they felt tired after performing the work (74.58%). The majority of the respondents facing joint problems (76.56%), feel difficulty in bending (83.13%) and got scratches /cuts/ injuries problems (62.19%) in farm/ allied activities. In case of occurrence of diseases and health problems due to farm activities, all the respondents suffered from numbness in feet and hands, backache, headache, pain in knees, shoulders and other joints. They did also suffer from Blisters on palm (85.21%) and heat exhaustion (69.69%). 44.69 per cent of the respondents adopted one posture in farm/ allied activities up to 1 hour. Most of the respondents (66.15%) take care of their tools and implements. The majority of them saw the doctor when the condition got miserable (69.58%) (Table 5).

Perceived Drudgery on body parts and their extent:: Table 6 reveals that all the women respondents felt pain/ drudgery in one or other parts of the body. while surveying the drudgery perceived in different parts of body majority of them faced very severe pain in backbone (78%), shoulder (72%), wrist (61%), and waist (45%) followed by moderate pain in elbow (50%) and neck (43%). It can be concluded that the whole body felt difficulty while performing different works related to crop production, post-harvest handling, and livestock activities (Table 7).

CONCLUSION

Hence, it can be concluded here that most of the women farmers were involved in all the three areas i.e. household work, agriculture and animal husbandry and found to be

Table 4: Average time spent (in hours/person/day season wise) by the farm women in the major activities in which women perceived drudgery

Activity	Season	Time spend (hrs/person/ day)	Frequency of performance	Posture used	Drudgery level Perceived
1. Crop Production related work areas					
Cleaning of field: Removal of Stalks & stubbles	Rabi Kharif Zaid	3-4 hrs	According to crop	Sitting+squatting+Bending	Difficult
Nursery bed preparation	Rabi Kharif Zaid	3-4 hrs	According to vegetable	Sitting+squatting+Bending	Difficult
Seed Sowing/Dibbling	Rabi Kharif Zaid	3-4 hrs	According to crop	Standing+Squatting+Bending	Difficult
Vegetable Sapling Transplanting	Rabi Kharif Zaid	3-4 hrs	According to vegetable	Sitting+Squatting+Bending	Difficult
Paddy Transplanting	Kharif	6 hrs.	Yearly	Standing+Bending	Very Difficult
Sugarcane Seed Cutting and planting	Autumn Spring	6 hrs.	Twice in year	Bending+Squatting (cutting) and + Standing+Bending (planting)	Difficult
Gap filling	Rabi Kharif Zaid	3-4 hrs	According to crop	Sitting+Bending	Neither Difficult nor Easy
Field Cleaning & Weeding	Rabi Kharif Zaid	6 hrs.	1-2 Times/ Season	Sitting+Bending+Squatting	Very Difficult
Harvesting/ Plucking/ Uprooting/ Detopping etc.	Rabi Kharif Zaid	For Crops: 5-6hrs For Veg: 2-4hrs	Multiple times according to crop & vegetable	Sitting+Squatting+Bending	Very Difficult
Bundling and carrying to threshing place	Rabi Kharif Zaid	1-2 hrs	Multiple times according to crop & vegetable	Sitting+Squatting+Bending	Neither Difficult nor Easy
2. Post-Harvest Handling related work areas					
Crushing	All season	2-3 hrs	According to crop	Sitting+Squatting+Bending	Difficult
Decortication/Shelling	All season	4-5 hrs	According to crop	Sitting+Squatting+Bending	Very Difficult
Winnowing and Sun Drying	All season	2-3 hrs	According to crop	Standing+Sitting+Squatting + Bending	Very Difficult
Sieving, Grading & Cleaning	All season	2-3 hrs	According to crop	Sitting+Squatting+Bending	Very Difficult
Bagging and stitching of bags for Storage	All season	1-3 hrs	According to crop	Standing+Sitting+Squatting + Bending	Difficult
3. Dairy and Livestock Production related work areas					
Milking of animals	All season	0.5-1 hr	Daily	Sitting+Squatting+Bending	Difficult
Fodder cutting/carrying	All season	1-2 hrs	Daily	Squatting+Sitting+Bending	Very Difficult
Fodder preparation and feeding to animals	All season	1-2 hrs	Daily	Standing+Squatting+Bending	Difficult
Cleaning of animal shed	All season	1-2 hrs	Daily	Squatting+Bending	Very Difficult
Carrying of animal waste for disposal	All season	1 hr	Daily	Standing+Bending	Very Difficult

Table 5: Comfortability and drudgery with equipments as perceived by the women respondents (N=960)

Parameters	Western Zone	
	Frequency	Percentage
Faced discomfort/Injury during farm/Allied activities		
Yes	871	90.73
No	89	9.27
Tools helps in reducing the force		
Yes	368	38.33
No	592	61.67
Uncertain	0	0.00
Feel tired after performing work		
Yes	716	74.58
No	244	25.42
Facing joint problems in farm/Allied activities		
Yes	735	76.56
No	225	23.44
Feel difficulty in bending in farm/Allied activities		
Yes	798	83.13
No	162	16.88
Got Scratches/Cuts/Injuries in farm/Allied activities		
Yes	597	62.19
No	363	37.81
Suffered from diseases/Health problems due to farm/Allied activities		
Eye infections	243	25.31
Ear disorders/Hearing problems	12	1.25
Skin cuts/Fungal infection	210	21.88
Allergy	327	34.06
Heat exhaustion/Heat strokes	669	69.69
Breathing problems/Bronchitis/Asthma	396	41.25
Numbness in feets/Hands	960	100
Back ache	960	100
Head ache	960	100
Pain in Knees, shoulders and other joints	960	100
Blisters on palm	818	85.21
Any other	1	0.10
To what extent you adopted one posture in farm/Allied activities		
30 min	325	33.85
1 hr	429	44.69
2 hr	206	21.46
Above 2 hr	0	0.00
How frequently you take care of hand tools and implements		
Yes	635	66.15
No	325	33.85
Do you go to the doctor after injuries/Allergies/Infections		
Always	0	0
Sometimes	13	1.35
Only when condition is serious	668	69.58
Never	279	29.06

Table 6: Drudgery perceived by respondents in different parts of the body

Questions regarding the use of tools	Answer of respondent	Total	
		Frequency	Percentage
Feel pain in body parts while performing	Yes	960	100
farm activities	No	0	0

Table 7: Degree of drudgery experienced in different body part of women farmers

Body Part	Very Severe		Severe		Moderate		Mild		Very Mild		Nill		Total	
	f	%	f	%	f	%	f	%	f	%	f	%	f	%
Knee	158	16	384	40	38	4	19	2	0	0	360	38	960	100
Elbow	0	0	0	0	480	50	336	35	144	15	0	0	960	100
Backbone	749	78	115	12	77	8	10	1	10	1	0	0	960	100
Shoulder	691	72	96	10	115	12	38	4	19	2	0	0	960	100
Neck	96	10	135	14	413	43	192	20	125	13	0	0	960	100
Wrist	585	61	163	17	115	12	77	8	19	2	0	0	960	100
Waist	430	45	205	21	172	18	115	12	38	4	0	0	960	100

working from early morning till late night. Sickle, *khurpi,* hand plough, fertilizer sprayer/broad caster, engine, harrow and tractor+ trolly were the major farm tools and implements possessed by the respondents. In case of livestock possession buffalo was found to be reared by most of the respondents followed by cattle. In crop production activities, paddy transplanting, field cleaning and weeding and harvesting/ plucking/ uprooting/ detopping etc were the most strenuous and drudgery prone activities, in which there is a need to have good intervention like improved, handy and drudgery reducing tools. Work rest cycle could also be suggested with other work simplification techniques. In post harvest management chores, decortication/ shelling, winnowing and sun drying and sieving, grading and cleaning were areas where maximum drudgery was perceived. Among all livestock management related activities fodder cutting/ carrying, cleaning of animal shed and carrying of animal waste for disposal were found as burdensome and drudgery prone. Most of the respondents found their existing tools as uncomfortable and producing drudgery and they faced very severe pain in backbone, shoulder, wrist, and waist followed by moderate pain in elbow and neck. The conclusion was drawn from the study that there is specific need of women friendly tools in the study area which should not be heavy, distort the correct postures and reduce the work force introduced by farm women to get the relief in working pattern.

REFERENCES

Bhople, R.R. and A. Pathai. 1998. Socio-economic dimensions of farm women labour. *Rural India*, 192.

Bimala, K.R.; S. Gandhi and M. Dilbaghi. 2001. Ergonomic evaluation of farm women picking cotton. A paper presented in the International Congress on Humanizing Work and Work environment held at IIT, Mumbai, 11-14 December, Mumbai (M.S.) INDIA.

Gite, L.P. and G. Singh. 1997. Ergonomics in agriculture and allied activities. A Technical Bulletin, No CIAE/1997/70, CIAE, Bhopal (M.P.) INDIA.

Mohanty, S.K.; B.K. Behera and G.C. Satapathy. 2008. Ergonomics of farm women in manual paddy threshing. Agricultural Engineering International: the CIGR E-journal. Manuscript MES 08 002.10.

Singh, P.; S.K. Dubey and S. Pandey. 2019. Occupational Health Hazards among Farm Women in Kannauj district of Uttar Pradesh. *Journal of Community Mobilization and Sustainable Development,* 14(1): 5-10.

Singh, R.K.P.; K.N. Agarwal; K.K. Satapathy; S. Biswas and M. Mawa. 2001. Analysis of drudgery prone activities and gender involvement in paddy cultivation. *Indian Journal of Hill Farming*, 14(2): 61-67.

Tripathi, K. and T. Selvan. 2016. Identification of training needs of rural females in improved home and farm managerial practices in Western Uttar Pradesh. *Journal of Community Mobilization and Sustainable Development,* 11(1): 24-28.

Verma, S.K. and B.P. Sinha. 1991. Inter gender sharing of drudgery in cultivation of major crops. *Indian Journal of Extension Education*, 27(1&2): 18-23.

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Impact of COVID-19 on Agriculture and Allied Sectors

A.K. Singh[1], Lakhan Singh[2] and Sunil Kumar[3]
[1]Division of Agricultural Extension, Indian Council of Agricultural Research, New Delhi
[2]ICAR-Agricultural Technology Application Research Institute, Pune, Maharashtra
[3]Shri Siddhagiri-Krishi Vigyan Kendra, Kolhapur, Maharashtra

ABSTRACT

COVID-19 has emerged a global pandemic, which has impacted world economy. Indian agriculture sector majorly share in Indian economy, is also one of the victim of this pandemic along with manufacturing and service sectors. The restrictions imposed due to COVID-19 have greatly impacted the agricultural allied sector in all corners. A national level study was formulated to see the impact of COVID-19 on agriculture and allied sectors and *expost facto* design of research was used**.** Heads and SMSs of KVKs from 11 ATARIs were selected as respondents. The questionnaire was developed with the help of Google form on six dimensions such as livestock sector, horticulture sector, food sector, agricultural labourers, social media and psychological dimension and normal descriptive statistics (Mean, Standard Deviation) was used. During the study it observed that in livestock sector, surplus production of milk and marketing, feed and concentrate availability were major affected areas along with government initiative for marketing with curfew passes considered as major factors. The effect of COVID-19 on food and horticulture/ floriculture sector was affected severely. The harvesting of major food crops was completed but in some part it was affected the farmers due to non-availability of labourers. Major fruit crops harvesting and marketing was affected. Agricultural labourers were affected mostly due to shut down of different activities. Through various government schemes labourers were supported financially and logistically with supply of food products. Social media have emerged as essential tools to disseminate the information through various social media and digital platforms. Various psychological effects were studied and accordingly suggestions were given. Best possible strategies in each dimension have been suggested which can be deployed with little medication.

Keywords: Agricultural and migrant laboureres, COVID-19, Food and Horticulture, Livestock, Psychological effect of COVID-19, Social media

INTRODUCTION

The COVID-19 pandemic has been considered as the most crucial global health calamity of the century and the greatest challenge that the human kind faced since the 2nd World War. In December 2019, a new infectious respiratory disease emerged in Wuhan, Hubei province, China and was named by the World Health Organization as COVID-19 (Chakraborty *et al.,* 2020). The COVID-19 pandemic is already having devastating impacts on the world economy –both directly and through necessary measures to contain the spread of the disease. These impacts are also being felt by the food and agriculture sector. Due to the restrictions imposed to keep people safe, this was triggered fears of a deep and prolonged global recession in many countries. According to IMF, in India the GDP growth rate has been estimated of 1.9 per cent only and forecasted global recession due to COVID-19. Global economy is projected to grow by 5.8 per cent in 2021 as economic activity normalizes, helped by policy support (World Economic Outlook, April, 2020). The impact of the coronavirus (COVID-19) pandemic had not only brought the global economy to a standstill but set the clock backwards on the developmental progress of several nations. Agriculture is one of the most important sectors in human development and is related to food security (Abdelhedi and Zouari, 2018; Lopez-Ridaura *et al*., 2019). Agriculture and allied sectors continue to be pivotal to the sustainable growth and development of the Indian economy. It significantly contributes in fulfilling the food and nutritional requirements of 1.3 billion Indians followed by production, employment and demand generation through various backward and forward linkages (GoI,

*Corresponding author email id: lakhanextn@gmail.com

2016). As a result, agriculture, food and nutrition have come into sharp focus as fallout of the COVID-19 crisis in India. Agriculture, forestry and fishery sector is expected to decline by -1.3 per cent between April to June, 2020 (The Statistica, 2020). As the share of agriculture sector in Indian economy is 17 per cent, which is higher than the manufacturing sector and agriculture alone will give more than 0.52 per cent to the growth rate of Indian economy. As per NITI Aayog, there will be 03 per cent growth in the agriculture sector, and add 0.5 per cent in India's GDP growth this fiscal year. The growth of the agriculture sector for current year is 60 per cent more than the non-agriculture sectors. The COVID-19 is affecting agriculture in two significant aspects: the supply and demand for food (FAO, 2020b). Although Indian food grain production is on record bumper production which is 3.67 per cent (10.46 million tonnes) when compared to the previous year 2018-19. The potential negative impacts of Corona on agricultural production, market stability, food supply may now be seen from the surface but it is still difficult to predict quantify the exact damage accurately. Local food systems are fragile in India. The media play an important role in the dissemination of information on the 2019 novel coronavirus disease (COVID-19) pandemic (Mejia *et al*., 2020). However, it is important to measure whether the population is receiving information that calms it down, as well as whether such news are in accordance with the magnitude of the issue. Migrants play a substantial role in agri-food systems. Measures affecting the movement of people (internally and internationally) and resulting labour shortages will have an impact on agricultural value chains, affecting food availability and market prices globally (FAO, 2020a). About 91 per cent of the total workforce is from the informal sector, which include mostly daily wage workers such as agricultural labourers, migrant and other workers. According to the Indian government's data, around 263 million people are involved in the agriculture sector and more than half of them are part of agricultural labour who do not own farmland but work on others for wages, harvest the crops and support the sale of the crops at the *mandis*. This vulnerable section of people will be the hardest hit during this pandemic of COVID-19. The worst part of the imposing social restriction was that it coincided with the country's peak harvesting time of a variety of crops of the season. Summer vegetables and fruits were ripened and ready to pick; wheat, paddy and barley crops were ready for harvest that may hit adversely the farmers. In this respect, the study has been planned to study the impact of coronavirus (covid-19) on agriculture and allied sector.

MATERIALS AND METHODS

This study was planned to see the impact of Coronavirus (COVID-19) on different sections such as livestock, food and horticulture, agricultural labourers, effect of social media in dissemination of information and psychological impact on people. A nationwide study was conducted and an *expost facto* design of research was used. For the study, the Heads and Subject Matter Specialists (SMSs) of KVKs of 11 ATARIs were selected as respondents purposively because of social restriction in mobility and direct data collection with farmers. The questionnaire was developed with the help of Google form on six dimensions such as livestock sector, horticulture sector, food sector, agricultural labourers, social media and psychological dimension. A total of 1748 respondents were selected for study. Responses were collected in categorical variable viz., Yes (1) or No (0) against each statement. For calculating each dimension's impact, normal descriptive statistics (Mean, Standard Deviation) was used.

RESULTS AND DISCUSSIONS

Effect on Livestock Sector: Agrarian economy has defined the stake of Indian economy since long time. The Pandemic of COVID-19 has ascertained the growth and seasonal works of farming. As a result of pandemic many sectors of agriculture and allied sector has been affected. India is number one in cattle and milk production in the world and it contributes largely in agrarian economy. Different statements were developed to measure the impact of coronavirus on livestock sector (Table 1).

The impact of coronavirus on agriculture and allied sectors were studied and it was found that majority of respondents (60%) were agreed that the farmers had faced problems in selling the milk to their customers in town and cities. The study was in consonance with findings of Bhandari *et al.* (2020) and Palsaniya *et al.* (2020) found that the livestock farmers found it difficult to sell the milk and other meat products. Following the impact of coronavirus, it was observed that majority of respondents (54%) were agreed that the milk price has not fallen (mean=0.609) in the villages and dairy farmers were not found in any distress sale. While the feed and concentrates are important factors for milch animals, majority of respondents (72%) were reported that feed and concentrate (mean=0.727) were

Table 1: Effect on Livestock Sector (N=1,748)

S. No.	Statements	Responses		Mean	Std. deviation
		Yes	No		
1	Do you feel that farmers are facing problem in selling of milk in the district?	1065 (60.9%)	683 (39.1%)	0.609	0.488
2	Do you think that the prices of milk have fallen down in the villages?	803 (45.9%)	945 (54.1%)	0.459	0.498
3	Do you feel that there is an interrupted supply of feed and concentrate for animals?	1272 (72.8%)	476 (27.2%)	0.727	0.445
4	Do you think that Veterinarians are serving uninterruptedly for the farmers?	1229 (70.3%)	519 (29.7%)	0.703	0.457
5	Do you feel that Government has allowed farmers to sell their products with curfew passes is a good initiative?	1670 (95.5%)	78 (4.5%)	0.955	0.206
6	Do you feel that appropriate advisories provided by KVK experts through different social media are effective?	1719 (98.3%)	29 (1.7%)	0.983	0.127
	Overall mean= 0.739			**Overall Std. deviation** = 0.160	

not available for animals because of interrupted supply to the users. The FAO (2020) done the study on impact of COVID-19 on livestock sector and found similar results. Veterinary services are required continuously for animals and in the study it was found that majority of respondents (70%) were agreed that the veterinarians were available in the dispensary (mean=0.703) for any type of health problem for animals. While due to restricted movement for people, the Government has allowed the farmers with curfew passes (mean=0.955) to sell their products like milk, food grains, vegetables, etc. considered as a very prominent and needful decision for farmers, were most of the respondents (95%) agreed and welcomed this type of decision. While the spread of coronavirus has happened during the time of harvesting of major crops, the advisory issued by the Krishi Vigyan Kendras (KVKs) through different social media (mean=0.983) in different thematic areas were found reliable and appropriate for farming community (98%).

Effect on Horticulture Sector: The impact of coronavirus was observed on horticulture sector and it was found that majority of respondents (65%) were agreed that harvesting of major fruits and vegetable crops have been affected (mean=0.649) in many districts. Further, due to the restricted opening of shops for supply of critical inputs for farmers (mean=0.699) has assured in terms of availability of inputs that led to continue the farm operations (70%). The majority of respondents (90%) agreed that transport and sale of many ornamental flowers and different seedling/saplings severely affected (mean=0.906) due to many reasons.

The study revealed that farmers have developed the alternative marketing channels (mean=0.828) such as door to door supply of essential commodities for people has proved to be an important tool for empowering the farmers as agreed by most of the respondents (83%). Majority of respondents (94%) were agreed with the fact that, Krishi Vigyan Kendras (KVKs) have been facilitated in the formation of many group based farming models such as FPOs/FPCs/SHGs for empowering the farmers proved to be an important initiative (mean=0.923) for effective and appropriate problem solving mechanism for farmers in marketing of horticultural produce. Mukherjee *et al.* (2018), in his study reported these institutions as important strategies to integrate farmers with production and value chain like Self Help Groups, Farmers Interest Groups, and Farmers' Cooperatives etc. Further, the study revealed that majority of respondents (94%) were highly appreciated the efforts of Government to help the farmers, traders, vendors, etc. in meeting the demand and supply of horticultural commodities (mean=0.942) up to certain extent.

Food termed as basic necessity for human survival and during the spread of coronavirus the major crops in the month of March and April were under harvesting. The study revealed that majority of respondents (72%) agreed that the harvesting of major food crops has been completed almost at proper time (mean=0.719) and didn't get affected more due to coronavirus infection. As per Govt. statistics in 3rd Advance Estimates of production of major crops for 2019-20, the total food grain

Table 2: Effect on Horticulture Sector (N=1,748)

S. No.	Statements	Responses		Mean	Std. deviation
		Yes	No		
1.	Do you feel that the harvesting of major fruit crops has been affected in the district?	1136 (65%)	612 (35%)	0.649	0.477
2.	Do you think that due to restricted opening of shops the supply of critical inputs can be assured for farmers?	1223 (70%)	525 (30%)	0.699	0.458
3.	Do you feel that the sale and transportation of ornamental flowers and seedling/saplings from nurseries have been severely affected?	1584 (90.6%)	164 (9.4%)	0.906	0.291
4.	Do you feel that as an alternative mechanism for marketing such as door to door supply has empowered group of farmers?	1449 (82.9%)	299 (17.1%)	0.828	0.376
5.	Are you satisfied with the joint efforts of KVKs with FPOs/FPCs/SHGs to solve the horticulture-related problems to a greater extent in the area?	1615 (92.4%)	133 (7.6%)	0.923	0.265
6.	Do you feel that relaxation is given by Govt. has helped the farmers, traders, vendors, etc. in meeting the demand and supply of horticultural commodities up to a certain extent?	1647 (94.2%)	101 (5.8%)	0.942	0.233
	Overall mean= 0.825		**Overall Std. deviation** = 0.102		

Table 3: Effect on Food Crops (N=1,748)

S. No.	Statements	Responses		Mean	Std. deviation
		Yes	No		
1.	Do you feel that harvesting of major food crops could be completed almost at proper time?	1257 (71.9%)	491 (28.1%)	0.719	0.449
2.	Do you feel that Government initiative of procurement centers for different food grains and horticultural produce will help the farmers?	1617 (92.5%)	131 (7.5%)	0.925	0.263
3.	Do you feel that regular farm labour unavailability will increase labour cost and cost of cultivation of crops?	1412 (80.8%)	336 (19.2%)	0.807	0.394
4.	Do you feel that Custom Hiring Centers has played crucial role in supplying big farm machineries and other equipments for farm operations?	1440 (82.4%)	308 (17.6%)	0.823	0.381
5.	Do you feel that State and technology driven advisories issued by ICAR/ SAUs/KVKs has helped the farmers to tackle the related problems?	1729 (98.9%)	19 (1.1%)	0.989	0.103
6.	Are you satisfied with initiatives taken by Govt. to overcome issues of farmers for food crops?	1595 (91.2%)	153 (8.8%)	0.912	0.282
	Overall mean= 0.862		**Overall Std. deviation** = 0.124		

production in the country is estimated to achieve a record of all-time high 295.67 million tonnes which is 3.67 per cent (10.46 million tonnes) when compared to the previous record 285.21 million tonnes during the 2018-19 crop year. The fact that delineated with the study that the harvesting of major food crops has been completed almost at proper time and didn't affect more due to coronavirus infection has enough food for the country. The majority of respondents (92%) agreed that the harvested produce were procured through various procurement centres for food grains and horticultural produce (mean=0.925) has found to be useful for farmers to sell their produce at right time. Regular farm labour unavailability has increased the labour cost and cost of cultivation of crops (mean=0.807) as agreed by majority of respondents (80%). This might be due to shortage of labourers and other reasons such as fear of infection and restriction on movement. Majority of respondents (82%) agreed that Custom Hiring Centers have played crucial role in supplying big farm machineries (mean=0.823) and other equipments for farm operations. The similar study was reported by Chahal *et al.* (2014) stated that Custom Hiring Centres have huge potential in supplying farm machineries at cheaper rate to farmers. It was observed majority of respondents (99%) found that state

Table 4: Effect of COVID-19 on labourers in Agriculture and Allied Enterprises (N=1,748)

S. No.	Statements	Responses		Mean	Std. deviation
		Yes	No		
1.	Do you feel that daily landless wage workers affected most due to coronavirus infection?	1542 (88.2%)	206 (11.8%)	0.882	0.322
2.	Do you feel that Procurement operations have been affected due to labour shortage for loading, unloading of produce?	1526 (87.3%)	222 (12.7%)	0.872	0.333
3.	Do you feel that despite of work, some workers want to stay home and waiting for Government welfare schemes?	1198 (68.5%)	550 (31.5%)	0.685	0.464
4.	Do you think that migratory workers will start his/her enterprise in their area according to their skill/expertise?	1143 (65.4%)	605 (34.6%)	0.653	0.475
5.	Do you feel that financial assurance through MGNREGA, PM Jan Dhan Yojna and Kisan Samman Nidhi (KISAN) Yojna has helped the farmers?	1654 (94.6%)	94 (5.4%)	0.946	0.225
6.	Do you feel that labourers can work in the field on the slogan of *Do Gajki Doori* (distancing by 2 feet) and by practicing hygiene practices?	1539 (88%)	209 (12%)	0.880	0.324
	Overall mean= 0.820			**Overall Std. deviation** = 0.094	

and technology driven advisories issued by ICAR/SAUs/ KVKs has helped the farmers (mean=0.989) to tackle the related problems. Majority of respondents (91%) were satisfied that various initiatives taken by government to overcome issues of farmers (mean=0.912) for food crops were effective.

The Agriculture and allied sector is particularly important in Asia, where its employment share is 30.5 per cent, has emerged as a major source of employment for women, who account for 41.9 per cent of the agricultural workforce in the developing world (ILO, 2017). The impact of coronavirus was studied on labourers in agriculture and allied enterprises and it was observed that majority of respondents (88%) were agreed that daily wage and landless wage workers were affected (mean=0.882) most in terms of employment due to coronavirus infection. The labour unavailability has affected the procurement operation (mean=0.872) due to labour shortage for loading, unloading of produce in the market as agreed by majority of respondents (87%). During the study the data on other aspects such as despite of work, some workers want to stay home and waiting for government welfare schemes was observed and 68 per cent respondents agreed that with the reason of fear of infection spread in work place may happen. It was conveyed by 65 per cent of respondents that migratory workers will start his/her enterprise in their area according to their skill/expertise. During coronavirus infection in March and April month, Government has helped financially to needy and beneficiary farmers of various welfare schemes such as MGNREGA, PM Jan Dhan Yojna and Kisan Samman Nidhi (KISAN) Yojna became beneficial to the farmers (mean=0.946) in this pandemic and agreed by majority of respondents (94%). Under the PM-KISAN Yojana 6.93 crore farmers were benefited over the Covid-19 crisis. Under the scheme, the government transfers Rs. 2,000 cash directly to the farmers' bank accounts through direct benefit transfer or DBT. Rs 13,855 crore have gone towards payment of first instalment. Under Jan Dhan scheme, 19.86 crore women account holders received Rs 500 each in their account with the total disbursement of Rs 9,930 crore (Hindustan Times, 2020). In the study, it was found that majority of respondents (88 per cent) were agreed that the appeal of social distancing was found to be an effective way (mean=0.880) for labourers while working in fields followed by practicing hygienic practices while performing most activities.

Social media has always played an important role in spread of timely information in most effective way. The study revealed that majority of respondents (90%) were agreed that, during this pandemic there is need for online delivery of various seasonal and crop specific farm inputs (mean=0.899) for on and off farm activities. Most of respondents (99.7%) were highly agreed that the KVKs have played their role in providing different agro-advisory/ information found reliable and action oriented (mean=0.996) for farmers. The study further revealed that majority of respondents (97.5%) had a thought that social media and digital platforms were the ways to help farmers (mean=0.975) in situation like COVID-19 pandemic.

Table 5: Effect of Social Media on Disseminating Information (N=1,748)

S. No.	Statements	Responses		Mean	Std. deviation
		Yes	No		
1.	I felt there is a need for online delivery of seasonal and crop-specific farm inputs	1573 (90%)	175 (10%)	0.899	0.300
2	I think that Agro-advisory given by KVKs is found reliable and action oriented for farmers	1742 (99.7%)	06 (0.3%)	0.996	0.058
3	I think that Social media and digital platforms are ways to help farmers in situation like COVID-19 pandemic	1705 (97.5%)	43 (2.5%)	0.975	0.154
4.	Apps like Zoom were found useful for video conferencing among farmers groups and others experts to resolve the farm related problems/issues	1322 (75.6%)	426 (24.4%)	0.756	0.429
5.	I always believe in authentic information disseminated by Govt. website (Ministry of Health and Family Welfare, WHO, ICMR/Arogya SetuApp)/ Govt portals/websites	1737 (99.4%)	11 (0.6%)	0.993	0.079
6.	I think that Kisan Call Centres has helped farmers responding their queries	1662 (95.1%)	86 (4.9%)	0.950	0.216
7.	I think the e-NAM portal is connecting all the Agricultural Markets (Mandis) for both perishable and non-perishable commodities across the nation and found more effective for marketing	1451 (83%)	297 (17%)	0.830	0.375
	Overall mean= 0.914		**Overall Std. deviation** = 0.143		

Majority of respondents (75.6%) found agreed that the use of different video conferencing application such as Zoom which has helped the farmers and farmers groups (mean=0.756) and others experts to interact and resolve the queries of farm related problems/issues in an effective way. The study revealed that majority of respondents (99.4%) were highly agreed that they always believe in the use of authentic information (mean=0.993) disseminated by Govt. website (Ministry of Health and Family Welfare, WHO, ICMR/Arogya Setu App)/ Govt. portals/websites. For the farming community, a specialized helpline number of Kisan Call Centers were found highly reliable (mean=0.950) and providing appropriate responses (95%) to various queries of farmers. While studying the impact of coronavirus on agriculture and allied sectors, the majority of respondents (83%) were agreed that the e-NAM portal is connecting all the Agricultural Markets (Mandis) for both perishable and non-perishable commodities across the nation and found more effective (mean=0.830) for marketing. The e-NAM have multi dimensions like to establish a national e-market platform for transparent sale transactions and price discovery initially in regulated markets, to provide liberal licensing of traders/buyers and commission agents by state authorities without any pre-condition of physical presence or possession of shop/premises in the market yard (Bachaspati, *et al.,* 2018). Till now more than 1,005 farmer producer organizations have been registered on e-NAM and have already traded 2,900 MT of agricultural produce that is worth of Rs. 7.92 crores (Shailaja Tripathi, 2020).

While studying the impact of coronavirus on agriculture and allied sector, various effects on psychological parameters were also studied. The study revealed that majority of respondents (98.8%) thought that they should support the needy persons (mean=0.987) around them during distress situation of COVID-19. During the study, it was observed that more than half of the respondents (53.5%) have developed the mental fear of losing savings and even basic services during COVID-19. Due to coronavirus infection in the country, majority of respondents (88%) found to agree that they have developed the feeling of frustration (mean=0.881) when others are not following the pre-cautionary measures for COVID-19. This was supported by Varshney *et al.* (2020) who found that during the initial stages of COVID-19 in India; almost one-third respondents had a significant psychological impact. The study further revealed that majority of respondents (96%) were highly agreed that the lifestyle of people would change after COVID-19 pandemic (mean=0.958) in public and private places. The scope of sanitary practices has been put first by people during this pandemic of COVID-19 and majority of respondents (98%) felt that people will understand the

Table 6: Psychological Effects on People (N=1,748)

S. No.	Statements	Responses		Mean	Std. deviation
		Yes	No		
1.	I support the needy persons around me during distress situation	1727 (98.8%)	21 (1.2%)	0.987	0.108
2.	I have a mental fear of losing savings and even basic services during COVID-19	936 (53.5%)	812 (46.5%)	0.464	0.498
3.	Feeling of frustration when others are not following the pre-cautionary measures for COVID-19	1540 (88.1%)	208 (11.9%)	0.881	0.323
4.	Lifestyle of people could be changed after COVID-19 pandemic in public and private places	1676 (95.9%)	72 (4.1%)	0.958	0.198
5.	I think people will understand the importance of sanitation (Swachch Bharat Abhiyan) and people will practice more hygiene and table etiquettes	1712 (97.9%)	36 (2.1%)	0.979	0.142
6.	I think Arogya Setu App has helped people regarding staying away from infection, symptoms, regular check and other recommendations regarding protection from COVID-19 and for getting vehicle passes	1685 (96.4%)	63 (3.6%)	0.963	0.186
	Overall mean= 0.872		**Overall Std. deviation** = 0.145		

importance of sanitation (Swachch Bharat Abhiyan) and people will practice (mean=0.979) more hygiene and table etiquettes. Government has launched the Arogya Setu App and majority of respondents (96%) opined that this app has helped people (mean=0.963) regarding staying away from infection, symptoms, regular check and other recommendations regarding protection from COVID-19 and for getting vehicle passes.

STRATEGIES

Despite of huge downfall due to COVID-19 pandemic in manufacturing and service sector, the agriculture sector could boost the Indian economy. The agriculture and allied sector need suitable measures to combat the effect of COVID-19 for current situation and *kharif* season has been discussed below:

Strategies for Livestock Sector

1. To combat the surplus milk production, there is need to establish a marketing channel for regular procurement of milk and value addition of milk-based products can be done.
2. Availability of feed and concentrate should be ensured and more fodder-based crop pattern can be adopted.
3. There should be encouragement on collective dairy farming/ cooperative farming to sell their milk.
4. Poultry and meat sectors need to be encouraged and misinformation needs to reduce by disseminating authentic information by government officials.
5. KVKs should provide regular training on care and handling of animal in normal and distress condition.

Strategies for Horticulture Sector

1. To avoid post-harvest losses, value addition and processing practices for fruits and vegetables need to be adopted followed by establishment of market linkage for fruits and vegetables.
2. To overcome the labour unavailability, mechanisation of farm is needed.
3. Farmers should adopt collective farming approach, may be Farmer Producer Companies to secure the farmers from distress sale.
4. There is need to develop and regulate the supply value chain which is disconnected now.
5. e-Trading and marketing need to use more ICT marketing digital platform like e-NAM, Agrmarknet etc.

Strategies for Food Sector

1. There is need to open regular shops for the purchase of critical inputs.
2. The sowing of *kharif* season should be completed in time.
3. A tie-up is needed with leading farmer producer organizations to supply produce directly to households. However, logistics and fulfillment needs considerable strengthening.

4. Big machineries movement should be allowed for farm operation. Custom Hiring Centers (CHCs) at village or Panchayat level are to be established with KVKs.
5. The Government should consider waiving the interest costs of all outstanding crop loans and ensure a fresh flow of credit to small and marginal farmers for the *kharif* season of 2020.

Strategies for Agricultural Labourers

1. Need to ensure possible employment for daily/ seasonal labourers with good amount of wages.
2. Small scale processing units can be developed as an enterprise to engage the labourers e.g. mini dal mill, oil mill etc. to be established through different government sources.
3. Bee keeping, Vermicomposting, bio-products production, and incubating them in KVKs to make use the facilities available with KVKs to take up mass production and supply.
4. There is need to increase the benefits of various social welfare scheme such as MGNREGA, Jan Dhan Scheme and Kisan Samman Nidhi Yojana.
5. Small scale business opportunities should be started in convergence mode with various ministries like agriculture, MSME, Rural development, Food and processing ministry and child and women development.

Strategies for Information Dissemination through Social Media

1. Need to ensure that correct and reliable information should be reached to farmers with social media, so encourage more use of official website/Apps.
2. Need a filter policy for restricting the dissemination of misinformation.
3. Need to add a greater number of famers in directory/ groups, or create a greater number of social media groups so that information can reach to large section of farmers.
4. There is need to perform the duty of a responsible citizen by not spreading any misinformation and educating other for adopting hygiene practices.

Strategies for Psychological Overcome due to COVID-19

1. Need not to panic, due to the increasing cases in counties and keep you and your family health at first priority.
2. There is need to follow the general guidelines for safety of person.
3. There is need to spread positive news around you.

CONCLUSION

COVID-19 has sealed every boundary and the economic activities of country. It has produced enormous effect on agriculture and allied sectors, which is called as base of Indian economy. Farmers are the key to reform the Indian economy and have the capacity to build nation economically strong to neglect the effect of COVID-19. With the estimated record production of food grain 295.67 million tonnes, to feed the 1.4 billion of population, now farmers are going for sowing of *kharif* crops. Farmers have entered into new normal of life during COVID-19 that may continue in post COVID-19 situation also by abiding the hygiene practices and adopting social distancing in the field as well as in normal life. With the effect in dairy sector where farmers have been affected by several reason like un even price of milk and other products, fall in meat production in poultry, fisheries and goatery sector, more demand fluctuation of milk and poultry, feed and fodder problems in district have imposed unavoidable circumstances. Similarly, in other sectors such as food and horticulture sectors have faced problems of labourers for field operation and supply of critical inputs for *kharif* season. The migrant agricultural labourers have created the crunch situation before the farming situations, which needs to be tackled with more care and attention. These sudden problems have arisen due to COVID-19 restriction to movement and shutdown of farming units in manufacturing and service sector. There is need to adopt the new normal of life with COVID-19 and need not to wait for complete eradication of virus. Farmers need to adopt the e-channel for marketing and advisory for farm and farm produce. Government should also ensure the best measure for farming community and proving regular food to labourers till they are going for any other livelihood options. There is great need of creating awareness for COVID-19 and their myths. There is need to support our farmer by various government schemes

with effective implementation and execution. A positive mindset is always a great weapon against this type of invisible enemy and this can encourage the farmers with their efforts towards the food security of the country.

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REFERNCES

Abdelhedi, I.T. and S.Z. Zouari. 2018. Agriculture and Food Security in North Africa: a Theoretical and Empirical Approach. Journal of the Knowledge Economy, pp. 1-18.

Bachaspati, Soham and Pathak, Hulas. 2018. Impact of e-NAM on arrival & prices of major commodities: A case study of Bhatapara APMC in Chhattisgarh. *Journal of Pharmacognosy and Phytochemistry,* 7(4): 3301-3304.

Chahal, S.S.; P. Kataria; S. Abbott and B.S. Gill. 2014. Role of cooperatives in institutionalization of custom hiring services in Punjab. *Agricultural Economics Research Review*, 27(conf): 103-110.

Chakraborty, I. and P. Maity. 2020. COVID-19 outbreak: Migration, effects on society, global environment and prevention. *Science of The Total Environment*, 138882.

FAO. 2020a. Migrant workers and the COVID-19 pandemic. Rome.

FAO. 2020b. *Mitigating the impacts of COVID-19 on the livestock sector.* Rome. https://doi.org/10.4060/ca8799en.

Government of India. 2016. State of Indian agriculture, 2015-16. Retrieved from http://eands.dacnet.nic.in/ PDF/ State_of_Indian_Agriculture, 2015-16.pdf.

Gunjan Bhandari and K.M. Ravishankar. 2020. Implications of COVID-19 for Indian Dairy Sector. *Food and Scientific Reports*, May, 1: 43-46.

Hindustan Times, (2020, 12 April). PM-KISAN, Jan Dhan, Ujjawala: Govt lends Rs 30,000 crore helping hand in Covid-19 crisis. Assessed from https://www.hindustantimes.com/india-news/pm-kisan-jan-dhan-ujjawala-how-govt-is-helping-in-covid-19-crisis/story-gtNSv87n72HPKOVYEIkXXL.html.

ILO, Sectoral Brief: COVID-19 and the impact on agriculture and food security, April 2020.assesedfromhttps://www.ilo.org/wcmsp5/groups/public/—ed_dialogue/—sector/documents/briefingnote/wcms_742023.pdf.

Lopez-Ridaura, S.; L. Barba-Escoto; C. Reyna; J. Hellin; B. Gerard and M. van Wijk. 2019. Food security and agriculture in the Western Highlands of Guatemala. *Food Security*, 11(4): 817-833.

Mejia, C.R.; D. Ticona; J.F. Rodriguez-Alarcon; A.M. Campos-Urbina; J.B. Catay-Medina; T. Porta-Quinto and M.R. Tovani-Palone. 2020. The Media and their Informative Role in the Face of the Coronavirus Disease 2019 (COVID-19): Validation of Fear Perception and Magnitude of the Issue (MED-COVID-19). *Electron J Gen Med.,* 17(6): em239.

Palsaniya, D.R. and Aniruddha Maity. 2020. Fodder and Livestock Sector in India During COVID-19 Lock Down: Possible Impacts and Mitigation Strategies. *Food and Scientific Reports*, May, Vol. 1: 34-35.

Shailaja Tripathi. (2020, May, 12). 177 New mandis integrated with e-NAM platform. *Jagranjosh*. *Assessed from* https://www.jagranjosh.com/current-affairs/177-new-mandis-integrated-with-enam-platform-1589261900-1.

Statistica, 2020. https://www.statista.com/statistics/1107798/india-estimated-economic-impact-of-coronavirus-by-sector/

Varshney, M.; J.T. Parel; N. Raizada and S.K. Sarin. 2020. Initial psychological impact of COVID-19 and its correlates in Indian Community: An online (FEEL-COVID) survey. *Plos One*, 15(5): e0233874.

WORLD ECONOMIC OUTLOOK REPORTS, World Economic Outlook, April 2020: The Great Lockdown April 2020.

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Dairy Sector Development in Sugarcane Based Cropping System of Uttar Pradesh (UP): Challenges and Opportunities

Rakesh Kumar Singh[1]*, Ashwani Kumar Sharma[2], Y.P. Singh[3] and S.C. Tripathi[4]

[1]SMS (Animal Science), KVK, ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh

[2]Principal Scientist (Agriculture Economics) ICAR-Indian Institute of Sugarcane Research, Lucknow, Uttar Pradesh

[3]SMS (Agriculture Extension) ATIC, Indian Agricultural Research Institute, New Delhi

[4]Professor (Veterinary and AH Extension Education), CoVAS, GBPUA&T, Pantnagar, Uttarakhand

ABSTRACT

Achieving Sustainable Development Goals (SDGs) such as reducing poverty, hunger and malnutrition by 2030 require that sustainable and profitable smallholder livestock production systems be developed and the connected social, economic, and environmental challenges-all at the same time be addressed at a more disintegrated level. This paper is an an attempt to analyse the livestock resources, diversity and associated issues in sugarcane intensive areas of Uttar Pradesh. The paper is based on the secondary source information as well as on primary source information from 20 urban and 20 rural dairy owning households from three most intensive sugarcane growing districts in UP. Analysis of livestock resources in UP state reveals that the buffalo population accounts for 44.57 per cent livestock resources while the cattle population accounts for its 28.46 per cent share. Breed-wise analysis revealed that there are just 12 recognized cattle breeds. Nearly 18.30 per cent of the total cattle population is exotic and crossbred animals. Amongst indigenous recognized breeds, the most common and hardy Hariana breed is having just 21.74 per cent pure animals. Amongst 6 recognised buffalo breeds, Murrah breed is very popular and constitutes 65.67 per cent of total buffalo population in the state. The share of pure animals amongst Murrah breed is just 22.88 per cent. Out of 22.20 millions milch animals, the in-milk animals were 16.42 millions (73.96%). The female: male ratio in exotic/CB, indigenous cattle and buffaloes was 4.67, 2.74 and 5.23, respectively. Holding-wise analysis reveals that only 29.82 per cent small landholders are rearing cattle and around 39.29 per cent are rearing buffaloes. The proportion of in-milk animal holders is less compared to large landholders. The role and contribution of livestock differed between the western and the eastern region of the UP. Buffalo are the prevailing livestock resource in western sugarcane intensive region in sharp contrast to eastern region as reveled by cattle: buffalo ratio of 0.38 and 0.59, respectively. Around 75.91 per cent of households in this region are owning buffalo, in sharp contrast to 27.69 per cent households in eastern region. The analysis of individual dairy farms/units highlights that different types of livestock production systems are in operation in urban and in rural areas. These systems, though different, are interconnected with each other on account of the constraints related to breeding and feeding management that played a crucial role in the efficiency and the profitability of the livestock production systems. The State is the largest producer of milk which is based not on large scale commercial production but on a large number of small producers with one to four bovines. An holistic approach is required to ease the constraints facing these dairy production systems in order to make them more efficient. Special emphasis is required for increasing the scale of operation through start-ups and agri-ventures in establishing modern and specialised livestock rearing entreprises by youths under new Govt initiatives such as AC & ABC scheme. A congenial and conducive policy environment needs to be developed for creating a sense of urgency and developing a collective action of producers at gram panchayat level in the form of well developed and business oriented gosala units supported by KVKs and veterinary hospitals for their extension needs. Institutional linkages be developed for managing the stray cattle menace at Gram Panchayat level itself. Extension and research needs for nutrition enrichment of sugarcane tops, the use of nano-technology in animal nutrition, reducing the age of maturity of female and in increasing the population of pure breeds of good quality indigenous stock need to be fulfilled in a time bound manner. Good cows of desi cattle breeds like Sahiwal and Gangateeri breeds need to be reared at each KVK level for demonstrating beneficial rearing scenarios of these breeds to the visiting and trainee farmers and farm women.

Keywords: Livestock resources and diversity, Sugarcane production system, Dairy animals, Dairy management practices, Stray cattle

*Corresponding author email id: rksaskvkiisr@yahoo.in

INTRODUCTION

In India, there are concerns about declining agricultural growth rates (agricultural growth rate has hovered around 2.8 per cent at 2004-05 prices over the last 25 years) due to lack of varied employment opportunities in rural India, dependence of households overwhelmingly on agriculture and allied sectors, lop-sided land distribution in terms of rural households owning insignificant land sizes that are increasingly becoming unviable due to rising cost of cultivation, and the resultant concentration of poor (73%) in rural areas (Kumar *et al.,* 2011). Livestock is an integral part of agricultural production system in India. With the intensification of agriculture, increase in population, per capita income, urbanization, liberalization and globalization, a drastic turnaround in the livestock sector has occurred, more so in post WTO phase. The value of output of livestock sector was Rs. 1043.5 thousands crores during 2017-18, including Rs. 701.5 thousand crores from milk group and Rs. 218.5 thousands crores from meat group (GOI, 2019). This sector is now being viewed as a major GDP contributor (4.9% of GDP and 28.4 per cent of agriculture GDP during 2017.18 at current prices) and foreign exchange earner. The global demand for livestock products export from India valued at Rs. 49.9 thousand crores during 2018-19 is on the rise (DGCI&S, 2019). The share of meat export has increased tremendously to 52.11 per cent of livestock export and about 1.13 per cent of total export earnings, while that of dairy products in livestock product export has reduced to a quite low level (below 5.0%) but now gaining marginally at 7.55 per cent in 2018-19 (APEDA, 2019). The major portion (90.42%) of meat export earnings is coming from bovine meat export rendering India a key player in the global meat market, and a global leader in buffalo meat exports, which increased at a compound annual rate of 28 per cent between 2007-08 and 2017-18, from Rs. 3,533 crores to Rs. 25988.45 crores (13.48 lakh metric tonnes) (APEDA, 2019). Indo-Gangetic Plains (IGP) in general and Uttar Pradesh in particular is one of the major areas for buffalo meat production and trade as 46.03 and 28.17 per cent of the country's buffaloes, respectively, are found in IGP and UP.

As India has the largest bovine population in the World, it ranks first among the world's milk producing Nations since 1998. In dairy sector, milk production in India during the period 1950-51 to 2017-18, has increased from 17 million tonnes to 187.75 million tonnes (GOI, 2019). The per capita availability of milk in the country which was 130 gram per day during 1950-51 has increased to 394 gram per day in 2018-19 (GOI, 2019) as against the world estimated average consumption of 291 grams per day during 2019. This represents sustained growth in the availability of milk and milk products for our growing population.

The increasing demand for livestock products continues to be a key opportunity for poverty reduction and economic growth, although the evidence of the last 10 years suggests that only a few countries have taken advantage of this opportunity effectively (Dijkman, 2009). The future role of smallholders in global food production and food security in the coming decades is however, unclear (Thornton, 2010). Smallholders currently are critical to food security, and this role is not likely to change significantly in the future. But increasing industrialization of livestock production may mean that smallholders may miss out on the opportunities that exist. The development and promotion of sustainable and profitable smallholder livestock production is the need of hour. For this, significant and sustained innovation (Dijkman, 2009), increasing governing regulation along food commodity chains, development of collective rights and community control (Gura, 2008), building social protection and strengthening links to urban areas (Wiggins, 2009), and massive investment (World Bank, 2009) are needed. Further achieving UNDP 2030 Agenda and its Sustainable Development Goals (SDGs), it requires achieving higher growth rates in all sectors of economy, as well as to ensure sustainable development of resources too (Some of the SDGs targets such as reducing poverty, hunger and malnutrition are also based on efficient development of sustainable livestock production systems. With just 10 years left to the 2030 deadline, India need to inject a sense of urgency in the livestock sector development too. This urgency also necessitates understanding the urgent challenges facing the livestock sector development and address connected social, economic, and environmental challenges – all at the same time. This also necessitates that the developmental issues need to be thoroughly examined at a more disintegrated level or at an agro-climatic one level. There is a challenge of sustaining crop productivity gains, improving rural livelihoods, and securing environmental sustainability in the Indo-Gangetic Plains (IGP) of India. While these issues have been examined in a pre-dominant rice-wheat cropping system (Erenstein, 2007), these issues and the challenges need to be examined

in sugarcane based smallholders livestock and dairy production system of IGP. The present paper examines the issues, plans and the programmes governing the livestock sector in general and the dairy sector in particular with special reference to state of Uttar Pradesh. The specific objectives of the paper are:

i) To analyse the livestock resources and diversity and its contribution to the dairy sector in India and at state level,

ii) To analyse the status of dairying practices at small holders livestock-sugarcane crop production systems in UP,

iii) To examine the challenges and opportunities for sustainable and profitable dairy sector development on small holders and suggest appropriate policy options.

MATERIALS AND METHODS

The paper discusses the livestock resources in UP State and in Indo-Gangetic Plains (IGP) as these areas were purposively selected for being known as having important sugarcane based intensive cropping system in India. UP state, a major state in IGP, accounts for about 49.22 per cent of the national area under sugarcane. The information pertaining to IGP has been compiled by considering information on Punjab, Haryana, UP, Bihar and West Bengal (WB) states. While describing the information pertaining to UP state, three distinct regions, viz., western, central and eastern have also been considered and explained in terms of one of the most intensive sugarcane growing district viz., Muzaffarnagar, Lakhimpur Khiri and Kushinagar, respectively. The paper is based on the information available from secondary as well as primary sources. The secondary data on nature and extent of bovine/livestock numbers and other aspects was compiled from secondary sources and various published documents of the Directorate of Animal Husbandry at the state and all-India level. The primary data was compiled on animal rearing, dairy management practices and the animal flow (trade pattern) scenarios in rural and urban setting at individual producer's level within a agro-climatic zone from a sample of 20 farmers each from rural and urban setting in Lakhimpur khiri district of UP. Tabular analysis was carried out to analyze the data. In order to assess the level of dairy management practices in dairy units in rural as well as in urban areas, indices were worked out separately for four types of management practices by a formula, $Ii=\Sigma xi/4n$, where Ii is the index value for each of the management category (breeding, feeding, disease and basic hygiene management) wherein, i varies from 1 to 4. For calculating each management category index value, xi varies from 1 to 10 and each takes the value from 1 to 5 to represent the status of management practice on a 5-point scale (very good, 4; good, 3; moderate, 2; poor, 1 and very poor, 0) and n represents the number of recommended management practices under the selected management category. In this way the index value varies from zero to one. Tabular techniques, percentages and compound growth rates were also used to present the results.

RESULTS AND DISCUSSION

Livestock resourcesand diversity in India and UP: Nature and Extent

The study of the nature and extent of livestock resources in the country is must from the livestock production system sustainability point of view. The total number of livestock in the country was 512.05 million numbers in 2012 as per 19th Livestock Census (Table 1). Out of this, there were 37.28 per cent cattle (190.90 millions), 21.23 per cent buffaloes (108.70 millions), 12.71 per cent sheep, 26.40 per cent goats and 2.01 per cent pigs. The total bovine population (cattle, buffalo, mithun and yak) was 299.9 millions. Over the years, the total livestock population has increased by 74.88 per cent from 292.80 million numbers during 1951. The population of cattle and buffaloes have increased by 150 and 186 per cent, respectively.

Indo-Gangetic Plains (IGP) shares 29.09 per cent of total livestock in the country while the share of IGP cattle, buffaloes, sheep and goats in the country is 27.52, 46.03, 4.85 and 29.55 per cent, respectively as per 2012 census report. UP accounts for 37.22 per cent cattle, 61.20 per cent buffaloes, 42.93 per cent sheep, 39.02 per cent goat and 46.14 per cent of the total livestock in IGP, and in this way UP State accounts for 10.24 per cent cattle, 28.17 per cent buffaloes and 13.42 per cent of total livestock population at all-India level. In sharp contrast to all-India scenario, the scenario in UP state highlights that the buffalo population contributes highest with 44.57 per cent followed by cattle population of 28.46 per cent. The livestock population in 2012, compared to 2007 census figures, has increased marginally by 3.21 per cent at IGP level, and by 14.01 per cent (from 60.27 million to 68.71 million) in UP. In respect of cattle and buffalo population

Table 1: Growth of Livestock Resources in India during 1951-2012

Livestock resources (Species)	All-India			UP		% of IGP	UP as % of India	IGP as % of India
	1951*	2012*	% increase in 2012 over 1951	2012*	% share			
Cattle	155.30	190.90	22.92	19.56	28.46	37.22	10.24	27.52
Buffaloes	43.40	108.70	150.46	30.63	44.57	61.21	28.17	46.03
Sheep	39.10	65.07	66.42	1.35	1.97	42.93	2.08	4.85
Goats	47.20	135.17	186.38	15.59	22.68	39.02	11.53	29.55
Pigs	4.40	10.29	133.86	1.33	1.94	47.80	12.97	27.13
Horses & ponies	1.50	0.63	-58.00	0.15	0.22	55.29	24.10	43.59
Mule s	0.06	0.20	233.33	0.04	0.06	52.02	21.33	41.00
Donkey	1.30	0.32	-75.38	0.06	0.08	67.08	17.70	26.39
Camel	0.60	0.40	-33.33	0.01	0.01	21.69	1.99	9.15
Yaks	nc	0.08	-	0.00	0.00	0.00	0.00	1.36
Mithun	nc	0.30	-	0.00	0.00	0.00	0.00	0.00
Total Livestock	292.80	512.06	74.88	68.72	100.0	46.14	13.42	29.09
Total Poultry	73.50	729.21	892.12	18.67		12.98	2.56	19.73

Note: Figures are in million numbers. Abbr: IGP stands for Indo-Gangetic plains
Source: GOI, 2012; Sharma *et al.*, 2019)

in the state, it has increased by 3.57 and 28.62 per cent, respectively compared to last census figures.

Dairy animals

i) Cattle: Cattle in the country are one of the major contributors in the livestock population as it constitutes about 37.28 per cent of the livestock population as per 19th Livestock census. The main categories under cattle population are exotic/crossbred[1] and indigenous/non-descript. The exotic and crossbred category is one of the high yielding categories of animals in cattle. The exotic and crossbred animals contribute nearly 22 per cent of the total cattle population at all-India level while its share at IGP and UP level is 24.58 and 18.30 per cent, respectively (Table 2). The most important exotic dairy cattle breeds in India are Jersey and Holstein Friesian (HF). The breeds namely crossbred Jersey and crossbred HF are considered under crossbred category. The crossbred Jersey has the highest share with 54.97 per cent as compared to 32.73 per cent of crossbred Holstein Friesian in the state. The pure exotic category has a share of just 1.70 per cent in Jersey and 1.62 per cent in Holstein Friesian at all-India level but in UP state their share has increased to 7.81 per cent and 8.17 per cent, respectively. Animals which belong to descript (identified)/non-descript (non-identified) breeds of indigenous origin are considered as indigenous animals. As per 19th Livestock Census over 71.70 per cent of the cattle population is indigenous in the state. These indigenous populations are divided into 43 recognized breeds at all-India level (NBAGR, 2019)[2]. As per Breed Survey, there are just 12 breeds in UP, and 18 breeds at IGP level. Besides the pure breeds, Breed Survey also considered estimation of total number of animals in specific breeds which have more than 50% phenotypic characteristics of a particular breed under the definition of graded breed of that particular indigenous breed. The highest contribution is from non-descript category of animals which is 74.9 per cent, 67.70 per cent and 51.72

[1]As per the definition adopted in Breed Survey, the animals which have their origin in other countries are described as exotic animals. Animals which are produced by crossing indigenous animals with exotic breeds or indigenous animals which have exotic inheritance are described as crossbred animals.

[2]ICAR-National Bureau of Animal Genetic Resources, Karnal (NBAGR), the nodal agency for the registration of newly identified germplasm of livestock and poultry of the country has registered 184 number of indigenous breeds in the country, which include 43 for cattle, 16 for buffalo, 34 for goat, 43 for sheep, 7 for horses & ponies, 9 for camel, 8 for pig, 2 for donkey, 1 for yak, 19 for chicken, 1 for duck and 1 for geese.

Table 2: Breed-wise concentration of pure and graded cattle in UP (Lakhs)

States	UP (Lakh)	All India (lakh)	UP as % of All India	Pure % of total (UP)	Per cent share (UP)
Jersy	22.468	236.30	9.51	12.43	11.49
HF	13.322	161.02	8.27	12.07	6.81
Bachaur	42.082	62.80	0.00	-	21.52
Deoni	24.821	48.82	1.19	25.11	12.69
Gir	5.755	6.70	0.09	9.50	2.94
Haryana	1.992	1.99	67.01	21.74	1.02
Kankrej	1.471	7.32	0.00	-	0.75
kankatha	0.005	24.32	85.85	57.59	0.00
Kherigarh	0.329	0.33	99.97	37.71	0.17
Khillar	0.016	5.37	0.00	-	0.01
Kosali	0.280	0.28	0.02	20.13	0.14
Mewati	0.042	3.52	100.00	44.85	0.02
Motu	0.049	51.13	0.30	17.61	0.02
Nagori	0.296	5.57	0.00	-	0.15
Ponwar	0.000	15.46	100.00	71.75	0.00
Rathi	0.000	3.03	0.00	-	0.00
Red Sindhi	0.000	20.14	5.32	23.80	0.00
Sahiwal	0.000	5.09	50.84	32.12	0.00
Siri	0.000	12.38	0.00	-	0.00
Tharparkar	0.000	0.18	20.09	34.04	0.00
Total Recognised Breeds	112.928	668.28	16.90	23.49	57.74
Non-descript	82.6427	1132.531	7.30		42.26
Total animals	195.57	1800.81	10.86		100.00
Non-descript as % of indigenous breed population	51.72	80.49			
Indigenous recognised as % of total indigenous population	48.28	19.51			
CB and graded as % of total cattle population	18.3	22.1			
Recognised indigenous as % of total cattle population	39.4	15.2			
Non descriptas % of total cattle population	42.3	62.9			

Source: GOI, 2013

per cent of the total Indigenous cattle at all-India, IGP and UP state level, respectively. In UP, out of the remaining 48.28 per cent, 26.34 per cent contribution is from Harianabreed following which Sahiwal and Kankatha contribute 15.53 per cent and 3.60 per cent, respectively of total indigenous cattle. Besides, Kherigarh and Tharparkar each contribute around 1 per cent of indigenous cattle. All other recognised breeds of cattle contribute less than 1 per cent each of the total indigenous cattle.

Out of 37 (pure and graded) breeds excluding non-descript category at all-India level, only 18 breeds are having their per cent share of pure breed population is more than 60 per cent. In all other breeds major contribution is from graded breeds. In UP, only two breeds Ponwar and Kankatha are having their pure breeds at more than 55 per cent in number. The most common Hariana breed in thestate is having just 21.74 per cent animals as pure breeds. The indigenous breeds are hardy and more climate resilient. For example, Tharparkar is climate resilient breed as it shows different color shades during different seasons in the year. Sahiwal is a very sensitive to cleanliness, and donot sit in dirty places. Keeping in view the challenges of the climate change, the graded animals of more than

50 per cent purity, and not the crossbred animals is the future of animal breeding programme in India.

ii) Buffaloes: Buffaloes in India are the third major contributor in the livestock population (21.23%), and the second largest contributor in the production of milk. However, in UP, buffaloes are the largest contributors with 44.57 per cent share of the livestock population as per 19th Livestock Census. Buffaloes are indigenous animals having sixteen breeds besides one non-descript category in the country as recognised by NBAGR. There are 7 recognised buffalo breeds available in IGP, and 6 breeds in UP besides the non-descript category. Murrah breed is very popular in the state as it constitutes around 92.03 per cent of pure +graded animals and 65.67 per cent of total buffalo population in the state, and 63.16 per cent of Murrah buffalo population of IGP. Bhadawari is another breed accounting for 5.17 per cent of buffalo population. Jaffarabadi, Mehsana, Nili Ravi and Surti are quite less and collectively account for less than 0.5 per cent of the total buffalo population. In UP, the share of pure, graded and non-descript buffaloes is 17 per cent, 54.35 per cent and 28.64 per cent, respectively. Among these individual six buffalo breeds, no breed is having their pure breeds of more than 60 per cent share. In all breeds, the major contribution is from graded breeds. In case of Murrah breed, pure animals are just 22.88% in number (Table 3).

Murrah is the most robust breed amongst all the 16 recognised breeds. However, the age of the maturity of this breed is comparatively more leading to an increase in the cost of production of this animal. A sizable population of the young stock of this good germplasm is routed towards slaughter houses. The research need to be targetted towards reducing the age of maturity of this animal so as to ensure that the good germplasm is not wasted in its early age.

iii) Milch animals: The number of milch animals (in-milk and dry) in cows and buffaloes were 22.20 million in UP during 2012, out of which the in-milk cows and buffaloes were 16.42 million (Table 4). The female cattle (cows) population was 14.65 million numbers while the female buffalo population was 25.71 million numbers. The exotic/crossbred milch cattle were 1.66 million whereas the indigenous milch cattle were 6.59 million. The milch buffaloes were 13.95 million. Out of the total number of female cattle in the state, around 20.12 per cent are exotic and cross bred cattle while 79.88 per cent are indigenous cows. The female: male ratio in exotic/CB, indigenous cattle and buffaloes is 4.67, 2.74 and 5.23 in the state. The female cattle: female buffaloes ratio is 0.64. Around 40.16 per cent female cattle and 40.44 per cent female buffaloes were in in-milk stage. Around 60.81 per cent cows and 58.74 per cent female buffaloes are breedable. Amongst breedable animals, 66.04 per cent cattle and 69.77 per cent buffaloes are in in-milk stage. More than 70 per cent milch animals were in -milk stage.

Dairy-sugarcane crop production system peculiarities in UP

i) Sugarcane intensiveness and animal rearing preferences : variations across regions: Sugarcane cultivation in Uttar Pradesh is carried out quite intensively

Table 3: Breed wise buffalo population in UP and IGP

Breed	UP (Lakhs)	All India (Lakhs)	IGP	UP as % of All India	% share of individual breed (UP)	Pure breed as % of total recognised in UP
Bhadawari	15.84	17.54	16.37	90.30	5.17	33.91
Jaffarabadi	1.31	17.71	1.59	7.38	0.43	43.70
Mehsana	0.11	36.25	0.61	0.32	0.04	44.63
Murrah	201.11	482.55	318.39	41.68	65.67	22.88
Nagpuri	0.00	1.91	0.02	0.00	0.00	-
Nili Ravi	0.14	6.77	6.27	2.02	0.04	40.24
Surti	0.03	38.93	0.98	0.06	0.01	20.18
Total Registered	218.53	601.66	344.23	36.32	71.36	23.83
Non-Descript	87.72	471.42	156.12	18.61	28.64	
Total Buffaloes	306.25	1073.09	500.35	28.54	100.00	

Source: GOI, 2013

in 2.16 million ha area accounting for 49.5 per cent of all India. It is grown quite intensively in 44 districts spread over all the three major regions, *viz;* western, central and eastern region of the state. In some of its districts, more than 50 per cent of net sown area is allocated for sugarcane cultivation. The livestock scenario on three sugarcane intensive districts, one each from these distinct regions of the state is presented in Table 4. The role and contribution of livestock differs between the western and the eastern plains of the UP. Buffalo are the prevailing livestock type in western region (Muzaffarnagar district) in sharp contrast to eastern region (Kushinagar district) as reveled by cattle: buffalo ratio of 0.38 and 0.59, respectively (Table 4). The dairy herds reflect the underlying investment trends in livestock on individual farm dairy units. The number of cattle has declined and being substituted by buffalo and crossbred cows in western UP. The choice of households between crossbred and buffalo varied reflecting production tradeoffs in terms of milk quality and quantity of milk, sturdiness of animals and availability of AI facilities. The general preference for buffalo in western UP reflects the perceived lower production risks due to its resistance to adverse weather; preference for high fat milk with generally higher milk price and good market opportunities; and a better market for unproductive animals. The relatively limited dairy component in East UP seems associated with a number of constraints, including shortage of capital, lack of green fodder and remoteness from consumer centres. The central region which is a sugarcane intensive tract and where good quality desi breeds are existing, the dairy sector is dependent more on cattle compared to buffaloes.

In sugarcane intensive areas, around 40 to 57 per cent of male cattle are being used for draught purposes. Western and central sugarcane intensive areas of the state are also using around 45 to 55 per cent of male buffaloes for draught purposes. Buffaloes constitute around 80, 47 and 9 per cent of the draught animals in Muzaffarnagar, Lakhimpur Khiri and Kushinagar districts, respectively

ii) Livestock/dairy farm-size in UP: Access to land is an important determinant of livestock holdings of households. There are about 23.30 million operational land holdings or the number of farmers of all sizes out of this buffaloes rearing households (HHs) are more (40.57%) and the cattle rearing is carried out by 30.40 per cent (Table 5). Average cattle herd size on cattle rearing HHs is 3.02 out of which 0.93 cattle are in in-milk stage. Around 61.45 per cent of the breedable stock in cattle is in-milk stage. Average buffalo herd size is 3.10 animals out of which 1.32 animals are in in-milk stage. The cattle rearing activity on small land holders is almost of the same nature as that of the overall category. However, on medium and large (M&L) land holdings, the proportion of buffaloes rearing HHs is significantly higher (56.31%) compared to that on small holders (39.29%). The proportion of cattle rearing HHs in M&L holdings is also higher at 37.48 per cent compared to 29.82 per cent in small holdings. The in-milk

Table 4: Milch and draught animals in sugarcane intensive tracts in UP ('000)

Indicators	Uttar Pradesh		Lakhimpur Khiri		Kushinagar		Muzaffarnagar	
	Cattle	Buffaloes	Cattle	Buffaloes	Cattle	Buffaloes	Cattle	Buffaloes
Total Animals (000)	19557	30625	661	528	158	269	208	553
Draught animals as % of total males	55.24	25.20	57.67	54.71	46.66	3.55	39.70	45.02
Share of animals in total draught animals	68.64	31.36	53.04	46.96	90.27	9.73	20.05	79.95
Female: Male Ratio	2.99	5.23	3.09	2.50	4.95	6.15	4.51	3.17
In-milk animals as % of total milch animals	71.27	75.54	80.90	69.79	59.80	69.00	75.21	76.31
In-milk animals as% of total breedable animals	66.04	69.77	75.52	62.22	54.65	64.69	71.05	71.73
Breedable animals as % of total female population	60.81	58.74	62.20	57.45	61.47	62.82	62.78	59.80
In-milk cattle to in-milk buffalo ratio	0.6		1.7		0.47		0.42	
In- milk CB: in-milk indigenous cow ratio	0.3		0.1		1.18		4.79	
CB: Indigenous cattle ratio	0.2		0.1		1.14		4.00	
Cattle: Buffalo ratio	0.6		1.3		0.59		0.38	
Share of Indigenous cattle in total cattle	92.78		93.5		76.36		46.21	

Source: GOUP, 2012

Table 5: Milch animal rearing pattern in sugarcane intensive areas in UP

Parameters	All size class				Medium & Large				Small			
	Uttar Pradesh	Lakhim-pur Khiri	Kushi-nagar	Muzaffar-nagar	Uttar Pradesh	Lakhim-pur Khiri	Kushi-nagar	Muzaffar-nagar	Uttar Pradesh	Lakhim-pur Khiri	Kushi-nagar	Muzaffar-nagar
Holdings reporting buffaoles as % of total holdings	40.57	35.46	27.69	75.91	56.31	56.31	41.72	86.05	39.29	33.07	27.28	74.42
Holdings reporting cattle as % of total holdings	30.40	30.08	13.63	29.99	37.48	38.86	12.25	45.95	29.82	29.07	13.68	27.64
In-milk cows per cattle rearing holding	0.93	0.84	0.32	1.24	1.19	1.29	0.29	1.50	0.91	0.77	0.32	1.18
In-milk buffao per buffaloes rearing holding	1.32	0.46	0.58	1.11	1.62	0.59	1.00	1.27	1.28	0.43	0.57	1.08
Number of cattle per cattle rearing holding	3.02	3.60	2.85	2.98	4.11	4.60	2.78	3.85	2.91	3.45	2.85	2.77
Number of buffaloes per buffalo rearing holding	3.10	2.26	1.93	3.14	3.95	2.55	2.64	3.73	3.00	2.20	1.89	3.05
Number of holdings (Lacs)	233.01	6.12	4.63	3.38	17.52	0.63	0.13	0.43	215.49	5.49	4.49	2.95
Percentage distribution across size-class												
i) Cattle:					12.62	25.34	16.96	2.49	87.37	74.66	83.04	97.51
ii) Buffaloes					13.31	17.20	18.44	5.87	86.68	82.80	81.56	94.12
iii) Bovines					13.03	19.41	17.59	4.45	86.97	80.58	82.41	95.55

Source: GOI (2012b)

stock on M&L holding is also higher compared to that on small holders. Around 86.87 per cent holdings are small holders at the state level, and the proportion of small holders increases from western region (80.58%) to eastern region (95.55%). M&L holdings account for 16 to 25 per cent share of bovines in western and central region and their share is just 2 to 6 per cent in eastern region. Buffalo are the prevailing livestock type in western region where 75.91 per cent of households own buffaloes (Table 5) with an average of 3.14 heads per household. This contrasts with 27.69 per cent households owning buffalo in eastern region having an average of 2.85 cattle and 1.93 buffaloes per rearing HH. Ownership of cattle per rearing HH in east region is also less compared to that in western and central parts. Also very less land holders (13.63%) own cattle in eastern region in sharp contrast to around 30% land holders in western and central parts. Around a fifth of the households (20%) kept draught cattle, primarily male buffalo and bullocks, with a tendency for this to decrease from 38 per cent of households in western UP to 10 per cent in eastern UP (Frenstein, 2007). Despite increasing tractorization of tillage operations, draught cattle still fulfill important transport functions, particularly in sugarcane producing areas in western UP. Higher in-milk stock of cattle as well as in buffaloes in western region may be attributed to the availability of green fodder in the form of sugarcane tops, and comparatively higher proportion of fodder cultivated crops.

iii) Farm-level dairy management practices: status and challenges: The status of dairy management practices under four broad categories (basic hygiene, feeding, breeding and disease management) at small holder dairy units was assessed and respective indices were computed (Table 6). A look into the table reveals that though not a single dairy farm was found to be modernized with respect to their basic dairy management practices as all the indices developed under four categories of management practices were not more than 0.50. A comparative analysis of urban and rural dairy units revealed that the rural areas, where the traditional management systems were dominating, were better compared to urban areas in respect of basic hygienic conditions and feeding management of animals. The indices generated to assess the level of dairy management practices were found to be higher on rural dairy units (RDUs) compared to urban dairy units (UDUs) except for breeding management. The indices for feeding management practices and the average quantity of feed, green fodder and dry fodder used per day per milch

Table 6: Level of dairy management practices and other efficiency parameters

Management Practice Particulars	Unit	UDUs	RDUs
Basic hygiene management	index value	0.21	0.26
Feeding management	index value	0.15	0.45
Breeding management	index value	0.27	0.22
Disease management	index value	0.19	0.17
Concentrate feeding per animal per day	kgs	0.59	0.66
Minimum milk yield level for retaining the in-milk buffalo on the unit	kgs/day	5.0	No such limit
Average milking period of the buffalo	months	5.6	No fixed period
Av. milk yield of buffaloes	Lt/day/animal	7.8	4.6

Source: Survey of farmers

animal on RDUs was much higher compared to that on UDUs. The urban dairy owners fed their animals mostly with the crop residues (wheat straw) not adequately supplemented with limiting nutrients, treatments *etc.* and the concentrates were fed mostly during milking time (Singh *et al.*, 2018). Though the animals in UDUs were of improved genetic potential, the necessary nutrient input was not provided to the animals. The poor nutrition consisting of less quantity of concentrates and fodders was responsible for sharp decline in the milk yield even after 5 to 6 months of calving. In order to maintain the milk supply as well as to ease the nutritional constraint on the farm, the UDUs maintained the animals only when they were in good milking stage and were found not to retain the in-milk animal if its milk yield went down the level of 5 kg/day. It led to the ultimate selling of the milch animals and also the female young and breedable stock to the farmers, either directly or through the middlemen/ beoparie*s* (Sharma *et al.*, 2008). UDUs also eased the crowd on their units by giving away the animals to farmers for rearing the animals for a period of 6 months to 1 year by entering into some intermediate arrangements in the form of paying some maintenance charges. The main problem in FDUs is with respect to breeding management as there is limited availability of good buffalo bulls for natural services. Also the artificial insemination (AI) for buffaloes is not so successful in villages for want of quality semen. The analysis highlights that dairy management practices are poor on dairy units, particularly those related to nutrition on UDUs and related to nutrition and breeding both on FDUs.

Challenges and Opportunities

i) Milk production potential on small dairy units: UP with milk production of 290.52 lakh metric tonnes is the largest milk producer of milk and accounts for 16.5 per cent of the total milk production in the country (Table 7). The milk production in UP increased at the growth rate of 4.6 per cent as compared to 6.6 per cent at all-India level for the last 5 years. The per capita availability of milk

Table 7: Milk Productivity per animal and milk Production in UP

Year	Cross Bred Cow	Non- Descript Cow	Buffalo	Goat	Total
Per Animal Per day Milk Production (kg)					
2010-11	7.069	2.564	4.431	0.741	-
2018-19	7.358	3.067	4.535	0.78	-
% increase	4.09	19.62	2.35	5.26	-
Milk Production (Lakh MT.) Per Annum					
2010-11	16.337	37.0921	144.97	11.935	210.334
2018-19	37.862	59.09	194.63	13.638	305.22
% increase	131.76	59.31	34.26	14.27	45.11
% individual share	12.40	19.36	63.77	4.47	100.00

Source: GOUP (2019)

in the state is 359 gm per day compared to 375 gm at all-India level. The contribution of cattle, buffaloes and goats in milk production is 31.65, 63.73 and 4.61 per cent, respectively. The cross bred cows contributes around 12.36 per cent of total milk production in the state, and about 39.04 per cent of the total milk produced from all types of cows. Most of the milk is produced by animals reared by small, marginal farmers and landless labours. Of the total milk production in India, about 48 per cent milk is either consumed in the rural area, and the balance 52 per cent of the milk is marketable surplus available for sale to consumers in urban areas. Out of marketable surplus it is estimated that about 40 per cent of the milk sold is handled by the organized sector and the remaining 60 per cent by the unorganized sector. About 16.6 million farmers are under the ambit of about 1.86 lakh village level Dairy Corporative Societies (DCS), out of which 29.5 per cent (4.9 million) of total farmers are women operating through 32,092 women DCS. Dairying has, thus, become an important secondary source of income for millions of rural families and has assumed the most important role in providing employment and income generating opportunities particularly for marginal and women farmers.

So far as milk consumption is concerned, as per NSS 68th round, the monthly per capita expenditure is Rs. 1278.9 in rural areas and Rs. 2399.24 in urban areas (Table 8). The expenditure on milk and milk products is 9.1 per cent while that on cereals and pulses is 12 per cent and 3 per cent, respectively in rural areas. In urban areas, their share is 7.8, 7.3 and 2.1 per cent, respectively. With the rise in income levels, the expenditure on milk and other dairy products is likely to increase in future. The increasing demand for diary and other livestock products will give rise to considerable competition for land between food and feed production, challenging problems of pollution of air and water due to increasing industrialization of livestock production system, impacts of climate change by increasing cost of livestock and livestock product production.

Table 8: Average monthly per capita expenditure as percentage of total MPCE

Items	NSS Round	Rural	Urban
Total expenditure (Rs.)	68th	1278.9	2399.24
Cereals	68th	12	7.3
Pulses	68th	3	2.1
Milk and products	68th	9.1	7.8
	66th	8.6	7.8
	64th	7.8	7.3
	63th	8.1	7.4
	62nd	8.2	7.3
	61st	8.5	7.9

Note: MPCE: Monthly per capita expenditure
Source: GOI, 2018

It is thus obvious that India is the largest producer of milk which is based not on large scale commercial production but on a large number of small producers with one or two bovines. So is the case with respect to UP state.

iii) Dairying and employment generation opportunities: Povery in rural areas have fallen, and livestock, particularly dairy animals have played a major role in it. Livestock rearing, compared to agriculture, has stronger effect on poverty reduction (Birthal and Taneja, 2006, Birthal and Negi, 2004). Also the livestock rearing has stronger impact on poverty reduction compared to simply owning land. The probability of becoming poor reduces by 2.5 per cent with an additional acre of land where as the households who own milch cows and buffaloes have 17 per cent less chances of becoming poor compared to those who donot own animals (Bijla, 2018). As per Tendulkar Methodology (Planning Commission, 2013), there are 59.8 million poors in UP out of which 47.9 millions reside in rural areas. The poor people are around 29.4 per cent of the total population in the state, and around 22 per cent poors residing in the country. The employment of persons in farming of animals/animal production in principal status (PS) category is just 15.9 persons per 1000 persons in rural areas and 6.7 in urban areas (Table 9). In PS+SS category, it is 34 and 9.5 persons in rural and urban areas, respectively. The quantum of employment has decreased over the years, and more so in terms of male manpower. The employment of females is about 4 times higher compared to males under PS category and 8 times higher under PS+SS category in rural areas. In urban areas, it is 2.5 times and 4.5 times higher under PS and PS+SS category, respectively.

Since the livestock holding size is small, going for livestock rearing on small farms has remained a subsistence type of farming mode. In order to further reduce the number of poors, a responsibe strategy is needed. A congenial and conducive policy environment need to be inculcated for self employment genearion and start-ups in dairy sector. Now in order to establish modern and

Table 9: Share of usually working persons in farming of animals and animals production per 1000 workers in usual status-All India

Particulars	NSS Round	Rural					
		Male		Female		Total	
		PS	PS+SS	PS	PS+SS	PS	PS+SS
NSS Report 458,1999-00	55th	20	22	41	98	26	49
NSS Report 515,2004-05	61st	21	23	61	132	33	63
NSS Report 537, 2009-10	66th	14	16	47	95	22	40
NSS Report 554, 2011-12	68th	9.2	10.2	37	88.3	15.9	34
Urban							
NSS Report 458,1999-00	55th	7	7	14	40	8	14
NSS Report 515,2004-05	61st	7	7	25	49	11	17
NSS Report 537, 2009-10	66th	5	5	19	33	8	11
NSS Report 554, 2011-12	68th	5.4	5.5	13.2	25.6	6.7	9.5

Source: GOI, 2019

specialised livestock rearing entreprises to benefit from scale economis as well as from the utilization of the by-products/wastes in agriculture, GOI has carried out number of initiatives. Start-ups and Agri ventures have beenidentified for agricultural graduates under AC &ABC scheme. The venture include, livestock health cover, veterinary dispensaries & services including frozen semen banks and liquid nitrogen supply and artificial insemination; setting up production units like dairy, poultry, piggery, fisheries, sheep rearing, goat rearing, emu rearing, rabbit rearing etc.; poultry and fishery hatcheries; feed marketing and testing units; cool chain including cold storage units; value addition centres; post harvest management centres for sorting, grading, standardization, storage and packaging; vermiculture units; production of bio-fertilizers, etc. The above activities are indicative in nature. Any other activity in animal husbandry or allied sectors or a combination of two or more of the above selected ventures may be set up by agricultural graduates with adequate technological backstopping from training institutes and financial support from NABARD. These units will generate income to the agri-preneurs and render extension services to the farmers. Special emphasis is to be given to women oriented extension strategies and training programmes.

iv) Managing feed and fodder challenges on smallholders production system: In India, an estimated 50 million tonnes of concentrate feed ingredients are available annually which yield about 10 million tonnes of crude protein (CP) and 32.5 million tonnes of total digestible nutrients (TDN). In comparison, the annual production of green fodder is estimated at nearly 500 million tonnes, yielding around 12 million tonnes of crude protein and 55 million tonnes of total digestible nutrients. Thus, green fodder is a vital source of nutrients, especially vitamins, for livestock. Green fodder is primarily obtained through cultivation. Presently, 9.38 million hectares of cultivated land at all-India level is under fodder crops, with a meagre average annual yield of 40 tonnes/hectare, which is low. In view of land constraints, efforts need to be put forth to i) enhance fodder production from available land and ii) increase availability of fodder by minimising wastage. A four-pronged strategy *viz*.; i) cultivation of green/fodder crops, ii) use of crop residues/ fortification, iii) growing of sugarbeet crop, iv) feeding of sugarcane tops(SCT) is required (Feedipedia, 2019). Use of sugarcane tops is one such option to meet the fodder requirement to animals (DKP, 2019). SCT is abundantly available in sugarcane based cropping systems in IGP and by tackling the major constraints limiting its use, more fodder will be made available during the off-harvest 'difficult' months. The first priority is the preservation of SCT. The problem of relatively low nutritive value of SCT is rather a lack of knowledge of judicious supplementing to exploit the most out of the ration. Research is desperately needed to find other forms of cheap 'ideal supplements'. SCT does not behave like cereal straws. It has good voluntary intakes and does not appear to respond to ammonia treatment. This deserves the

attention of research workers for elucidation. An integrated approach to encourage farmers and parallel services to move to SCT preservation is a major step towards easing the fodder constraint the increase in livestock numbers and production. On a conservative estimate, around 5 tonnes of dry matter (DM) is produced per hectare (at 26% DM). The SCT produced per hectare (21 tonnes) is theoretically enough to provide forage for 1 livestock unit (LU) over a year (1 LU = 500 kg). Thus, SCT could be fed to ruminants to ease the fodder constraint. In Northern India, sugarcane tops are obtained by the small livestock owners in exchange of harvesting work (Yadav and Sharma, 2007). However, as they are not available year round, ensiling them increases availability (Naseevan *et al.,* 1988).

Sugar cane tops can be very well ensiled alone as well as with 0.5 per cent urea. The silage is well acceptable to crossbred cattle and contains 47.8 per cent TDN (Banerjee, 2000).Various methods of preservation for SCT are available ranging from small plastic bag silos, below ground trench silos, above ground low cost silos (1–4 tonnes), small concrete silos (2–6 tonnes), and large concrete silos (100–4000 tonnes). Large concrete silos have been successfully used in different countries but small concrete silos for the medium and small livestock producers are recent development. The quality of the silage made with SCT and molasses from 1 to 5 percent of cane tops (fresh) and 1 per cent ammonium sulphate compares very well with norms set for temperate crops silage. The recent technology of preserving cane tops with NH_3 produced *in situ* from urea has also been successfully applied in small concrete silos (1–4 tonnes). The resulting preserved materials have been well received by both the livestock and the farmers. Silos need to be popularized on the farmers' fields, and aggressive demonstration programmes are needed.

***v) Enhancing coverage of veterinary care*:** The improvements in animal productivity have been through the use of veterinary science and technology, and the same trend will continue in future. With only 5871 all types of veterinary hospitals including mobile vans and stockman centres, 9 cattle breeding farms, 3 buffalo breeding farms and 9 fodder seed production farms in the state (Table 10), the veterinary infrastructure need to be improved at Gram Panchayat level. However, the use of nanotechnology may add new dimensions in veterinary care in future. The next few decades may well see nanotechnology applied to various areas in animal management. Nano-particles may be able to affect nutrient uptake and induce more efficient utilization of nutrients for milk production, for example. One possible approach to animal waste management involves adding nano-particles to manure to enhance biogas production from anaerobic digesters or to reduce odours. There are, however, considerable uncertainties concerning the possible human health and environmental impacts of nano-particles, and these risks will have to be addressed by regulation and legislation.

Table 10: Veterinary and Animal Husbandary Infrastructure in IGP

Infrastructure available	Ownership	UP
Total Veterinary hospitals/dispensaries/ Stockman centres, etc.	AH Deptt	5871
Semen production centres	AH Deptt	3
Cattle breeding farms	AH deptt	9
Buffaloes breeding farms	AH deptt	3
Fodder seed production farms	AH Deptt	9

Source: GOI, 2019

vi) Ensuring efficient animal marketing management: The marketing of animals in cattle fairs (CFs) and livestock markets (LMs), the formal routes, is not uniform and orderly developed in the state. There is virtually no control for monitoring the livestock marketing operations and the market management is being performed on ad-hoc basis. Most of the animal marketing in cattle fairs and markets is on un-scientific lines (Pandey, 2007). The quantum of animal marketing business is quite high and is under private management. Sizable quantum of animal is marketed through informal routes, particularly in the rural areas. Improved dairy animal breeds first come to the urban dairy units (UDUs) and then from there they pass on to the farmers in the villages for subsequent one or two calvings. After completing a cycle or a period on FDU, they are marketed with the involvement of tribal community/slaughter house agents in livestock markets for further routing towards slaughterhouses. Farmers preferred the purchase of animals from FDUs because these are good milch breeds (Murrah breed) and could be purchased at much less price (10-50% less) at five month's in-milk stage (Sharma *et al*., 2008). Infertile cows are being driven out of the locality by the owners, and the ultimate destination point of these animals is to give rise to stray

cattle now (and was under question mark about 2 years back). The marketing of animals in LMs needs to be made orderly by proper legislation and through the intensive use of information and communication technology. The services of the local community be recognized in animal trade and in animal breeding. In addition, the extension and development efforts for generating better breeding and fodder facilities are also required. Livestock marketing studies are also essential to provide vital information on the operations and efficiency of the livestock marketing system for effective research, planning and policy formulation in the livestock sector (Bekure and Tilahun, 1992).

iv) Managing Stary cattle menance: There are around 10.09 lakh stray cattle population in UP. At individual district level these numbers vary from one thousand in western region to seven thousands in eastern region. These cattle are around 0.62 per cent to 4.80 per cent of the total cattle in the district. These are mostly male young stock, bulls, infertile, old or defunct cows. The stray cattle not only destroy crops but also affect the fodder availability to the more productive animals. Though the state has number of *gosalas* but the menace is still serious. At *gosala* level, business opportunities linked to the rearing of cattle need to be developed. Gosalas be developed as cattle based income generating units by encouraging enterprises like biogas production, *Agarbatti* making, bio-fertilizers, bio-pesticides from cow urine, heat resistent tiles, flower pots and as training and demonstration unitsto ensure the financial viability of the gosala. As per GOUP initiatives, gosalas are being developed in each Gram Panchayat level. However, an holistic approach and a system of linking stakeholders is required to efficiently meet out their feed and veterinary care requirements as well as to dispose of the products developed from enterprises based on these units. The conservation of desi breeds be encouraged at these *Gosalas* and KVKs. Some of the animals that turn productive at gosalas be approved for providing loan at the bank level as is the case with the rearing of Jersy and HF. The veterinary officials be associated with each gosalas for providing veterinery care to animals. The farmers also need to be integrated with gosalas for bringing or leaving animals. Good bulls of desi breeds like Sahiwal and Gangateeri be kept at Gosalas for conservation and multiplication of these desi cattle breeds. Good cows of these breeds need to be reared at each KVK level for demonstrating beneficial rearing scenarios of these breeds to the visiting and trainee farmersduring their training programmes.

CONCLUSION

The increases in livestock productivity in the recent past are mostly due to scientific and technological developments, and these development particularly in breeding, nutrition and animal health will continue to contribute to increasing potential production, efficiency and genetic gains. However, the demand for livestock products in the future would be heavily moderated by socio-economic factors such as human health concerns and changing socio-cultural values. Two types of livestock production system, on one side highly intensive production systems, and on the other, the smallholder production systems are likely to exist in India. Under the threat of climate change and with land, water and diversity reported to be shrink by 30-50% by 2050, the climiate resilient and sustainable livestock production systems are required for smallholders in the state. Ways to increase the size of the livestock farm need to be devised to benefit from the scale of economics. More intensive and specialised systems may also be encouraged by strengthening collective action or through linking it with the self employment opportunities and start-ups for the agricultural graduates. Good quality indiginous and graded animals will be the future of indian livestock production system under climate stress conditions. Gosalas and KVKs may impart a crucial role in the development and conservation of indigenous breeds in gosalas at gram panchayat level through selective breeding. In this way the genetic upgradation of 11.3 crore low milk yielding non-descript bovine population could be ensured.

REFERENCES

APEDA. 2019. http://apeda.gov.in/apedawebsite/six_head_product/animal.htm

Banerjee, A.; P. Bardhan; K. Basu; M.D. Chaudhuri; M. Ghatak; A.S. Guha; M. Majumdar; D. Mookherjee and D. Ray. 2002. Strategy for economic reform in west Bengal. *Economic and Political Weekly,* 37.

Bekure, S. and N. Tilahun. 1992. Livestock Marketing Studies, ILCR (International Livestock Center for Africa), Nairobi, Kenya.

Bijla, S. 2018. Dynamic Poverty processes in rural India and the role of livestock. *Agril. Econ. Res. Rev.,* 31(Conference Number): 9-16.

Birthal, P.S. and D. Negi. 2012. Livestock for higher, sustainable and inclusive agricultural growth. *Economic and Political Weekly,* 47(26/27): 89-99.

Birthal, P.S. and V.K. Taneja. 2006. Livestock sector in India: opportunities and challenges for small holders. In: Smallholder livestock production in India: opportunities and challenges (P.S. Birthal, V.K. Taneja & W. Thorpe, eds.). National Centre for Agricultural Economics and Policy Research (NCAP), New Delhi and International Livestock research Institute (ILRI), Nairobi.

DGCI&S. 2019. Foreign Trade Statistics, Directorate General of Commercial Intelligence and Statistics, Ministry of Commerce and Industry, Govt of India, Kolkata.

Dijkman, J. 2009. Innovation capacity and the elusive livestock revolution. *LINK News Bulletin*, October 2009. www.innovationstudies.org Google Scholar

DKP. 2019. Dairy Knowledge Portal : http://dairyknowledge.in/article/sugarcane-tops

Erenstein, O.; W. Thorpe; J. Singh and A. Varma. 2007. Crop–livestock interactions and livelihoods in the Indo-Gangetic Plains, India: A regional synthesis. Crop–livestock interactions scoping study—Synthesis. CIMMYT–ILRI–RWC, New Delhi, India.

Feedipedia. 2019. https://www.feedipedia.org/node/558; Feedipedia: Animal feed resources information system

GOI. 2011. Revised Agri-Clinics and Agri-Business Centres (AC&ABC) Scheme-2010. Ministry of Agriculture, Department of Agriculture and Cooperation, Krishi Bhawan, New Delhi. p. 44.

GOI. 2012. 19th Livestock Census-2012, All India Report, Govt of India, Ministry of Agriculture, Department of Animal Husbandary, Dairying and Fisheries, Krishi Bhawan, New Delhi. p. 164.

GOI. 2012b. Input Survey 2011-12, Ministry of Agriculture & Farmers Welfare, Krishi Bhawan, New Delhi.

GOI. 2013. Estimated livestock population breed wise based on breed survey, Govt of India, Ministry of Agriculture & Farmers Welfare, Department of Animal Husbandry, Dairying and Fisheries, Krishi Bhawan, New Delhi. p. 219.

GOI. 2015. Estimated livestock population breed wise based on Breed Survey 2013, Department of Animal Husbandry, Dairying & Fisheries (Animal Husbandry Statistics Division), Ministry of Agriculture & Farmers Welfare, Krishi Bhawan, New Delhi.

GOI. 2018. National Accounts Statistics, 2018, NSSO, Ministry of Statistics and Programme Implementation, New Delhi.

GOI. 2019. Basic Animal Husbandry & Fisheries Statistics 2019, Govt of India, Ministry of Fisheries, Animal Husbandry and Dairying, Department of Animal Husbandry and Dairying, Krishi Bhawan, New Delhi. p.164.

GOUP. 2012. Livestock Census-2012, Animal Husbandry Department, Government of Uttar Pradesh.

GOUP. 2019. Livestock Production Data, Statistics, Animal Husbandry Department, Government of Uttar Pradesh.

Gura, S. 2008. Industrial livestock production and its impact on smallholders in developing countries. Consultancy report to the League for Pastoral Peoples and Endogenous Livestock Development, Germany.

Kumar, A.; P. Kumar and A.N. Sharma. 2011. Rural Poverty and Agricultural Growth in India: Implications for the Twelfth Five-Year Plan. *Indian Journal of Agril Economics,* 66(3): 269-278.

Naseeven, R. 1988. Sugarcane tops as animal feed. In: Sugarcane as feed. Sansoucy, R., Aarts, G. and Preston, T.R. (eds.) FAO Animal Health and Production Paper No. 72, pp. 106-122.

NBAGR. 2018. New Breeds Registered, National Bureau of Animal Genetic Resources

Karnal-132001 (Haryana) retrieved from http://www.nbagr.res.in/registeredbreed.html

Pandey, U.K. 2007. Rapporteur's Report on Trading in Livestock and Livestock Products. *Indian Journal of Agriculture Economics,* 62(3): 562-574.

Planning Commission. 2013. Review of Expert Group to Review the Methodology for Estimation of Poverty (2009) Planning Commission, Government of India.

Sharma, A.K.; R.K. Singh and S.C. Tripathi. 2008. Nature, Extent and Determinants of milch animal trade in Mid Plain Zone of Uttar Pradesh. *Indian Journal of Agriculture Marketing,* 22(2): 72-92.

Sharma, A.K.; S.C. Tripathi; R.K. Singh and A.K. Singh. 2019. Challenges and business opportunities in dairy sector development in sugarcane based cropping system of UP: Souvenir (*eds. S.C. Tripathi, Avadhesh Kumar, A.K. Upadhyay, Stuti Vatsya, Prakash Bhatt and Nidhi Arora*), 3rd National Conference of Society for Veterinary & Animal Husbandary Extension (SVAHE) on Livestock Development for Societal Needs: Extension and Allied Sector Initiatives, April 03-05, 2019, Department of Veterinary & AH Extension Education, College of Veterinary and Animal Sciences, GBPUA&T, Pantnagar (Uttara Khand), pp. 121-131.

Singh, R.K.; Y.P. Singh; A.K. Sharma and B. Prakash. 2018. Animal Trade Practices and Opportunities for Small Dairy Units in Central Region of Uttar Pradesh. *Journal of Community Mobilization and Sustainable Development,* 13(3): 410-418.

Thornton, P.K. 2010. Livestock production: recent trends, future prospects. *Phil. Trans. R. Soc.* B, 365: 2853–2867.

UNDP. 2018. The 2030 Agenda in action. What does it mean?, UNDP.

Wiggins, S. 2009. Can the smallholder model deliver poverty reduction and food security for a rapidly growing population in Africa? Background paper for the Expert Meeting on How to feed the World in 2050, FAO, UN.

World Bank. 2009. Minding the stock: bringing public policy to bear on livestock sector development. Report no. 44010-GLB.Washington, DC.

Yadav, R.L. and A.K. Sharma. 2007. Sugarcane: High density planting. The Hindu Survey of Indian Agriculture, pp. 69-75.

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Enrollment, Retention and Progression of Home Science Post Graduates in Northern India

Ritu Mittal[1]*, Kiranjot Sidhu[2] and Jaspreet Kaur[3]

[1]Assistant Professor, [2]Senior Scientist, [3]Research Fellow, Department of Extension Education and Communication Management, Punjab Agricultural University, Ludhiana, Punjab

ABSTRACT

Students are most essential asset for any educational institute. The social and economic development of the country is directly linked with student academic performance. Academic performance at graduation level predicts the future performance of the students in higher education and vocational courses. Home Science is an interdisciplinary field of science that prepares its students to develop themselves with multiple vocations and career options. In the current study, an attempt was made to analyze enrollment, retention and progression of Home Science postgraduates from Northern State Agricultural Universities (SAUs) of India. Survey questionnaires were developed to collect primary and secondary data so as to elicit structured responses in quantifiable terms. Sample of the study consisted of the Home Science post graduates from seven selected SAUs from the northern states of India who had completed Master's programme between the period 2012-13 and-2016-17. The list of the students along with their contact numbers and e-mail ID's was obtained from respective SAUs. Data indicated that during five years span, 94.15 per cent students passed out, out of 599 students admitted while 5.84 per cent dropped before completing their degrees. Only 17.19 per cent students were admitted through ICAR-AIEEA (PG) against 25 per cent seats reserved for ICAR students. Overall, more than one third of the students opted for PhD after completing Masters programme. The study shows that Home Science students are competing well in the fast changing job market scenario and possess professional skills needed for employment. It indicates that Home Science education has kept pace with market demand.

Keywords: Home science, Postgraduate, Enrollment, Retention, Progression

INTRODUCTION

Home Science is an interdisciplinary field of science that prepares its students to develop themselves for multiple vocations and professional career options. Technical knowledge and information learnt in various branches of Home Science is helpful not only for professional use like any other disciplines but also for their personal and social growth. In fact, it is the only discipline which offers excellent opportunities for students to be a good home maker, efficient manager, good teacher, social worker and dedicated employer and much more. Home Science Education in India has undergone metamorphosis since its inception in the first quarter of last century. Initially it aimed mainly on preparing females for the role of housewives. But after independence when community development and welfare were recognized as important facet of national growth and development, then Home Science got recognition as the subject that could prepare the manpower for achieving success in community related tasks (Raghuvanshi, 2018). In State Agricultural Universities, Home Science Colleges were established in late sixties and early seventies. Since then, the Indian Council of Agricultural Research keeps on restructuring and reorienting its curriculum depending upon the demands of the society and job market. Higher education in various disciplines is augmented time to time to prepare its students for the job market by inculcating various hard and soft skills. So is the case in the discipline of Home Science which as a field of study and a profession has widened its scope (Sidhu, 2001). Till 1997, Home Science Bachelor's three years degree in SAU's was of general nature. Later as per the recommendations of third and fourth Dean's committee of ICAR, the programme duration was increased to four years with major thrust on enhancing employability and entrepreneurial abilities of the Home Science graduates.

*Corresponding author email id: rituhsee@pau.edu

The discipline has witnessed many challenges in terms of intake of students besides its nomenclature. Assessment of intake and drop out ratio is one of the basis on which the curriculum can be evaluated which can further point towards the modifications required in the curriculum. Hence it is imperative to understand the enrollment of students in the discipline, to check how many of them actually complete their degrees and what kind of progress they made in their career. In the current study an attempt was made to analyze enrollment, retention and progression of Home Science postgraduates in northern State Agricultural Universities (SAUs) of India.

MATERIALS AND METHODS

The study was carried with a sample of post graduates from Home Science college of six Northern SAUs namely Punjab Agricultural University (PAU) Ludhiana, Punjab; Chaudhary Charan Singh Haryana Agricultural University (CCSHAU) Hisar, Haryana; Chandra Shekhar Azad University (CSA) Kanpur, UP; Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya (CSKHPKV) Palampur, Himachal Pradesh; Gobind Ballabh Pant University of Agriculture & Technology (GBPUAT) Pant Nagar, Uttarakhand; and Maharana Pratap University of Agriculture & Technology (MPUAT), Udaipur**.** All the Home Science post graduates of these Northern SAUs who had completed their M.Sc. programme during the period 2012-13 to-2016-17 were selected as sample. The data was collected through primary and secondary sources. Information regarding enrollment, students retained and dropped out was taken from secondary sources i.e. records of the universities. The list of the students along with their contact numbers and e-mail ID's was procured from respective universities. Questionnaire was mailed to all these passed out students to know about their previous academic profile and academic performance during the degree programmes and their further degrees/education and placement status. In total, 564 questionnaires were e mailed, out of which 481 questionnaires (85% response rate). Data was analysed using frequencies and percentages.

RESULTS AND DISCUSSION

Personal and Educational Profile: It is evident from Table 1 that all the students were female in PAU, HAU, CSKHPKV, MPUAT and GBPUAT except 3.20 per cent male in CSA. Further the table indicates that majority of the students were from urban background in these universities except CSKHPKV and MPUAT with an average percentage of 58.60 per cent. It shows that either a larger proportion of urban students opt for Home Science programme or rural students don't opt for the programme. Similarly, Mann *et al.* (2018) also reported that more of urban students were opting for Home Science programme. It is a matter of concern as agricultural universities are aimed at education, research and extension with rural farm families as their primary stakeholders. As SAUs aim at promoting excellence in agriculture and allied fields, strategies need to be chalked out to include more of rural students from agricultural families so as to change their perception not only through agricultural education but also towards agriculture as a profession.

Further, the majority of the students from almost all SAUs (except GBPUAT) were matriculates from their respective State Education Boards. Overall majority of respondents (60.70%) matriculated and completed intermediate level from State Education Board except GBPUAT where majority students were from CBSE Board. More than half (61.0%) of students secured marks between 56 to 75 per cent in the qualifying class.

During the B.Sc. Home Science programme, about 62 per cent of the students in all the universities had secured between 68-79 percentage of marks. Data interestingly shows that none of the students from GBPUAT was placed in low percentage marks category where as none from CSKHPKV was found in high percentage category. This can be attributed to higher percentage of admitted students in GBPUAT from CBSE as compared to CSKHPKV and maybe were better equipped academically to pursue higher studies. Another reason can be the proficiency in English which is the medium at graduate level.

Further at post-graduation level, majority (61.30%) of the students in all the universities had secured medium (68-79%) percentage whereas 30.60 per cent students had high (80-92%) and remaining 8.10 per cent students had low (55-67%) percentage of marks. This reveals an average trend of average students in an average class.

Admission criteria: Table 2 depicts the distribution of respondents according to admission criteria for different streams of M.Sc. programmes in Home Science. In HAU, students except ICAR nominees were admitted on merit as the university does not conduct entrance exam. In all the other universities, majority (60.70%) of the students got admitted through entrance exams conducted by the

Table 1: Personal and Educational profile of the Home Science post graduates of selected Northern SAUs (n=481)

Variables	PAU (n_1=110)	HAU (n_2=124)	CSA (n_3=94)	CSKHPKV (n_4=12)	MPUAT (n_5=72)	GBPUAT (n_6=69)	Total
Gender							
Male	-	-	3 (3.20)	-	-	-	3 (0.60)
Female	110 (100)	124 (100)	91 (96.80)	12 (100)	72 (100)	69 (100)	478 (99.40)
Locality							
Rural	49 (44.50)	56 (45.20)	25 (26.60)	7 (58.30)	38 (52.80)	24 (34.80)	199 (41.40)
Urban	61 (55.50)	68 (54.80)	69 (73.40)	5 (41.70)	34 (47.20)	45 (65.20)	282 (58.60)
Respondent's Education							
Board during High school							
CBSE	38 (34.50)	41 (33.00)	37 (39.40)	4 (33.30)	25 (34.70)	39 (56.50)	184 (38.30)
ICSE	-	-	2 (2.10)	-	-	3 (4.34)	5 (1.00)
State education board	72 (65.50)	83 (67.00)	55 (58.50)	8 (66.70)	47 (65.30)	27 (39.10)	292 (60.70)
Percentage of marks in qualifying class (Intermediate)							
Low (35-55)	2 (1.80)	6 (4.80)	5 (5.30)	-	8 (11.10)	-	21 (4.40)
Medium (56-75)	74 (67.20)	77 (63.00)	61 (64.90)	7 (58.30)	42 (58.30)	30 (43.40)	291 (61.00)
High (76-95)	34 (31.00)	41 (33.20)	28 (29.80)	5 (41.70)	22 (30.60)	39 (56.50)	169 (35.10)
Percentage of marks during Graduation							
Low (55-67)	14 (12.70)	20 (16.00)	5 (5.30)	8 (66.70)	6 (8.30)	-	53 (11.00)
Medium (68-79)	72 (65.50)	78 (63.00)	58 (61.70)	4 (33.30)	41 (57.00)	43 (62.30)	296 (61.60)
High (80-92)	24 (21.80)	26 (21.00)	31 (33.00)	-	25 (34.70)	26 (37.70)	132 (27.40)
Percentage of marks during Post graduation							
Low (55-67)	12 (10.90)	15 (12.10)	2 (2.10)	2 (16.60)	8 (11.10)	-	39 (8.10)
Medium (68-79)	65 (59.10)	73 (58.90)	67 (71.30)	5 (41.70)	39 (54.20)	46 (66.70)	295 (61.30)
High (80-92)	33 (30.00)	36 (29.00)	25 (26.60)	5 (41.70)	25 (34.70)	23 (33.30)	147 (30.60)

Table 2: Distribution of Respondents according to admission criteria in M.Sc. Home science Programme (n=481)

Admission Criteria	PAU (n_1=110)	HAU (n_2=124)	CSA (n_3=94)	CSKHPKV (n_4=12)	MPUAT (n_5=72)	GBPUAT (n_6=69)	Total
Merit	-	102 (82.20)	-	-	-	-	102 (21.20)
University Entrance exam	90 (81.80)	-	84 (89.30)	12 (100.00)	55 (76.30)	51 (73.90)	292 (60.70)
Through ICAR-AIEEA (PG) Entrance exam	20 (18.10)	22 (17.70)	10 (10.60)	-	17 (23.60)	18 (26.00)	87 (18.00)

universities with state wise figures showing highest percentage in CSKHPKV (100%) followed by CSA (89.3%), PAU (81.8%) MPUAT (76.3%) and GBPUAT (73.9%). ICAR-AIEEA (PG) entrance exam qualified students opted for different universities of their choice. Data reveals that highest number (22) opted for HAU followed by PAU (20), GBPUAT (18), MPUAT (17), CSA (10) and none for CSKHPKV Palampur. This could be due to geographical location of the University and non availability of Home Science Master's Programme in some of the streams.

Enrollment and Retention: Comprehensive view of overall enrolment and retention of students in M.Sc. Home Science during XII FYP in selected Northern SAUs as shown in Table 3 shows that in 2010-11 and 2011-12, 95.20 per cent passed out from each batch of 125 students and 4.80 per cent students left/ dropped. In the year 2012-

13, 128 students took admission, out of which 94.53 per cent passed out in the year 2014-15 with a dropout of 5.46 per cent. Out of 116 students who took admission in 2013-14 only 89.65 per cent passed out showing highest percentage of dropouts. In 2014-15, 105 students took admission but 96.19 per cent passed out. During these years (2010-11 to 2014-15) the overall data shows that 94.15 per cent students out of 599 students admitted in M.Sc. Home Science programme in selected Northern SAUs passed out while 5.84 per cent dropped before completing their degrees. This was mainly due to poor academic performance or their personal problems as reported by them.

Similar data of the students admitted through ICAR-AIEEA (PG) entrance exam reveals a mixed trend for the year 2010-11 (18.40%), 2011-12 (14.40%), 2012-13 (19.53%), 2013-14 (916.37%) and 2014-15 (17.14%) with an overall of 17-19 per cent which was less than the availability of seats (25%). This can be attributed to lack of awareness among UG students to appear for ICAR-AIEEA (PG) and associated benefits. Another reason can be the hesitance among parents to allow girls to move to other states which is mandatory for availing the fellowship. Mechanism may be developed to disseminate information regarding the examination, procedures and facilitate for its preparation. Parents may also be counseled to avail the facility for better professional career of their wards.

ICAR conducts All India Entrance Examination every year for admission in agricultural universities. Scholarships are also awarded to attract meritorious students in the discipline. Table 4 describes overall enrolment and retention of students in M.Sc. Home Science programme during XII FYP in selected Northern SAUs through ICAR-AIEEA (PG). All the students who took admission through ICAR-AIEEA during 2010-11 (23), 2011-12(18), 2013-14 (19) and 2014-15 (18) passed out. But in the year 2012-13, one student dropped out of 25 who were admitted. Hence, only one out of 103 admitted students did not pass out in M.Sc. Home Science programme through ICAR-AIEEA (PG) exam in selected Northern SAUs It can hence be concluded that dropout percentage of ICAR nominees during these five years was negligible. This can be attributed to academically brighter students getting admission through ICAR-AIEEA leading to better results.

Educational Progression of M.Sc. Pass outs: Table 5 shows the educational progression of Home Science post graduates of selected Northern SAUs revealing a majority (58%) progressing ahead for admission to higher

Table 3: Enrolment and retention of Students in M.Sc. Home Science in selected Northern SAUs

Year of admission	Year of passing out	Students admitted	Students passed out	Students left/ dropped	Students admitted through ICAR-AIEEA (PG)
2010-11	2012-13	125	119 (95.20)	6 (4.80)	23 (18.40)
2011-12	2013-14	125	119 (95.20)	6 (4.80)	18 (14.40)
2012-13	2014-15	128	121 (94.53)	7 (5.46)	25 (19.53)
2013-14	2015-16	116	104 (89.65)	12 (10.34)	19 (16.37)
2014-15	2016-17	105	101 (96.19)	4 (3.80)	18 (17.14)
Total		**599**	**564 (94.15)**	**35 (5.84)**	**103 (17.19)**

Table 4: Enrolment and retention of students admitted in M.Sc. Home Science through ICAR-AIEEA (PG)

Year of admission	Year of passing out	Students admitted	Students passed out	Students left/ dropped
2010-11	2012-13	23	23 (100.00)	-
2011-12	2013-14	18	18 (100.00)	-
2012-13	2014-15	25	24 (96.00)	1 (4.00)
2013-14	2015-16	19	19 (100.00)	-
2014-15	2016-17	18	18(100.00)	-
Total		**103**	**102 (99.02)**	**1 (0.97)**

Table 5: Educational progression of Home Science postgraduates of selected Northern SAUs (n=481)

Educational Qualification	PAU (n_1=110)	HAU (n_2=124)	CSA (n_3=94)	CSKHPKV (n_4=12)	MPUAT (n_5=72)	GBPUAT (n_6=69)	Total
M.Sc. only (No progression)	47 (42.72)	51 (41.12)	33 (35.10)	5 (41.66)	37 (51.38)	29 (42.02)	202 (41.99)
M.Sc. + B.Ed	12 (10.90)	19 (15.32)	24 (25.53)	1 (8.33)	8 (11.11)	4 (5.79)	68 (14.13)
M.Sc.+ Diploma	15 (13.63)	6 (4.83)	7 (7.44)	-	-	5 (7.24)	33 (6.86)
M.Sc.+ Ph.D.	36 (32.72)	48 (38.70)	30 (31.91)	6 (50.00)	27 (37.50)	31 (44.92)	178 (37.00)

education. Majority (37.0%) among these choose PhD programme. The university wise trend reveals a large percentage of students in CSKHPKV (50%), GBPUAT (44.92%), HAU (38.70%), MPUAT (37.50%), PAU (32.72%) and CSA (31.91%) seeking admission in PhD programme after completing the Master's programme.

However, data also points towards no academic progression among a large percentage in all universities with a majority (51.38%) in MPUAT. This may be due to socio cultural factors. According to Desai and Andrist (2010) in India, mean age of marriage among girls remains to be below 20 years. With majority of the female students enrolled in the programme (99.40), who tend to discontinue or are not interested in higher education and the job. Hence, opting to get married at this level among majority of the students may be the major cause of lack of academic progression.

Another important choice made by students in CSA (25.53%), HAU (15.32%), MPUAT (11.11%), PAU (10.90%), CSKHPKV (8.33%) and GBPUAT (5.79%) was to seek admission to B.Ed degree programme. This may be due to more number of opportunities in both government and private schools as teachers than in universities. Diploma pursuers after M.Sc. were few (less than 10%) except in PAU (13.63%)

The progression of students after acquiring MSc degree clearly shows that large percentage of female students are not pursuing higher studies after M.Sc. which can be attributed to socio cultural factors like age of marriage, separation from spouse (in case they marry), economic constraints or the decision to pursue in-service Ph.D. However, a large percentage seeking admission to Ph.D programme is a clear indication of the changing trend where Home Science post graduates are aiming for higher degree in light of high competition in the job market particularly in education sector and also the general trend among girls to pursue higher degrees aiming towards professional growth.

Employment Status: The Table 6 depicts that after post-graduation (M.Sc. Home Science), more than half (55.30%) of the students were unemployed, out of which more than half (37%) were pursuing PhD programme as shown in Table 5. Those employed were more in private sector (31.19%) than the public sector (13.51%). Employment status of PAU pass outs was better than that of other SAUs closely followed by HAU. The lowest on

Table 6: Annual income and employment status of the respondents

Educational Qualification	Number of respondents from SAUs (%)						
	PAU (n_1=110)	HAU (n_2=124)	CSA (n_3=94)	CSKHPKV (n_4=12)	MPUAT (n_5=72)	GBPUAT (n_6=69)	Total (n=481)
Employment and occupational status							
Unemployed	46 (41.82)	64 (51.61)	52 (55.32)	9 (75.00)	51 (70.83)	44 (63.77)	266 (55.30)
Employed (Public sector)	23 (20.91)	19 (15.32)	9 (9.57)	2 (16.67)	6 (8.33)	6 (8.70)	65 (13.51)
Employed (Private sector)	41 (37.27)	41 (33.06)	33 (35.11)	1 (8.33)	15 (20.83)	19 (27.54)	150 (31.19)
Annual income of Respondent's (Rs.)							
No income	46 (41.81)	64 (51.61)	52 (55.31)	9 (75.00)	51(70.83)	44 (63.76)	266 (55.30)
Below 200000	32 (29.09)	39 (31.45)	30 (31.91)	1 (8.33)	14 (19.44)	18(26.08)	134 (27.85)
Up to 500000	30 (27.27)	21 (16.93)	12 (12.76)	2 (16.66)	7 (9.72)	7 (10.14)	79 (16.42)
50000-1000000	2 (1.81)	-	-	-	-	-	2 (0.41)

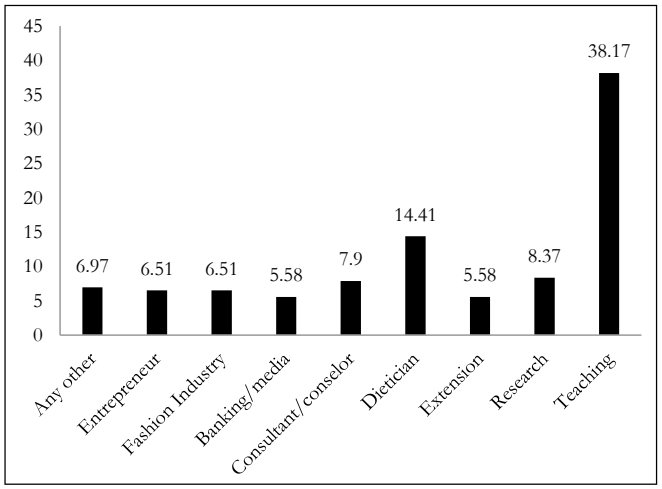

Figure 1: Percentage of home science post graduates in different occupations

the ladder was CSHPKV. Income was low with one third pursuing doctoral degrees, out of those employed, 27.85 per cent had annual income of less than 2 lakhs, 16.42 per cent up to five lakhs while negligible (0.41%) percentage of students reported earning between five to ten lakhs. However, lower income can be justified as the respondents were fresh pass outs. Panda *et al.* (2019) identified per centage of passed out students employed, salaries and wages of graduates from higher education and relative rate of graduate employment as the Indicators for Monitoring and Evaluation (M&E) of Agricultural Education System (AES) of India in teaching-learning.

An appraisal of Figure 1 reveal employment preferences of Home Science post graduates. Teaching is the most preferred occupation by Home Science Post graduates (38.14%) followed by Dietician or Continental Chef (14.41%), Research jobs as SRF/RF or Project Fellow (8.37%) and Consultant/Counselor jobs (7.90%). Besides 2.49 per cent were pursuing Extension work related jobs as CDPO or Extension officer while others were working in banks and media sector (5.58%), fashion industries (6.51%) and as an entrepreneur (6.51%). Low self employment rate can again be attributable to social cultural factors with girls always being less exposed to risk taking economic activities and exposure to the market skills. Lack of access to credit and need for financial security may be some other factors contributing to this trend. The results are in line with Mann *et al.* (2018) who also found that only two per cent Home Science Graduates were self employed.

CONCLUSION

It can be concluded that more of urban, academically average students were opting for UG programme in Home Science. Extra weight age to the students passing from rural schools at entrance level and increasing awareness among students in rural areas can lead to more students from rural areas opting for the degree. Increasing the awareness of the job prospects in public, private and entrepreneurial level can further lead to brighter and more students choosing the degree program. Those enrolled in degree programmes should be guided and counseled by advisors according to their academic abilities as SAUs have strong advisory mechanism. Those more academically inclined and capable can be guided for professional growth. They can be guided for preparation for JRF and other competitive exams and arrange for their exposure to seminars, conferences etc. so that they become acquainted with different aspects of the profession. On the other students with higher level of skill orientation and managerial abilities can be guided accordingly. They may be exposed to higher level of particular skill. Interaction of students with banks, audit companies and MSME officials can be arranged so that students may understand different aspects and requirements of entrepreneurship. This process can be initiated from the very first year so as to generate interest among students who are keen on financial independence through self-employment start exploring various options and work towards them at an early stage. Besides Home Science Colleges need to partner with institutes of repute for projects and sharing students so that industries may know the capacity and capabilities of Home Science graduates. Hence an effort in this regard in form of students Ready Programme (Rural and Entrepreneurship Awareness Development *Yojna*) is a welcome step.

The ICAR Fifth Dean's Committee has restructured the course curricula to develop much needed skills and entrepreneurial mind set among the graduates to take up self employment. Student READY Programme includes Experiential Learning and In Plant training/ Industrial training for ensuring and assuring employability and develop entrepreneurs. Practical content have been increased in the courses where ever necessary. Quality reforms in teaching methodologies will enhance students competence and thus job prospectus. Stakeholders of Home Science look forward for better employment and

entrepreneurship scenario based on new initiatives. Further there is a need to strengthen guidance and placement cells at the university level to facilitate students to compete for fellowships and prepare them for their professional growth and create linkages with the industry for enhancing job opportunities.

REFERENCES

Desai, S. and L. Andrist. 2010. Gender Script and Age at Marriage in India. *Demography*, 47(3): 667-687.

Mann, S.K.; D. Sachen and K. Kaur. 2018. Occupational Status of Home Science Graduates and Postgraduates of Punjab Agricultural University, Ludhiana, Punjab. *Journal of Community Mobilization and Sustainable Development*, 13(1): 375-381.

Mann, S.K.; R. Mittal and D. Sachen. 2018. Promoting Professionalism and Self–employed in Home Science. *Asian Journal of Home Science*, 13(1): 375-381.

Panda, C.K., A. Kumar and V. Tripathi. 2019. Perception of Faculties on Teaching and Learning Indicators for Monitoring and Evaluation of Agricultural Education System. *Journal of Community Mobilization and Sustainable Development*, 14(1): 109-115.

Raghuvanshi, R. 2018. Changing Perspectives of Home Science Education in India. *Indian Farmers Digest,* 51(2): 4.

Sidhu, K. 2001. Recommendations of the XXIVTH Biennial Conference of the Home Science Association of India. *The Indian Journal of Home Science,* 27: 107-108.

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People's Perception on the Status of Fisheries Resources and Habitats in Mahanadi River Basin

L.K. Tyagi[1]*, Rejani Chandran[1], Sangeeta Mandal[1], Trivesh S. Mayekar[2], Amit Singh Bisht[1] and Sanjay Kumar Singh[1]

[1]ICAR-National Bureau of Fish Genetic Resources, Lucknow, Uttar Pradesh

[2]ICAR-Central Coastal Agricultural Research Institute, Goa

ABSTRACT

An understanding of the perceptions of fisherfolks can complement biological and habitat studies undertaken by the scientists and help in making effective action plans to design or improve conservation efforts. Therefore, perception of local fishing communities towards the status of fisheries resources and habitats was studied in the Mahanadi river basin- a major inter-state east flowing rivers in the peninsular India, covering its entire main channel and six major tributaries in the upper and lower basins namely, Sheonath, Hasdeo, Mand, Ib, Tel and Ong. A total of 16 primary field surveys were conducted and 99 river sites were explored for assessment of fish diversity in the whole Mahanadi basin. In this paper, results of 770 respondents are presented. People's perception revealed a clear reflection of the decline of natural fisheries resources in the rivers of the basin studied, despite the fact that rivers of the Mahanadi basin possess rich diversity of fish species. This could be due to reduced abundance and reduced sizes of some of the commercially important fish species, in the riverine fisheries resources, as reported by the fisherfolks, and also recorded in our biological studies. A range of causes mainly representing habitat degradation & ecological alterations, anthropogenic causes and climatic factors, were perceived by the fisherfolks to be responsible for decline in fisheries resources and impacting their sustainability in the rivers studied.

Keywords: People's perception, Mahanadi river basin, Status of fisheries resources, Fish diversity

INTRODUCTION

Biodiversity and humans have had a close and mutually supportive relationship for tens of thousands of years. The biological resources upon which people depend have the critical character of being renewable, when they are managed well; but biological resources that are abused can also become extinct. The way societies have managed their resources determines how much diversity survives and the way that societies manage biological diversity determines the productivity of important resources and ecological services.

Freshwater fish habitats are easily over-exploited by unsophisticated fishing gears and vessels because they are less hostile as a working environment than the oceans. In addition to their commercial goods value, both economically and non-economically valuable fish populations play active roles in the maintenance of ecosystems and in the provision of various ecosystem services. Therefore, indirect effects of over-fishing can have more important impact on aquatic ecosystem structure and function than the removal of the fish (Botsford *et al.* 1997). Thus, larger impacts of fish biodiversity decline are much more serious than we presently know and, are yet to be visualised, estimated and valued.

The underlying causes of loss of biodiversity including fish biodiversity, stem from human impacts ranging from changes in attitude toward nature; growth in human population and natural resource consumption; the impact of global trade; economic systems that fail to value the environment and its resources; and inequity in the ownership, management, and flow of benefits from both the use and conservation of biological resources. Therefore, the goal of conservation and sustainable management of biodiversity including fish diversity is to strike the optimal balance between conserving the diversity in nature and advancing human sustainable living. This requires monitoring fish biodiversity, its use, and changes in natural and managed ecosystem; understanding human impacts

*Corresponding author email id: tyagilk@gmail.com

on fish diversity by understanding connections between biological and socio-economic processes; and protecting and restoring aquatic ecosystems, species, populations and genetic diversity. An understanding of the perceptions of fisherfolks can complement biological and habitat studies undertaken by the scientists and help in making effective action plans to design or improve conservation efforts. It is known that understanding perceptions of stakeholders can provide action plans to design or improve conservation efforts since the burden of compliance and effects of regulation are to be borne by them (Bennet, 2016). Engaging stakeholders in the discussion of local transformations may also contribute to the development of shared local management strategies regarding the knowledge and opinions of stakeholders about the place they live in (Mani-Peres *et al.,* 2016).

In this perspective, perception of local fishing communities towards the status of fisheries resources and habitats was studied in the Mahanadi river basin covering its entire main channel and six major tributaries in the upper and lower basins namely, Sheonath, Hasdeo, Mand, Ib, Tel and Ong.

Mahanadi River Basin: Mahanadi is one of the major inter-state east flowing rivers in the peninsular India. It rises 6 km from Pharsiya village near Nagri town in Dhamtari district of Chhattisgarh at an altitude of 442 m, traverses through mainly the states of Chhattisgarh and Odisha, and falls into the Bay of Bengal at false point. The Mahanadi river basin is spread with in geographical coordinates of 80.30' to 86.50' East longitudes and 19.20' to 23.35' of North latitudes. The total catchment area of the basin is 1,41,600 km^2 which is mainly spread in the states of Chhattisgarh (52.9%) and Odisha (46.3%). Total length of Mahanadi River is 851 km, out of which 357 km is in Chhattisgarh and rest 494 km is in Odisha. During its course, eight major tributaries namely, Sheonath, Pairi, Jonk, Hasdeo, Mand, Ib, Tel and Ong join Mahanadi.

Riverine fisheries have open access in both the states (Chhattisgarh and Odisha) in which the Mahanadi basin falls. Except at two major reservoirs (Ravishankar Sagar reservoir, also known as Gagrail reservoir in Chhattisgarh, and Hirakud reservoir in Odisha), fishing is done by local fisherfolks in the rivers near their villages, and in summers or winters when water availability reduces in some stretches of the rivers, they go further away from their villages to fish. There is no licensing or regulation to fish in rivers, except major reservoirs built on rivers. In the Ravishankar Sagar reservoir in Chhattisgarh, and Hirakud reservoir in Odisha, fishing is leased out to the fishing cooperative societies formed by the people of nearby villages alongside the reservoirs who were displaced by the formation of these reservoirs. In Dudhawa reservoir in the headwaters of Mahanadi River near Dudhawa village about 21 km west of Sihawa near the origin of Mahanadi river, fishing was leased out to a local contractor during the time of present study, and fishing was done by local fishermen which was purchased and sold by the contractor. Similarly, in Minimata Hasdeo Bango multipurpose storage reservoir on Hasdeo River, fishing was governed by a fish company who took reservoir on lease. Later on, the company left and the lease was undertaken by a contractor and fishing was done by local fishermen in good numbers and sold to contractor.

In view of this, the present study was undertaken to document and analyse perception of fisherfolks towards status of fisheries resources and habitats, its causes as perceived by them and measures suggested by them for improving availability of fisheries resources in the rivers in the Mahanadi river basin.

MATERIALS AND METHODS

The present study was undertaken as part of a two-phase large institutional project aimed at studying fish diversity and traditional ecological knowledge of fisherfolks in the Mahanadi river basin. A total of 16 primary field surveys (ranging from 8-14 days each) were conducted by the project team and a total of 99 sites were explored for assessment of fish diversity in the Mahanadi basin covering its main channel in both, upper basin (from origin of Mahanadi to beginning of the Hirakud reservoir) and lower basin (from Hirakud reservoir to Paradeep), as well as, eight major tributaries (Table 1).

Data on perceptions of fishing communities about status of fisheries resources, perceived causes for decline in fishery resources and habitats, measures suggested for the enhancement of fishery resources, and associated aspects related to habitats and the riverine ecosystem, was collected and analysed from 870 fishermen/women belonging to 98 villages of Mahanadi river and its six major tributaries (Sheonath, Hasdeo, Mand, Ib, Tel and Ong) in both upper and lower basins (Table 2). In this paper, results of 770 respondents are presented as the respondents of Ib River which were published (Chandran *et al.,* 2018) in an earlier publication. Selection of respondents was

Table 1: Details of explorations conducted in Mahanadi basin

Project Phase	Basin explored	No. of explorations conducted	No. of sites explored	Period during which explorations conducted
I	Upper Mahanadi	9	56	November 2012 - January 2016
II	Lower Mahanadi	7	43	July 2016 – September 2018
Total		**16**	**99**	

Table 2: River-wise details of villages/sites surveyed for obtaining people's perception in Mahanadi basin

River	No. of sites/ villages	No. of respondents interviewed
Upper Basin		
Mahanadi main channel (Upper)	22	235
Sheonath	13	85
Hasdeo	14	75
Mand	4	30
Total (Upper basin)	**53**	**425**
Lower Basin		
Mahanadi main channel (Lower)	25	250
Tel	7	60
Ong	3	35
*Ib**	*10**	*100**
Total (Lower basin)	**45**	**445**
Grand Total	**98**	**870**
Reported in this paper#	**88**	**770**

*Results of Ib River were published in an earlier publication (Chandran *et al.,* 2018), hence, excluded in this paper.
#Excluding the respondents of Ib River.

purposive. A creative process of selecting respondents was followed to ensure that the representative stakeholders get interviewed who have first-hand experience of the fishing activities in the studied river(s) and, thus, relevant for the study. Respondents were selected from the fishing sites or villages near the fishing sites along the rivers studied, where explorations were carried out for fish diversity. Major criteria of selecting a respondent was that he/she should be engaged in fishing activities in the river either directly in catching fishes on the site (majority belonged to this category) or in assisting family member in associated activities like net making, sorting fishes, selling fishes in local market (mainly women) or few small traders who come to fishing sites daily and purchase fishes from fishermen for selling in nearby villages and small towns.

A semi-structured interview schedule was specifically prepared for collecting data. Data on general profile of the respondents and their perception on the status of fisheries resources in rivers, perceived causes for decline in fish diversity and sustainability of fisheries, measures suggested for the enhancement of fishery resources, and associated aspects related to habitats and the riverine ecosystem, were collected by personally interviewing the respondents during filed exploration survey. The results were analysed using content analysis of open-ended questions and descriptive statistics like frequency and percentage.

RESULTS AND DISCUSSION

People's perception with respect to status of fishery resources in Mahanadi river basin: People's perception on the status of fisheries resources was obtained for three time periods i.e. how they perceive fisheries resources to have been in the past (10 years or more ago), how they find the resources in the present times, and how they perceive resources are likely to be in future. Their perception for each of these three time periods was obtained on a four point continuum of the perceived adequacy of fisheries resources in the rivers ranging from abundant to just adequate, not adequate to grossly inadequate. The data are presented in Table 3.

A large majority of the respondents (80–100%) in the studied rivers in the whole Mahanadi basin perceived that, fisheries resources were abundant in the past. Three fourth of the respondents in river Mahanadi lower main channel (74%) and half of the respondents in rivers Mahanadi upper main channel (56.6%), Sheonath (47%), Hasdeo (56%), Tel (58.3%) and Ong (57.2%) perceived that fisheries resources are not adequate in present times, On the other hand, 16-37 per cent of the respondents in above rivers perceived fisheries resources to be just adequate in present times. In river Mand, however, nearly half of the respondents perceived fisheries resources to be just adequate to sustain livelihoods in present times whereas

Table 3: People's perception with respect to status of fishery resources in Mahanadi river basin

Rivers	Periods for which perception obtained	Perceived status of fishery resources			
		Fishery resources are abundant	Just adequate to sustain livelihood	Not adequate to sustain livelihood	Grossly inadequate and in very poor condition
Upper Basin					
Main Mahanadi river	In past	188 (80)	35 (15)	12 (5)	0 (0)
(n=235)	At present	8 (3.4)	57 (24.3)	133 (56.6)	37 (15.7)
	Likely to be in future	0 (0)	30 (12.8)	124 (52.8)	81 (34.4)
Sheonath (n=85)	In past	76 (89.4)	9 (10.6)	0 (0)	0 (0)
	At present	5 (6)	32 (37.6)	40 (47)	8 (9.4)
	Likely to be in future	0 (0)	21 (24.8)	52 (61.2)	12 (14.1)
Hasdeo (n=75)	In past	64 (85.3)	11 (14.7)	0 (0)	0 (0)
	At present	0 (0)	21 (28)	42 (56)	12 (16)
	Likely to be in future	0 (0)	7 (9.3)	38 (50.7)	30 (40)
Mand (n=30)	In past	30 (100)	0 (0)	0 (0)	0 (0)
	At present	5 (16.6)	14 (46.7)	11 (36.7)	0 (0)
	Likely to be in future	0 (0)	10 (33.3)	15 (50)	5 (16.7)
Lower Basin					
Main Mahanadi river	In past	235 (94)	15 (6)	0 (0)	0 (0)
(n=250)	At present	0 (0)	42 (16.8)	185 (74)	23 (9.2)
	Likely to be in future	0 (0)	24 (9.6)	65 (26)	171 (64.4)
Tel (n=60)	In past	60 (100)	0 (0)	0 (0)	0 (0)
	At present	0 (0)	12 (21.7)	35 (58.3)	12 (20)
	Likely to be in future	0 (0)	5 (8.3)	11 (18.3)	44 (73.4)
Ong (n=35)	In past	35 (100)	0 (0)	0 (0)	0 (0)
	At present	0 (0)	11 (31.4)	20 (57.2)	4 (11.4)
	Likely to be in future	0 (0)	3 (8.5)	19 (54.3)	13 (37.2)

over one third (36.7%) respondents in river Mand also perceived fisheries resources to be not adequate in present times. In all the rivers studied, nil or very negligible number of respondents perceived fisheries resources to be abundant in present times.

As far as the future status of fisheries resources is concerned, over half of the respondents (50–61%) in the rivers in upper Mahanadi basin and river Ong in lower Mahanadi basin, perceived that resources will not be adequate to sustain livelihoods. Moreover, over one third of the respondents in the rivers Mahanadi upper main channel (34.4%) and Hasdeo (40%) perceived the resources to be grossly inadequate and in very poor condition, in future, whereas in rivers Sheonath and Mand, one fourth to one third of the respondents (24.8 and 33.3%, respectively) perceived the resources to be just adequate to sustain livelihoods. In lower Mahanadi basin, on the other hand, two-thirds to three-fourth of the respondents in rivers Mahanadi lower main channel (64.4%) and Tel (73.4%) perceived the fisheries resources to be grossly inadequate and in very poor condition, in future. On the other hand, 18-26 per cent of the respondents in these two rivers perceived the resources to be just adequate to sustain livelihoods.

It is clear from the above findings that though fisherfolks agreed that the fisheries resources were abundant in past, over half of them in almost all the rivers felt that fisheries resources are not adequate to sustain their livelihoods at present and expected to be grossly inadequate in future. Similar findings were reported by Tyagi *et al.* (2008) in river Ghagra in UP. In our biological studies in these projects, however, a rich number of fish diversity

was recorded in the Mahanadi basin including 120 finfish species belonging to 84 genera of 43 families under 14 orders and two shellfish species. During interactions, the fisherfolks however, reported several commercially important fish species whose abundance and catches have declined like *Chitala chitala*, *Clarias magur*, *Channa marulius*, *Anguilla bengalensis*, *Gibelion catla, Labeo rohita, L. dyocheilus, L. pangusia, Bagarius spp. (Bagarius bagarius* and *B. yarrelli), Pangasius pangasius, Garra gotyla, Ompok pabo,* etc. Further, several fisherfolks also reported that proportion of large fishes caught has steadily decreased over the years in several fish species like *Gibelion catla, L. rohita, Chitala chitala*, *Bagarius bagarius, Silonia silondia, Tor putitora, Pangasius pangasius,* etc. While studying the abundance of various species in details (site-wise, season-wise), in several sites of the rivers studied, relative abundance of minor fishes and those of lower commercial value, was found higher than that of higher commercial value. Therefore, though the fish diversity values were high in all the rivers studied (as revealed by various diversity indices used in the analysis of biological data), due to reduced abundance and reduced sizes of some of the commercially important fish species, the fisherfolks found riverine fisheries resources not adequate at present and were apprehensive that they may be grossly inadequate to sustain the livelihoods in future. It could be a cumulative effect of several factors, some of which were mentioned by the fisherfolks themselves.

Perceived threats /causes for decline in fish diversity and sustainability of fisheries: The perception of natural environment and its changes are influenced by different factors and it is difficult to determine precisely which are the most important (Peterlin *et al*., 2005). Perceptions of people, however, that live in a particular place for a long period of time and accompanied its historical evolution, can be considered a diagnosis of preterit environmental reality of the location, enabling a direct comparison between past and present (Jung *et al.,* 2011 and Taylor *et al.,* 2011). Therefore, respondents were asked open-ended question as what they perceive are the causes for decline or threats to fisheries resourcesand their sustainability in rivers, they fish in. Content analysis of their responses revealed ten causes/threats, representing three major categories – habitat degradation & ecological alterations, anthropogenic causes and climatic factors, were perceived by varying percentage of respondents (Table 4).

The data presented in Table 4 reveal that reduced water availability (volume and depth) in rivers was perceived as a major cause for decline in fisheries resources and their sustainability by almost half of the respondents (42.3-4.2%) in six out of seven rivers studied (except Hasdeo River) and it occupied rank I in four rivers (upper Mahanadi main channel, Sheonath, Mand and Ong) and rank II in another two rivers (lower Mahanadi main channel and Tel). Similarly, siltation of rivers was perceived by 40- 63.3 per cent of the respondents as another major cause and it also occupied rank I in two rivers (lower Mahanadi main channel and Tel) and rank II in two rivers (Sheonath and Ong). Siltation of rivers was also perceived by one third of the respondents in two other rivers (upper Mahanadi main channel and Hasdeo) as a major cause and ranked at III where as, in river Mand, it was at rank IV, perceived by one fourth of the respondents.

Reduced availability of natural food for fishes in river was another important factor which as a cause of decline, was perceived by 28-33.3 per cent of the respondents in four rivers (Hasdeo, lower Mahanadi main channel, Tel and Ong), with ranks ranging from III to V. In other three rivers only few of the respondents mentioned it as a cause. Similarly, loss of natural breeding grounds of fishes was perceived by one fourth of the respondents in four rivers (Sheonath, Hasdeo, lower Mahanadi main channel and Tel), whereas in other three rivers less than one fourths of the respondents mentioned it as a cause of decline, with ranks ranging from VI to VII.

Use of small meshed gear by the fishing communities was perceived as the second most important cause of decline in fisheries resources and their sustainability in three rivers of upper Mahanadi basin namely, upper Mahanadi main channel, Hasdeo and Mand by 44.2, 37.3 and 36.6 per cent respondents, respectively. In lower Mahanadi main channel, on the other hand, it was perceived at rank III (38.8%); whereas, in other two rivers of lower Mahanadi basin, namely, Tel and Ong, one fifth (rank VII) and one fourth (rank IV) of the respondents, respectively, perceived it as a cause of decline in fisheries resources and their sustainability.

In river Hasdeo, half of the respondents perceived water pollution in rivers as the major cause of decline and it occupied rank I in this river. In river Sheonath, one third of the respondents perceived it as a cause of decline of fisheries resources and it was ranked at III. In other rivers except Ong, 20-23 per cent of the respondents (ranks varying from V–VII) perceived water pollution in rivers

Table 4: Perceived threats /causes for decline in fish diversity and sustainability of fisheries

Threats /causes	Percentage of respondents and rank in various rivers*													
	Upper Mahanadi		Sheonath		Hasdeo		Mand		Lower Mahanadi		Tel		Ong	
	f(%)	Rank	f(%)	Rank	f(%)	Rank	f(%)	Rank	f(%)	Rank	f(%)	Rank	f(%)	Rank
Habitat degradation & ecological alterations														
Reduced water availability in rivers(volume and depth)	120(51)	I	36(42.3)	I	20(26.6)	V	13(43.3)	I	115(46)	II	29(48.3)	II	19(54.2)	I
Siltation of rivers	89(37.8)	III	34(40)	II	24(32)	III	8(26.6)	IV	141(56.4)	I	38(63.3)	I	17(48.6)	II
Loss of natural breeding grounds of fishes	42(17.8)	VII	21(24.7)	VII	19(25.3)	VI	5(16.6)	VI	61(24.4)	VII	16(26.6)	VI	6(17.1)	VI
Reduced availability of natural food for fishes in river	20(8.5)	V	15(17.6)	VIII	21(28)	IV	3(10)	VIII	74(29.6)	V	20(33.3)	IV	10(28.5)	III
Anthropogenic														
Use of small meshed gear	104(44.2)	II	27(31.7)	IV	28(37.3)	II	11(36.6)	II	97(38.8)	III	12(20)	VIII	9(25.7)	IV
Increased population pressure on the natural fisheries resources	87(37)	IV	27(31.7)	V	14(18.6)	VII	9(30)	III	79(31.6)	IV	17(28.3)	V	5(14.3)	VII
Water pollution	47(20)	VI	29(34)	III	38(50.6)	I	6(20)	V	58(23.2)	VIII	14(23.3)	VII	4(11.4)	VIII
Destructive fishing like dynamiting or use of pesticides and other poisons for mass killing	31(13.2)	IX	12(14.1)	IX	5(6.6)	X	4(13.3)	VII	28(11.2)	IX	-	-	-	-
Climatic factors														
Reduced Rainfall	40(17)	VIII	22(25.8)	VI	12(16)	VIII	-	-	68(27.2)	VI	21(35)	III	7(20)	V
Floods	-	-	-	-	11(14.6)	IX	-	-	25(10)	X	6(10)	-	-	-

f = No. of respondents; *Not all the causes were perceived by all the respondents and multiple causes could be perceived by a respondent. Hence, percentages do not add up to 100

as a cause of decline in fisheries resources and their sustainability. Increased population pressure on the natural fisheries resources was perceived by as a major cause of decline in fisheries resources by 28-37 per cent of the respondents with ranks ranging from III to V, in five rivers (upper Mahanadi main channel, Sheonath, Mand, lower Mahanadi main channel and Tel), out of seven rivers studied, whereas, in other two rivers less than 20% of the respondents mentioned it as a cause.

In four rivers (Sheonath, lower Mahanadi main channel, Tel and Ong) 20-35 per cent of the respondents perceived reduced rainfall as another cause of decline with ranks ranging from III to VI. Few respondents in two rivers (Hasdeo and lower Mahanadi main channel) also mentioned floods as a cause of decline in fisheries resources and their sustainability.

A perusal of above reveals that factors related to habitat degradation and ecological alterations (like reduced water availability in rivers, siltation of rivers), were reported by large number of fisherfolks as a major cause of decline in fisheries resources and their sustainability, while few other factors related to the habitat ecology like loss of natural breeding grounds of fishes and reduced availability of natural food for fishes in river, etc., were also perceived by quite considerable percentage of fisherfolks in most of the rivers studied. The siltation of rivers was perceived as a major issue by greater number of fisherfolks in the lower Mahanadi basin than the upper basin which is quite obvious as river Mahanadi is known to carry heavy load of silt to the sea from its lower delta. This perception of fisherfolks corroborates with the ongoing concerns about health and ecological integrity of rivers in the country, and its impact on the fisheries resources. The ecological conditions of peninsular rivers depend on its hydrological characteristics (like water level, current velocity and discharge) which vary from very lean to very high depending on relative rainfall in respective watershed (Srivastava 2007). Decline in fishery output has earlier been reported to occur due to habitat destruction or its modification, chemical pollution, over-exploitation and introduction of exotic species; besides multiple deleterious impacts of dams, barrages and lift irrigation complexes (Jhingaran, 1991; Dehadrai *et al.,* 1994; Sehgal, 1994; Dehadrai and Ponniah, 1997 and Dhanze and Dhanze, 1998). Habitat destruction caused by silting has been the major problem for the inland rivers, as the silt content carried by the Indian rivers is reported to be 2050 million tons out of total eroded soil (from cultivable land and forests) of 5334 million tons per annum (Dehadrai and Ponniah, 1997). Such massive silting of rivers and erosion of the soil is the conspicuous effects of indiscriminate destruction of riparian and catchment area vegetation (Srivastava, 2007). Tyagi *et al.* (2008) also reported siltation of the Ghagra river and lack of water in the river/ loss of habitat, as a major perceived reason for decline of fish germplasm resources.

In a comprehensive review of river ecology in India, Srivastava (2007) have reported, 'many anthropogenic modifications of river water on the results of despoliation caused in many sectors; but most prominent among them are: (a) River pollution throughout the country caused by untreated urban sewage, industrial effluents, agricultural runoff, mining wastes, religious ceremonies and navigational operations; (b) Indiscriminate destruction of drainage basin because of clearing of riparian zone vegetation which, in turn, is responsible for elevated load of suspended solid and increased magnitude and frequency of flood changing the level of interaction between land and water; and hence affects allochthonous input of energy source and (c) River regulation, lift irrigation and water allocation without considering the ecological consequences have influenced much adversely to the density, diversity and productivity of aquatic bioresources. Further population of migratory fishes is negatively affected'.

Fisherfolks also perceived several anthropogenic causes for decline in fisheries resources and their sustainability like use of small meshed gear, increased population pressure on the natural fisheries resources and water pollution in most of the resources. We could observe this during our exploratory field surveys across various river sites. Some of these factors have multiple and cumulative effects on the status and sustainability of natural fisheries resources: increasing population and reducing fish catches intensifies the competition to catch limited and dwindling resources, which often leads to increasing use of small meshed gears for maximum harvesting in less time, ignoring its severe adverse consequences for resource sustainability and ecological health, and this further puts more population pressure on reduced per unit of resource.

Though there are not many studies clearly establishing causative links among various factors for decline in natural fisheries resource, habitat alteration and anthropogenic reasons have been reported to cause many fishes of lotic system to become endangered and vulnerable (Yadav *et*

al., 1994 in Brahamputra river system; Chandra, 1994 in Ganga river system and Kotwal, 1994 in east coast river system). Patra *et al.* (1984) had long back concluded that primary production of Mahanadi river system has been adversely affected by industrial wastes and sewage discharge. Similar findings were reported by Tripathi 1991 in river Ganga. Tyagi *et al.* 2008 also reported use of fine mesh sized nets by poachers, use of insecticides and pollution of water caused by a local sugar mill, as major perceived reasons for decline of fish germplasm resources.

Measures suggested by the fisherfolks to improve the availability of fisheries resources in rivers for future use: Fisherfolks suggested six measures to improve the availability of fisheries resources in rivers for future use (Table 5). Two measures 'Providing alternative livelihood opportunities to fisherfolks' and 'Resource enhancement measures like fish ranching, by government departments', were suggested by one third to half of the respondents in all the rivers of Mahanadi basin (32.9–50% and 31.4-46.6%, respectively, for two measures). Measures 'Efforts to increase availability of water in rivers' and 'Reduction of siltation in rivers', were however, suggested by larger percentage of the respondents in the rivers of lower Mahanadi basin (33.3-51.4% and 40-63.3%, respectively for two measures) than the upper Mahanadi basin (29.8-40% and 20-36.2%, respectively for two measures). 'Awareness creation among fisherfolks about ill effects of destructive fishing practices including usage of small meshed gears' was suggested by 14-31 per cent of the respondents in the studied rivers across the basin. Thus, it is clear that majority of fisherfolks expect the government agencies to undertake various measures for improving the availability of fisheries resources in the rivers for future use. Tyagi *et al.* (2008) also reported similar findings in Ghagra river in U.P. People's emphasis on 'providing alternative livelihood opportunities to fisherfolks', seems a realization of the population pressure on the fisheries resources, as was brought out in the previous section. People also realized that 'awareness creation among fisherfolks about ill effects of destructive fishing practices including usage of small meshed gears', would be helpful in improving the availability of fisheries resources in the rivers for future use. Here fishing cooperative societies can play an important role, as has been shown by studies conducted at various places (Tyagi *et al.,* 2013), but only if they, as a social organization, could be mobilized and facilitated to function effectively for educating their members towards greater compliance of conservation

Table 5: Measures suggested by the fisherfolks to improve the availability of fisheries resources in the rivers for future use

Suggestions	Percentage of respondents in various rivers						
	Upper Mahanadi	Sheonath	Hasdeo	Mand	Lower Mahanadi	Tel	Ong
Efforts to increase availability of water in rivers	70(29.8)	27(31.7)	18(24)	12(40)	124(49.6)	20(33.3)	18(51.4)
Reduce siltation in rivers	85(36.2)	30(12.7)	14(18.6)	6(20)	112(44.8)	38(63.3)	14(40)
Resource enhancement measures like fish ranching, by Government departments	92(39.1)	34(40)	22(29.3)	14(46.6)	94(37.6)	27(45)	10(28.5)
Awareness creation among fisherfolks about ill effects of destructive fishing practises including usage of small meshed gears	74(31.5)	20(23.5)	17(22.6)	9(12)	65(26)	11(18.3)	5(14.3)
Ban on sand mining	35(14.9)	18(21.2)	-	-	25(10)	9(15)	-
Alternative livelihood opportunities to fisherfolks	98(41.7)	28(32.9)	27(36)	15(50)	105(42)	24(40)	12(34.3)

measures for sustainable use of natural fisheries resources in future (Tyagi *et al.,* 2014).

CONCLUSION

The perception of fisherfolks on the status of fisheries resources in rivers at present and in future, presents a worrisome scenario, as majority of the fisherfolks perceived the resources not only inadequate to sustain livelihoods but quite a lot of them perceived resources to be grossly inadequate and in very poor condition in future, in majority of the rivers studied. People's perception is a clear reflection of the decline of natural fisheries resources in the rivers of the basin studied, despite the fact that rivers of the Mahanadi basin possess rich diversity of fish species. This could be due to reduced abundance and reduced sizes of some of the commercially important fish species, in the riverine fisheries resources, as reported by the fisherfolks, and also recorded in our biological studies.

A range of causes mainly representing habitat degradation & ecological alterations, anthropogenic causes and climatic factors, were perceived by the fisherfolks to be responsible for decline in fisheries resources and impacting their sustainability in the rivers studied. More focused multidisciplinary studies involving fisheries biologist, aquatic ecologists, limnologists and social scientists are required to probe deeper onto these factors for establishing empirical causative linkages on which comprehensive corrective interventions for resource enhancements and restoration of riverine ecological health can be based in future.

It was heartening to note that the fisherfolks were aware of, not only the decline of fisheries resources, but also its causes, as well as, suggested some measures too for improving the riverine resources. They, however, expect government agencies to intervene for resource enhancement as they do not feel themselves capable enough to undertake conservation measures. These findings would be helpful to the resource managers and policy makers in formulating effective conservation and resource enhancement measures and, to the researchers for undertaking more in-depth multidisciplinary studies for guiding habitat restoration programmes in the basin.

REFERENCES

Bennett, N.J. 2016. Using perceptions as evidence to improve conservation and environmental management. *Conservation Biology,* 30: 582–592.

Botsford, L.W.; Juan Carlos Castilla and Charles H. Peterson. 1997. The Management of Fisheries and Marine Ecosystems. *Science*, 277: 509-515.

Chandra, R. 1994. Some endangered, vulnerable and rare miscellaneous fishes of Ganga river system, *Hilsa ilisa* (Ham) and *Setipinna phasa* (Ham). *In:* Dehadrai, P.V.; P. Das and S.R. Verma (Eds). *Threatened Fishes of India.* Society for Nature Conservation, Muzaffarnagar, India, pp 7-11.

Chandran, Rejani; L.K. Tyagi, A.K. Jaiswar, Sudhir Raizada, Sangeeta Mandal, Trivesh S. Mayenkar, A.S. Bisht and Sanjay K. Singh. 2018. Fisher's outlook and perception towards fishery resources of River Ib. *Journal of Community Mobilization and Sustainable Development*, 13 (1): 79-83.

Dehadrai, P.V.; P. Das and S.R. Verma (Eds). 1994. *Threatened Fishes of India*. Society for Nature Conservation, Muzaffarnagar, India, p 412.

Dehadrai, P.V. and A.G. Ponniah. 1997. Conserving India's fish biodiversity. *International Journal of Ecology and Environmental Sciences,* 23: 315-326.

Dhanze, J.R. and R. Dhanze. 1998. Post impoundment impact on the Biodiversity of Western Himalayan River system - a case study. *Proc. Acad. Environ. Biol.* 7: 11-16.

Jung, C.A.; P.D. Dwyer, M. Minnegal and S.E. Swearer. 2011. Perceptions of environmental changes over more than six decades in two groups of people interacting with the environment of Port Phillip Bay, Australia, *Ocean & Coastal Management*, 54: 93-99.

Jhingaran, V.G. 1991. Fish and Fisheries of India. Hindustan Publishing Corporation, New Delhi, p 727.

Katikiro, R.E. and J.J. Mahenge. 2016. Fishers' Perceptions of the recurrence of dynamite-fishing practices on the coast of Tanzania. *Frontiers in Marine Science,* 3: 233.

Kotwal, G.V. 1994. Endangered, vulnerable and rare food fishes of the east coast river system. *In:* Dehadrai, P.V.; P. Das and S.R. Verma (Eds). *Threatened Fishes of India.* Society for Nature Conservation, Muzaffarnagar, India, pp. 57-61.

Mani-Peres, Caiua, Luciana Y. Xavier, Claudia R. Santos and Alexander Turra. 2016. Stakeholders perceptions of local environmental changes as a tool for impact assessment in coastal zones. *Ocean & Coastal Management*, 119: 135-145.

Patra, A.K.; L.D. Nayak and E. Patnaik. 1984. Seasonal primary production of river Mahanadi at Sambalpur in Orissa. *Trop. Ecol.,* 25: 153-157.

Peterlin, M.; B. Kontic and B.C. Kross. 2005. Public perception of environmental pressures within the Slovene coastal zone. *Ocean & Coastal Management*, 48: 189-204.

Sehgal, K.L. 1994. State of art of endangered, vulnerable and rare coldwater fishes of India. *In:* Dehadrai, P.V.; P. Das and S.R. Verma (Eds). *Threatened Fishes of India*. Society for Nature Conservation, Muzaffarnagar, India, pp. 127-135.

Srivastava, V.K. 2007. River Ecology in India: Present Status and Future Research Strategy for Management and Conservation. *Proc. Indian Natn. Sci. Acad*., 73(4): 255-269.

Taylor, R.R.; M.A. Morrisan, N.T. Shears. 2011. Establishing baselines for recovery in a marine reserve (Poor Knights Islands, New Zeland) using local ecological knowledge). *Biological Conservation*, 144: 3038-3046.

Tripathi, B.D. 1991. An overview of hydrobiological features of the Ganga in the stretch from Mirzapur to ballia. *In:* Krishnamurthy, C.R., K.S. Bilgrami, T.M. Das and R.P. Mathur (Eds). *The Ganga – A Scientific Study*. Ganga Project Directorate, Ministry of Environment and Forest, Govt. of India, pp 156-160.

Tyagi, L.K., U.K. Sarkar and S.K. Paul. 2007. People's perception about conservation of fishery resources outside the protected water bodies: A case study in Lakhimpur Khiri District of UP. *Indian Research Journal of Extension Education,* 7(1): 36-38.

Tyagi, L.K.; U.K. Sarkar and S.K. Paul. 2008. People's perception on conservation and management of fish germplasm resources in and around wildlife protected areas: A study in Katerniaghat Wildlife Sanctuary, U.P. *Indian Research Journal of Extension Education,* 44(3 & 4): 44-51.

Tyagi, L.K.; A.S. Bisht, Amar Pal and K.K. Lal. 2013. Functioning of Fishing Cooperative Societies in Selected States of India. *Journal of Community Mobilization and Sustainable Development*, 8(1): 90-93.

Tyagi, L.K.; A.S. Bisht and Amar Pal. 2014. Performance of Fishing Cooperative Societies in Implementing Fish Conservation Measures: Case Studies from Two Reservoirs of Orissa. *Journal of Community Mobilization and Sustainable Development*, 9(1): 48-51.

Yadav, Y.S. and R. Chandra. 1994. Some threatened carps and catfishes of Brahamputra river system. *In:* Dehadrai, P.V.; P. Das and S.R. Verma (Eds). *Threatened Fishes of India*. Society for Nature Conservation, Muzaffarnagar, India, pp 45-55.

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Hunger and Voice: Marginalization and Impoverishment Causing A Chaotic Social Ecology

Anannya Chakraborty[1] and S.K. Acharya[2]

[1]Ph.D. Scholar (UGC NET-JRF Fellow), [2]Professor, Department of Agricultural Extension, BCKV, Mohanpur, Nadia, West Bengal

ABSTRACT

After 72 years of independence India is still suffering from the malicious problem of hunger and poverty. In the recent report produced by International Food Policy Research Institute (IFPRI) India ranked 100th in terms of hungry children and women, in count and status, whereas, 21.7 per cent of it's people are below the poverty line. According to National Crime Record Bureau, in the year 2015 the total numbers of farmers who have committed suicide is 5670. A survey of FAO reveals that nearly 75 per cent of food insecure and vulnerable people are directly or indirectly related to agriculture. Another report of FAO has revealed that about 78 per cent of the farmers are ready to quit agriculture. This is really alarming as well as distressing while we have made a call for complete digitization to create ICT driven modern India. Even in chronic hunger India's position is worse than African countries and also some neighbouring countries like Bangladesh. Hunger is associated with poverty that refrain poor people to accept ample of food, in quantity and quality. If hunger is the consequence, poverty is certainly the cause and if both poverty and hunger are the consequences, the silence is the cause that is invasive, intrinsic and invisible by nature (sometimes may be). Hunger is a status which makes us physiologically stressed and weak, mentally insulated and psychologically depressed. Poverty can be measured in terms of income. In other way the other forms of poverty are educational starvation, cultural deprivation and social depletion. Silence can be perceived in terms of inability of a person to raise voices against discrimination, both social and economic atrocities as well as a decision to go silent whenever it needs to utter voices. On this preamble the present study was conducted in Baraberi GP under Nadia district of WB. 150 respondents were selected purposively and they were interviewed thoroughly with a structured interview schedule. The results of the study reveals that the cobweb of hunger are poverty are creating a chaotic situation as far as the social and economic issues are concerned. Miscommunication or no communication has been triggered as the root cause of this disillusionment.

Keywords: Chaos, Communication, Chronic hunger, Hunger, Poverty, Social ecology

INTRODUCTION

Even with the swashbuckling claim on growth and prosperity on the present civilization, the other side of this prosperity is so brick and disastrous that have no match for the past centuries even. Out of around 7 billion population of the world, 1.5 billion are hungry. They don't have adequate access to food, if it is there, the quality doesn't stand any where near to fulfil their calorie requirement. In India, 350 million people are living below the poverty line and of them, 200 million people have become victim to moderate to extreme hunger indexes. 42 per cent of the new born babies are under weight. 60 per cent of the children are suffering from moderate to high level of anaemia experiencing stunted growth. Beyond the curtain of hunger, there is another problem that is chronic hunger. Based on hunger index we the nation is occupying 100th position in the world (IFPRI Report, 2017). The scenario of chronic hunger is even worse and astoundingly it is worse than African nations as well.

Everyone feels hungry on a daily basis. Most people are able to satisfy this craving and need. Even if not immediately, they can count on having a meal or snack within hours. This is not the type of hunger that Bread is concerned with. People who suffer chronic hunger don't have the option of eating when they are hungry. They do not get enough calories, essential nutrients, or both. People who are hungry have an ongoing problem with getting food to eat. They have a primary need - how to feed

Email id: [1]chakraborty.ext@gmail.com, [2]acharya09sankar@gmail.com

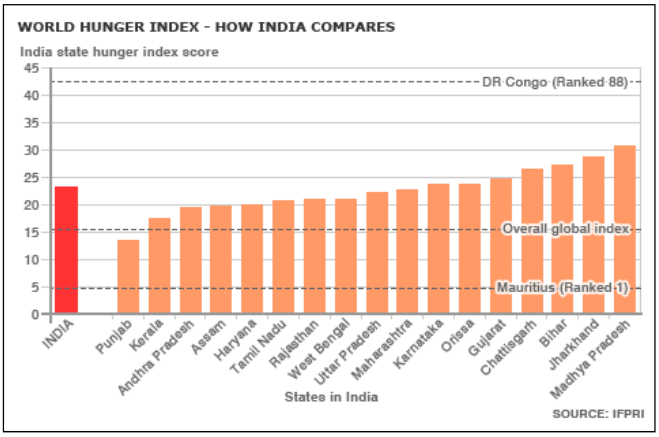
themselves and their children today and tomorrow. They have little energy for anything else. In politics, humanitarian aid, and social science, hunger is a condition in which a person, for a sustained period, is unable to eat sufficient food to meet basic nutritional needs.

Throughout history, portions of the world's population have often experienced sustained periods of hunger. In many cases, this resulted from food supply disruptions caused by war, plagues, or adverse weather. For the first few decades after World War II, technological progress and enhanced political cooperation suggested it might be possible to substantially reduce the number of people suffering from hunger. While progress was uneven, by 2000 the threat of extreme hunger subsided for many of the world's people. According to the WFP some statistics are that, "Some 795 million people in the world do not have enough food to lead a healthy active life. That's about one in nine people on earth. The vast majority of the world's hungry people live in developing countries, where 12.9 per cent of the population is undernourished."

Until 2006, the average international price of food had been largely stable for several decades. In the closing months of 2006, however, prices began to rise rapidly. By 2008, rice had tripled in price in some regions, and this severely affected developing countries. Food prices fell in early 2009, but rose to another record high in 2011, and have since decreased slightly. The 2008 worldwide financial crisis further increased the number of people suffering from hunger, including dramatic increases even in advanced economies such as Great Britain, the Eurozone and the United States.

The Millennium Development Goals included a commitment to a further 50 per cent reduction in the proportion of the world's population who suffer from extreme hunger by 2015. As of 2012, this target appeared difficult to achieve, due in part to persistent inflation in food prices. However, in late 2012 the UN's Food and Agriculture Organization (FAO) stated it is still possible to hit the target with sufficient effort. In 2013, the FAO estimated that 842 million people are undernourished (12% of the global population). Malnutrition is a cause of death for more than 3.1 million children under 5 every year. UNICEF estimates 300 million children go to bed hungry each night; and that 8000 children under the age of 5 are estimated to die of malnutrition every day.

India continues to have serious levels of widespread hunger forcing it to be ranked a lowly 100 among 118 developing countries for which the Global Hunger Index (GHI) was calculated in the year 2017 (IFPRI Report). Countries worse than India include extremely poor African countries such as Niger, Chad, Ethiopia and Sierra Leone besides two of India's neighbours: Afghanistan and Pakistan. Other neighbours Sri Lanka, Bangladesh, Nepal and China are all ranked above India. The GHI is calculated by taking into account four key parameters: shares of undernourished population, wasted and stunted children aged under 5, and infant mortality rate of the same age group. Of the 131 countries studied, data was available for 118 countries. This year, for the first time, two measures of child hunger -wasting and stunting -have been used to give a more complete picture. Wasting refers to low weight in relation to a child's height, reflecting acute under nutrition. Stunting refers to the deficiency in height in relation to age, reflecting chronic under nutrition. The International Food Policy Research Institute (IFPRI) makes the annual calculations of GHI. Basing its readings on the most recent data, the 2016 GHI for India was derived from the fact that an estimated 15 per cent population is undernourished -lacking in adequate food intake, both in quantity and quality. The share of under-5 children who are 'wasted' is about 15 per cent while the share of children who are 'stunted' is a staggering 39 per cent. This reflects widespread and chronic lack of balanced food. The under-5 mortality rate is 4.8 per cent in India, partially reflecting the fatal synergy of inadequate nutrition and unhealthy environments.



SILENCE: THE CAUSE OF HUNGER

In the modern civilized era there are two sides of the world: haves and have nots. One side is happy and prosperous with all the modern amenities and comforts of life, at the same time the other side is living in the dark

and dearth of extreme poverty and hunger. But why is the discrimination? Is it because of the uneven distribution of resources? Inaccessibility of information? Lack of awareness about their rights, or because simply of their silence?

We can site many of the examples where the deprived section of the society when broke their silence, they just burst like a volcano and turn the society into ashes. For example we can say about the Cuba Movement Fidel Castro, Vietnam movement, Naxal movement of India etc.

So, we can say that if hunger is to eliminated we have to reduce poverty and if we have to eradicate both hunger and poverty, silence is to be broken and empowerment is to be put in place.

OBJECTIVES

1. To delineate the present status of hunger and voice as prevalent amongst the target research group.
2. To isolate the variables, dependent and independent in order to study their interactive relationship.
3. To elucidate the contributory factors characterizing both voice and hunger and the perceived interdependence.
4. To generate a micro level policies for making appropriate interventions.

MATERIALS AND METHODS

The present study was conducted in the Beraberi gram panchayat under Habra block in the district of Nadia, West Bengal.

The village was selected purposively according to the convenience of the researcher. Then from this village 140 respondents (all women) were selected randomly and they were interviewed through a structured interview schedule. The statistical tool used in this study is step down regression.

Hunger was measured in terms of calorie intake by a respondent, while voice was measured by estimating the degree of communication uttered, expressed and shared. Both the accrued data had undergone data normalisation process to make them befitting for normal distribution curve. These two criterion variables have been predicted from a score of 21 predictor variables.

List of Variables

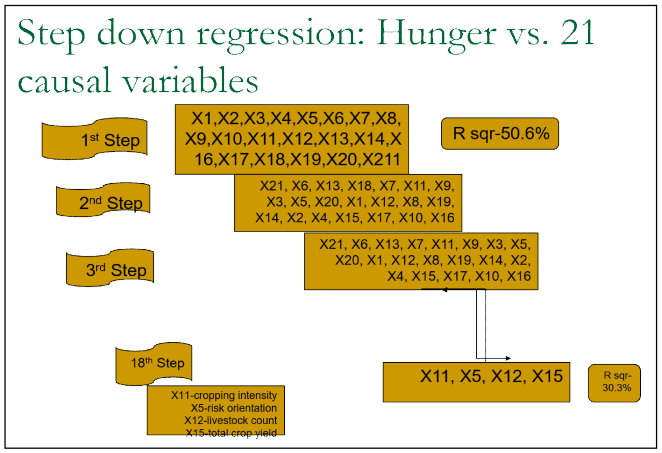
Variables	Notation
Causal variables	
Age	X_1
education	X_2
Family size	X_3
Economic motivation	X_4
Risk orientation	X_5
Management orientation	X_6
Stress perception on hunger	X_7
Stress perception on poverty	X_8
Stress perception on voice	X_9
Size of holding	X_{10}
Cropping intensity	X_{11}
Livestock count	X_{12}
Livestock yield	X_{13}
Pond and fish	X_{14}
Total crop yield	X_{15}
Cost of cultivation	X_{16}
No. of fragments	X_{17}
Communication variables	X_{18}
Marketed surplus	X_{19}
Energy consumption	X_{20}
BMI	X_{21}
Consequent variables	
Hunger	Y_1
Voice	Y_2

RESULT AND DISCUSSION

The above model presents the multiple regression analysis between criterion variable Hunger vs. 21 causal variables. It has been found that the variable cropping intensity (X11), risk orientation ((X5), livestock count (X12) and total crop yield (X15) have contributed substantially to the variance embedded with the consequent variable hunger.

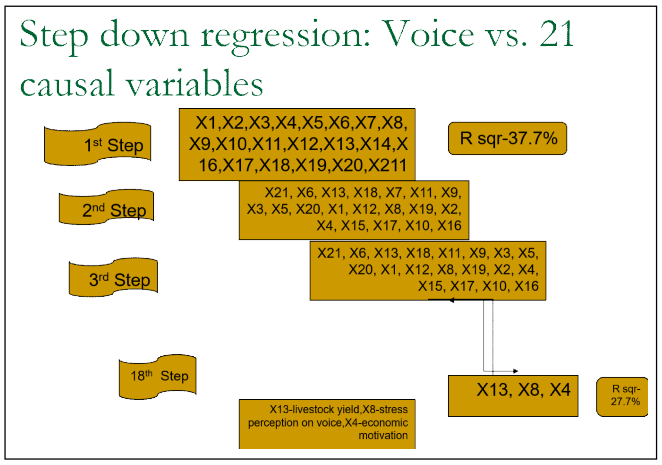
The R^2 value being 0.506, it is to infer that 50.6 per cent of variance in the consequent variable has been explained by the combination of these 21 causal variables.

The above model also depicts that the 4 causal variables those are cropping intensity (X11), risk orientation ((X5), livestock count (X12) and total crop yield (X15) have been retained at the last step.



The R^2 value being 0.303, it is to infer that 30.3 per cent of variants in the consequent variable has been explained by the combination of these 4 causal variables.

The rural people are mostly affected by hunger because of their poor risk bearing capacity, declining livestock count, overall declination of profit and ultimately low intensity of cropping. Low cropping intensity subsequently leads to low crop yield. Low livestock count leads to low amount of family resources which ultimately leads to higher level of hunger.



The above model presents the multiple regression analysis between criterion variable Hunger vs. 21 causal variables. It has been found that the variable economic motivation (X4), livestock yield (X13) and stress perception on voice (X8) have contributed substantially to the variance embedded with the consequent variable voice.

The R^2 value being 0.377, it is to infer that 37.7 per cent of variance in the consequent variable has been explained by the combination of these 21 causal variables.

The above model also depicts that the 3 causal variables those are economic motivation (X4), livestock yield (X13) and stress perception on voice (X8) have been retained at the last step.

The R^2 value being 0.277, it is to infer that 27.7 per cent of variants in the consequent variable has been explained by the combination of these 3causal variables.

Stress has been identified as being responsible for increasing silence and fatigued voices, either to defend them from poverty or to inflicting hunger and thereafter it has contributed to poor economic motivation.

CONCLUSION

Poverty, hunger and voice are interrelated with each other. They have got a wave of interaction as well. The study suggests that the aspect of making stakeholders shouting for the cause can have enough logic in fighting of poverty, rather than opting for a furtive silence of course within a tent of performing agro ecosystem. The other factors are like yield, cropping intensity, livestock count can come up as decisive factors along with the socio-psychological components like voice and communication.

REFERENCE

Acharya, S.S. and R.L. Jogi. 2007. Input subsidies and agriculture: Future perspectives. In: *Institutional Alternatives and Governance of Agriculture,* Ed: Vishwa Ballabh, Academic Foundation, New Delhi, pp. 95-118. A. Sen, Poverty and Famine: An Eassy on Entitlement and Deprivation (1981) Clarendon press Oxford, page: 56-87.

Ballard, T.; A. Kepple and C. Cafiero. 2013. The Food Insecurity Experience Scale: Development of a Global Standard for Monitoring Hunger Worldwide. Rome, FAO. (available at http://www.fao.org/3/a-as583e.pdf).

Chakraborty, A. and S. Acharya. 2018. Hunger poverty and voice: The impact and interrelation, Conference Proceedings.

Coates, J. 2013. Build it back better: Deconstructing food security for improved measurement and action. *Global Food Security,* 2(3): 188-194.

Coates, J.; E.A. Frongillo; B.L. Rogers; P. Webb; P.E. Wilde and R. Houser. 2006. Commonalities in the experience of household food insecurity across cultures: what are measures missing? *Journal of Nutrition,* 136: 1438S-1448S.

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Economic Benefits of Marketing of Value Added Marigold Flowers

Manpreet Kaur[1]*, Anil Bhat[2], Rakesh Sharma[3], S.P. Singh[2] and L.M. Gupta[4]
[1]Department of Agricultural Economics, CCSHAU Hisar, Haryana
[2]Division of Agricultural Economics and Agribusiness Management, SKUAST Jammu
[3]KVK, Jammu
[4]Division of Agro-forestry, SKUAST Jammu

ABSTRACT

The production of high value cash crops such as flowers has always been more beneficial to the farmers than the traditional crops but the marketing channels used for its marketing, post harvest management and value addition significantly affect the returns of the farmers. This study covers the value addition aspect in marigold flower crop and its impact on the marketing efficiency of crop. The study was conducted in the subtropical region of Jammu for which the farmers, wholesalers and retailers of Jammu and Kathua districts were selected by multistage sampling technique. The marketing channel (Farmer-wholesaler-Retailer-Consumer) was selected for analysis. The study concludes that the marketing of marigold as garlands increase the income of the farmers by more than 40 percent. The marketing efficiency of the channel was 0.60 when farmer was making garlands while it was 0.26 in case of wholesaler and retailer although the marketing margin of the beneficiary performing value addition was increased.

Keywords: Value addition, Marketing, Marigold, Garlands

INTRODUCTION

Floriculture or flower farming is a discipline of horticulture concerned with the cultivation of flowering and ornamental plants for gardens and floristry, comprising the floral industry. Flowers properly grown can yield 15-20 times more returns than cereals and other crops (Sharma, 2014). Commercial floriculture has higher potential per unit area than most of the field crops and is therefore a lucrative business. Floriculture crops like gerbera, carnation, etc. are grown in green houses. The open field crops are chrysanthemum, roses, gaillardia, lily, marigold, aster, tuberose etc. The world floriculture trade has a high degree of concentration by product and sources. Developed countries in Europe, America, and Asia account for more than 90 percent of demand. Asia-Pacific countries are the main suppliers to Japan and Hong Kong. Africa, Middle Eastern, and other European countries are the principal suppliers to Europe's main markets, Colombia and Ecuador dominate the market in the USA (Ghule and Menon, 2013). Globally more than 145 countries are involved in floriculture industry and the global floriculture trade is estimated to be at US$ 70 billion (Anonymous, 2015c). According to the International Association of Horticultural Producers (AIPH 2010), 7,02,383 ha area was under flower production in different countries of the world, of which the total area in Europe was 48,705 hectare (ha), North America was 21,067 ha, Asia was 523,829 ha, the middle East was 4,026, Africa was 7,604 ha, North America was 21,067 and central and South America was 97,152 ha (Misra and Ghosh, 2016). The Netherlands is the most important importer from developing countries, in addition to being a major producer of cut flowers, with the Dutch flower auctions functioning as the main trade hub (Centre for the promotion of Imports from developing Countries, 2015). United States, Germany, United Kingdom, Netherlands and United Arab Emirates were major importing countries of Indian floriculture during the same period (APEDA, 2017).

In India, floriculture is being viewed as a high growth industry. India ranks second in flower cultivation next to China. Though, India's present share in the global floricultural export market is negligible (0.61%) as compared to the Netherlands (58%), Columbia (14%), Equador (7%), Kenya (5%), Israel (2%), Italy (2%), Spain (2%) and others (10%) (Anonymous, 2015c). In 2013-14, India has a total area of 255020 ha under total flower

*Corresponding author email id: mkaur2515@gmail.com

cultivation with an annual production of 1754500 MT loose flowers and 47942 lakh cut flowers. Tamil Nadu, Karnataka, West Bengal, Maharashtra, Andhra Pradesh and Gujarat are the major flower producing states having 1,21,150 ha area that accounts for nearly half of the India's total area under floriculture (Anonymous, 2015d). India has exported 22,518.58 MT of floriculture products to the world for the worth of '479.42 crores in 2015-16 (APEDA, 2017).

Marigold, belonging to family Asteraceae, is an important and popular flower of India and rank third in number after roses and chrysanthemum (Kolambkar, 2014). Marigold is grown over an area of 53530 ha with a total production of 497720 MT loose flowers and 765000 numbers of cut flowers (Anonymous, 2015d). It is used extensively as loose and cut flower for decoration purposes. Along with that, marigold has medicinal properties too. Marigolds therapeutic action is anti-inflammatory, anti-infective, antitumor, antispasmodic cholagogue, soothing, emollient, astringent, protective, healing, choleretic, perspiration, hemostatic, sedative, bactericidal, antiviral and antitrichomonasic (Duda, 2012). Marigold is also a potential flower crop for natural colour extraction and there is huge demand for natural colours of marigold, calendula, hibiscus, gomphrena, petunia etc. in the international market. Presently, in our country the commercial extraction of marigold carotenoids is done in Cochin (Kerala), Hyderabad (Andhra Pradesh), near Satyamangalam forest (Tamil Nadu) and Bangalore (Karnataka). It is also regularly exported to Mexico, Peru, USA, Japan, Spain, Romania, Netherlands, Turkey, Poland, Italy, Australia, Canada, Africa etc. (Chaurasia, 2013).

In Jammu province, there is an increasing demand of variety of marigold flowers by the visiting pilgrims (more than 4.2 million/year) at Shri Mata Vaishno Devi Ji Shrine Katra. The marigold flowers are exported during the month of October to November on the occasion of navratras from the other states of the country like Delhi etc. Moreover, being a city of temples, the flower is also demanded for worship/pooja purposes by certain communities of the population (Singh, 2013). In Jammu and Kashmir state, flowers are grown over an area of 750 ha in 2013-14 (Anonymous, 2015d). Out of which marigold crop ranked first among all flowers with maximum area of 530 ha under cultivation followed by gladiolus, rose, tulip, chrysanthemum etc. (Anonymous, 2015d). In Jammu province, a total of 468.53 ha area is under flower cultivation with a total production of 13680 MT loose flowers and 10.01 lakh number of cut flowers in 2014-15. Out of which, marigold flowers were grown over an area of 467.33 ha with a total production of 13680 MT (Anonymous, 2016b). Jammu subtropics have suitable agro climatic conditions for production of marigold. Jammu district has the highest area (289.36 ha) under marigold production followed by Kathua (65.00 ha), Reasi (54.05 ha) and Samba (30.65 ha). The production of marigold follows the same order like the trend of area as 6960 MT in Jammu, 1560 MT in Kathua, 1300 MT in Reasi and 730 MT in Samba (Anonymous, 2016b). Marigold crops are among the important commercial crops and evaluating their economics of production and marketing will help the growers to a greater extent as how to make their cultivation and marketing more profitable besides will also act as a guideline for the planning of policy planners/scientists. Therefore, the present study was conducted for studying how value addition of marigold flowers is to the farmers.

MATERIAL AND METHODS

The present study was purposively conducted in Jammu and Kathua districts of Jammu and Kashmir state as the selected districts were having highest area, 289.36 and 65 ha, respectively under marigold flower crops during the year 2014-15. Multistage random sampling design was adopted for the selection of samples. For selection of villages, a village wise list of marigold farmers was procured from Department of Floriculture of the concerned district. Five villages were selected from each district on the basis of highest number of marigold farmers, so as to constitute a total of 10 villages. Ten farmers were selected randomly from the each selected villages to make a sample size of 100 farmers for the study. The primary data were collected through survey method by interviewing the marigold growers with the help of prepared and pre-tested questionnaire. The data collected were tabulated and analyzed for examining the marketing cost and benefits.

Analysis of marketing: The data collected were tabulated and analyzed for examining the marketing cost, margins, price spread and the marketing efficiency.

Marketing margins, costs and loss: The post harvest loss at various stages of marketing has been included either in the farmer's net margin or market intermediaries' margin. In the present study, the marketing loss at different

stages has been explicitly estimated. The modified formulae has been used for separating the 'post harvest loss during marketing' at different stages of marketing as well as for estimating the producers' share, marketing margins and marketing loss.

a) Net farmers price: The net price received by the farmer has been estimated as the difference in gross price received and sum of marketing costs and value loss during harvesting, grading, transport and marketing. Thus, the net farmer's price is expressed mathematically as follows:

$$NP_F = GP_F - \{C_F + (L_F \times GP_F)\} \text{ or}$$
$$NP_F = \{GP_F\} - \{C_F\} - \{L_F \times GP_F\} \quad \text{... (1)}$$

Where NP_F is net price received by the farmers (Rs./kg),

GP_F = is gross price received by the farmers or wholesale price to farmers (Rs./kg),

C_F = is the cost incurred by the farmers during marketing (Rs./kg),

L_F = is physical loss in produce from harvest till it reaches assembly market (per kg or %).

b) Marketing margins: The margins of market intermediaries included profit and returns, which accrued to them for storage, the interest on capital and establishment after adjusting for the marketing loss due to handling. The general expression for estimating the margin for intermediaries is given below.

Intermediaries Margin = Gross price (sale price) – Price paid (cost price) – Cost of marketing – Loss in value during wholesaling

Net marketing margin of the wholesaler is given mathematically by

$$MM_w = GP_w - GP_F - C_w - (L_w \times GP_w) \text{ or}$$
$$MM_w = \{GP_w - GP_F\} - \{C_w\} - \{L_w \times GP_w\} \quad \text{... (2)}$$

Where, MM_w = is net margin of the wholesaler Rs./kg),

GP_w = is wholesaler's gross price to retailers or purchase price of retailer (Rs./kg)

C_w = is cost incurred by the wholesalers during marketing (Rs./kg),

L_w = is physical loss in the produce at the wholesale level (per kg)

In the marketing chain, when more than one wholesaler is involved, i.e., primary wholesaler, secondary wholesaler, etc., then the total margin of the wholesaler is the sum of the margins of all whoelsaers. Mathematically,

$$MM_w = MM_{w1} + \ldots\ldots + MM_{wi} + \ldots\ldots + MM_{wn}$$

Where, MM_{wi} = is the marketing margin of the i-th wholesaler.

Net marketing margin of retailer is given by:

$$MM_R = GP_R - GP_W - C_R - (L_R \times GP_R) \text{ or}$$
$$MM_R = \{GP_R - GP_W\} - \{C_R\} - \{L_R \times GP_R\} \quad \text{... (3)}$$

Where, MM_R = is net margin of the retailer ('/kg),

GP_R = is price at the retail market or purchase price of the consumers (Rs./kg)

L_R = is physical loss in the produce at the retail level (per kg),

C_R = is the cost incurred by the retailers during marketing (Rs./kg).

The first bracketed term in equations (1), (2) and (3) indicates the gross return, while the second and third bracketed terms indicate respectively the cost and loss at different stages of marketing. Thus, the total marketing margin of the market intermediaries (MM) is calculated as:

$$MM = MM_W + MM_R$$

Similarly, the total marketing cost (MC) incurred by the producer/ seller and by various intermediaries is calculated as:

$$MC = C_F + C_W + C_R$$

Total loss in the value of produce due to injury/ damage caused during handling of produce from the point of harvest till it reaches the consumers is estimated as

$$ML = \{L_F \times GP_F\} + \{L_W \times GP_W\} + \{L_R \times GP_R\}$$

c) Marketing efficiency: Most commonly used measures are conventional input to output marketing ratio, Shepherd's ratio of value (price) of goods marketed to the cost of marketing (Shephard, 1965) and Acharya's modified marketing efficiency formula (Acharya and Agarwal, 2001). However, all these measures do not explicitly mention the loss in the produce during the marketing process as a separates item in marketing. As reduction in loss itself is one of the efficiency parameters, there has been a need to incorporate this component explicitly in the existing marketing ratios to get correct measures of marketing efficiency while comparing alternate markets/ channels. 'Marketing loss' component was incorporated in the widely used formula as given by

Acharya and Agarwal (2001) and the modified marketing efficiency (ME) formula is given below.

$$ME = \frac{NP_F}{MM + MC + ML}$$

Where, NP_F = is net price received by the farmers (Rs./kg),

MM = is the marketing margin,

MC = is marketing cost,

ML = is marketing loss.

RESULTS

To assess the benefit of value addition of marigold by selling it as garlands in study area, the longest marketing channel was analyzed to know the value added by the functionaries by making garland which is farmer-wholesaler-retailer-consumer. A standard garland of 200g was taken which means 1 kg of flowers would yield 5 garlands. There were three conditions which occurred in this scenario that farmer or wholesaler or retailer could make garland and then these three conditions were analyzed separately which revealed that the marketing cost incurred by the farmer was 13.50/kg in the first case when the farmer is making garlands and in other cases, when he is selling the flowers to wholesalers, his marketing cost remained 8.50/kg. In the second scenario when the wholesaler was making garlands, the marketing cost of wholesalers was 7.50/kg while in other cases, it remained 2.50/kg and in the last scenario, where the retailer was making garlands, the marketing cost incurred by the retailer was Rs. 10.50/kg while in other cases, it was 5.50/kg (Table 1). The price spread as per cent of consumers' rupee for different market functionaries of marigold under the channel farmer-wholesaler-retailer-consumer is given in table 4.19 in three different conditions of farmer making garland or wholesaler making garland or retailer making garland.

The marigold growers received a net share of 37.30/kg, 20.30/kg and 20.30/kg which were 37.30 per cent, 20.30 per cent and 20.30 per cent of price paid by the consumer for the Ist, 2nd and 3rd scenario, respectively. The producer's sale price of marigold garlands in 1st scenario was 50.00/kg while it was Rs. 28.00/kg in both 2nd and 3rd scenario. The table further revealed that per kg marketing cost incurred by the farmer was 10.50/kg in 1st scenario while it was Rs. 5.50/kg in 2nd and 3rd scenario where the farmer was selling flowers to the wholesalers.

Table 1: Components in marketing of marigold garlands

Particulars	Functionary making garland (5 garlands/kg)		
	Farmer	Wholesaler	Retailer
Marketing cost incurred by the producer	**10.50**	**5.50**	**5.50**
1. Cost of containers	0.50(4.76)	0.50(9.09)	0.50(9.09)
2. Transportation charges	2.00(19.05)	2.00(36.36)	2.00(36.36)
3. Labour engaged	3.00(28.57)	3.00(54.55)	3.00(54.55)
4. Cost of carry bags	0.00(0.00)	0.00(0.00)	0.00(0.00)
5. Making charges	5.00(47.62)	0.00(0.00)	0.00(0.00)
Marketing cost incurred by the wholesaler	**2.50**	**7.50**	**2.50**
1. Cost of carry bags/Containers	0.50(20.00)	0.50(6.67)	0.50(20.00)
2. Labour engaged	2.00(80.00)	2.00(26.67)	2.00(80.00)
3. Making charges	0.00(0.00)	5.00(66.67)	0.00(0.00)
Marketing cost incurred by the retailer	**3.50**	**3.50**	**8.50**
1. Transportation charges	1.50(42.86)	1.50(42.86)	1.50(17.65)
2. Cost of carry bags	0.50(14.29)	0.50(14.29)	0.50(5.88)
3. Shop/ Rehri charges	2.50(71.43)	2.50(71.43)	2.50(29.41)
4. Making charges	0.00(0.00)	0.00(0.00)	5.00(58.82)
Total marketing costs	**15.50**	**15.50**	**15.50**

(Figures in parenthesis indicates percentage of total)

Table 2: Price spread and marketing margin of marigold garlands

S.No.	Particulars	Functionary making garland		
		Farmer	Wholesaler	Retailer
1.	Net price received by the producer	37.30	20.30	20.30
2.	Marketing cost incurred by the producer	10.50(10.50)	5.50(5.50)	5.50(5.50)
3.	Marketing loss of the producer	2.20(2.20)	2.20(2.20)	2.20(2.20)
4.	Producer's sale price	50.00(50.00)	28.00(28.00)	28.00(28.00)
5.	Marketing cost incurred by the wholesaler	2.50(2.50)	7.50(7.50)	2.50(2.50)
6.	Marketing loss of wholesaler	3.28(3.28)	3.28(3.28)	3.28(3.28)
7.	Marketing margin of the wholesaler	14.22(14.22)	31.22(31.22)	8.22(8.22)
8.	Wholesaler's sale price or retailer's purchase price	70.00(70.00)	70.00(70.00)	42.00(42.00)
9.	Marketing cost incurred by the retailer	3.50(3.50)	3.50(3.50)	8.50(8.50)
10.	Marketing loss of retailer	4.04(4.04)	4.04(4.04)	4.04(4.04)
11.	Marketing margin of the retailer	22.46(22.46)	22.46(22.46)	45.46(45.46)
12.	Retailer's sale price	100.00(100.00)	100.00(100.00)	100.00(100.00)
13.	Price paid by the consumer	100.00(100.00)	100.00(100.00)	100.00(100.00)
14.	Producer's share in consumer's rupee	0.37(37.30)	0.20(20.30)	0.20(20.30)
15.	Total marketing margin	36.68	53.68	53.68

(Figures in parenthesis indicates percentage of total)

The marketing cost borne by the wholesaler was 7.50 per cent of consumer's rupee in 2nd scenario where he was making garlands while in 1st and 3rd scenario where either the farmer or the retailer was making garland, it was 2.50 per cent of consumer's rupee. The marketing loss incurred by the wholesaler was Rs. 4.04/kg in all the three scenarios. In case of retailer, marketing cost worked out to be Rs. 8.50/kg in 3rd scenario where retailer was making garlands while in the other two scenarios, it was Rs. 3.50/kg. Margin of retailer was maximum in 3rd scenario when he was making the garland (Rs. 45.46/kg) followed by 1st and 2nd scenario where he was getting Rs. 22.46/kg in both scenarios. Margin of wholesaler was maximum in 2nd scenario when he was making the garlands, i.e. Rs. 31.22/kg followed by 1st scenario (Rs. 14.22/kg) and 3rd scenario (Rs. 8.22/kg). These results are in line with findings of Raina *et al* (2011) who found that farmers are able to get higher returns on value addition in marigold and gladiolus.

Marketing efficiency of selling marigold in the channel of farmer-wholesaler-retailer-consumer in different scenarios is given in Table 3. The marigold farmers received highest net return per kg in 1st scenario (Rs. 37.30/kg) where they were making garlands whereas in 2nd and 3rd scenario they were receiving Rs. 20.30/kg. Reshma *et al.* (2017) also reported that higher returns can be obtained by post harvest management and value addition by the farmer. Total marketing loss and total marketing cost was same in all the three scenarios, i.e. Rs. 9.52/kg and Rs. 15.50/kg, respectively. Total marketing margins whereas turned out to be different, i.e. Rs. 36.68/kg in 1st scenario and Rs. 53.68/kg in both 2nd and 3rd scenario. 1st market scenario with marketing efficiency of 0.60 was found most efficient among all.

Table 3: Marketing efficiency of marigold garlands in different scenarios

Particulars	Functionary making garland		
	Farmer	Wholesaler	Retailer
Net price received by the farmer	37.30	20.30	20.30
Marketing margin	36.68	53.68	53.68
Marketing cost	15.50	15.50	15.50
Marketing loss	9.52	9.52	9.52
Marketing efficiency	0.60	0.26	0.26

CONCLUSION

Marigold flowers were sold by retailers as garlands and it was studied in three possible scenarios in the longest channel (farmer-wholesaler-retailer-consumer) that farmer or wholesaler or retailer could make garland. A standard

garland size of 200g was taken which means 1 kg of flowers would yield 5 garlands. The marketing cost incurred by the farmer was Rs. 13.50/kg in the first case when the farmer is making garlands and in other cases, when he is selling the flowers to wholesalers, his marketing cost remained Rs. 8.50/kg. In the second scenario when the wholesaler was making garlands, the marketing cost of wholesalers was Rs. 7.50/kg while in other cases, it remained Rs. 2.50/kg and in the last scenario, where the retailer was making garlands, the marketing cost incurred by the retailer was Rs. 10.50/kg while in other cases, it was Rs. 5.50/kg. The marigold growers received a net share of Rs. 37.30/kg, Rs. 20.30/kg and Rs. 20.30/kg which were 37.30 percent, 20.30 percent and 20.30 percent of price paid by the consumer for the 1st, 2nd and 3rd scenario, respectively. The producer's sale price of marigold garlands in 1st scenario was Rs. 50.00/kg while it was Rs. 28.00/kg in both 2nd and 3rd scenario. Margin of retailer was maximum in 3rd scenario when he was making the garland (Rs. 45.46/kg) followed by 1st and 2nd scenario where he was getting Rs. 22.46/kg in both scenarios. Margin of wholesaler was maximum in 2nd scenario when he was making the garlands, i.e. Rs. 31.22/kg followed by 1st scenario (Rs. 14.22/kg) and 3rd scenario (Rs. 8.22/kg). The marigold farmers received highest net return per kg in 1st scenario ('37.30/kg) where they were making garlands whereas in 2nd and 3rd scenario they were receiving Rs. 20.30/kg. These results are in line with Chandravanshi *et al.* (2018) who found that higher returns were obtained on value addition of flowers either by making bouquets, garlands of for using them for car decoration. The results of Chand (2010) are also in line with the findings. Total marketing margins whereas turned out to be different, i.e. Rs. 36.68/kg in 1st scenario and Rs. 53.68/kg in both 2nd and 3rd scenario. 1st market scenario with marketing efficiency of 0.60 was found most efficient among all while marketing efficiency of 0.26 was observed in another scenario which is in line with the result obtained by Omar *et al.* (2014).

REFERENCES

Acharya, S.S. and N.L. Aggarwal. 2001. *Agricultural Marketing in India.* Third edition, Oxford and IBH Publishing Company, New Delhi.

Agricultural and Processed Food Products Export Development Authority (APEDA). 2017. www.apeda.gov.in assessed on 16.05.2017.

Anonymous. 2015c. Vision 2050, Directorate of Floriculture, ICAR.

Anonymous, 2015d. India stat. www.indiastat.com/agriculture/2/whatsnew.aspx assessed on 12.05.2017.

Anonymous. 2016b. Directorate of floriculture, Jammu.

Chaurasia, V. 2013. *An Economic Study of Production and Marketing of Marigold Cultivation in Raipur district of Chattisgarh.* M.Sc. (Ag.) thesis. Indira Gandhi Krishi Vishwavidyalaya, Raipur, India.

Chand, R. 2010. Effect of Marketing Efficiency of Horticultural Commodities under Different Supply Chains in India. *Research report.* National Centre for Agricultural Economics and Policy Research. New Delhi.

Chandravanshi, V.; M.R. Chandrakar; P.K. Sinha; T. Sahu and Y.K. Sai. 2018. Success story of major flowers in Raipur city: Value Chain on flowers for Marketing. *Journal of Pharmacognosy and Phytochemistry,* 7(3): 2031-33.

Duda, S.; L.S. Muntean and M.M. Duda. 2012. Results on Economic Efficiency in Marigold's Growing in Climatic Conditions form Jucu, Cluj. *Bulletin UASVM Agriculture,* 69(1): 232-237.

Ghule, T. and S. Menon. 2013. Scope and Future of Floriculture Industry in India. *GRA- Global Research Analysis,* 2(2): 28-29.

Reshma, G.; J.P. Sharma; R.R. Burman and K. Amit. 2017. Restraining Factors in Value Chain Development of Flower in National Capital Region of India: Farmers' Perception. *Journal of Community Mobilization and Sustainable Development,* 12(1): 15-20.

Kolambkar, R.A.; R.R. Suryawanshi; H.R. Shinde and K.V. Deshmukh. 2014. A study on marketing of marigold in western Maharashtra. *International Research Journal of Agricultural Economics and Statistics,* 5(2): 143-147.

Misra, D. and S. Ghosh. 2016. Growth and export status of Indian floriculture: A review. *Agricultural Research communication Centre,* 37(1): 77-80.

Omar, M.I., M.M.I Chowdhury; M.T. Islam; M.R. Islam and M. Islam. 2014. Marketing Efficiency and Post Harvest Loss of Flower in Bangladesh. *IOSR Journal of Business and Management,* 16(1): 45-51.

Raina, V.; M.S. Nain; B.S. Hansra and D. Singh. 2011. Marketing Behaviour and Information Sources Utilization Pattern of Flower Growers. *Journal of Community Mobilization and Sustainable Development,* 6(2): 180-184.

Sharma, M.K. 2014. *Economic analysis of commercial flower cultivation in Sirmaur district of Himachal Pradesh.* Ph.D. thesis. Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur, India.

Singh, A.K.; M.K. Singh and R.R. Singh. 2013. The Economics of marigold flowers in Eastern Uttar Pradesh. *The Journal of Rural and Agricultural Research,* 13(2): 75-78.

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Relationship Between Selected Characteristics of Awardee Farmers and Extent of Their Opinion Leadership

Sujay Kademani[1]*, V.L.V. Kameswari[2], Neelam Bhardwaj[3] and Amardeep[4]

[1]Ph.D. Scholar, Division of Agricultural Extension, ICAR-Indian Agricultural Research Institute, New Delhi-110012

[2,3]Professor, [4]Associate Professor, Department of Agricultural Communication, G. B. P. U. A & T, Pantnagar, Uttarakhand

ABSTRACT

To bring about a change and to uplift Indian agricultural system, there is a need to involve "localites" in extension work who have certain extent of opinion leadership. Progressive farmers can assume the role of para-professionals to make way for "Farmer to Farmer Extension" approach, which can increase the efficiency and reduce workload of extension functionaries. Various institutions honour progressive farmers with awards, which pave the way for motivating other farmers in social system. A study was conducted in the state of Karnataka to find out the extent of opinion leadership of awardee farmers. It was found that majority of the awardee farmers had high extent of opinion leadership and most of them were frequently contacted by their fellow farmers, scientists and officials from State Department of Agriculture. This paper discusses the relationship between profile characteristics and the extent of opinion leadership of awardee farmers.

Keywords: Awardee farmers, Opinion leadership, Relationship, Farmer to farmer extension

INTRODUCTION

India, still being a predominantly agrarian economy, 69 percent population lives in rural areas (Census, 2011) and around 47 percent of workforce is engaged in agriculture (Labour Bureau, 2015-16). In post independent India, agriculture has seen exponential growth only till the decade of mid 1960s'. Later on, secondary sectors have over taken the agricultural growth rate. Despite its significance, contribution of agriculture to the overall GDP of the country has come down over the years and currently hovers around 15.87 percent (CSO Report, 2019). While India has made large strides in achieving goals of food security, availability and accessibility, it still faces a formidable agrarian crisis. National Commission on Farmers, headed by M.S. Swaminathan, has drawn attention to the "knowledge deficit" that constrains agricultural productivity in India. This deficit highlights the failure of public extension system and inability of extension workers to enrich the farmers with knowledge about new technologies. The public or government extension system has been one of the important channels for information dissemination for farmers in India, but its outreach has remained limited to a small proportion of farm households (NSSO Report, 2005). To reduce this knowledge gap, there is a need for strong linkage between farmers and extension agencies. But the ratio of extension staff to farmers varies widely across the country from 1:300 in Kerala to 1:2000 in Rajasthan (Raabe, 2008). As per the report of Dalwai committee, in 2012-13, one extension functionary served 1162 farmers. As on April, 2017 only 13,672 positions were filled and 14,265 positions were vacant. If these vacancies are filled up, then the ratio would improve from 1162 farmers per officer to 1037 farmers per change agent. This gap is unlikely to be reduced in near future. Thus, the shortage of extension professionals happens to be most basic problem in extension system.

In order to appropriately target extension programs and advisory services, it is therefore important to understand the access and use of information by the farmer. The findings show that, still the personal sources dominate the agricultural information system (Nain *et al.*, 2015). Although there are a large number of extension agencies and functionaries that disseminate technical information, farmers are reluctant to adopt majority of the innovations. This reluctance is due to lack of personal appeal of extension agents and their cosmopolite image (Rogers, 2003). Very few number of extension professionals are able to reach out to huge network of

*Corresponding author email id: meetbksujay@gmail.com

farmers and convince them about the need for technology adoption or behavioural change. Farmers live in a networked system and often their activities and adoption decision are influenced by "progressives" from whom they seek information and advice. Various institutes honour these progressive farmers with awards and they command certain degree of opinion leadership which has remained largely untapped (Shilpashree, 2011 and Basanayak, 2012). The researchers have found that most of the awardee farmers had high extent of opinion leadership (Vimalraj, 2010 and Kademani, 2019). They are the best available and underutilized human resources, which have never been exploited by formal extension system. To tap the opinion leadership of awardee farmers, there should be a provision for utilizing them in agricultural extension. Hence, there is a need to find out if they can be used as paraprofessional aides by knowing the profile characteristics and the extent of opinion leadership they possess. It is also important to know how these characteristics of farmers (independent variables) influence their opinion leadership (dependent variable).

MATERIALS AND METHODS

The study was conducted in Bagalkot and Bengaluru (Rural) districts of the state of Karnataka. There are six State Agriculture Universities (SAU's) in Karnataka out of which three were selected purposively. The universities with highest number of districts under its jurisdiction were selected purposively. The two districts, Bagalkot and Bengaluru (Rural) were selected by simple random sampling. All farmers awarded between 2016-18 by three selected SAU's i.e., UAS Dharwad, UAS Bengaluru and UHS Bagalkot in the two selected districts were the respondents for the study. A total of 116 farmers were awarded by the selected SAU's during 2016-18 out of which ninety three awardee farmers were personally interviewed by the researcher. The respondent selection was based on census method. Few awardees could not be personally interviewed owing to limitations of time and their unavailability. Majority of the data gathering was completed through personal interview method.

Correlation coefficient is used to find out the relationship between independent and dependent variables. It is used to compute the relationship between certain profile characteristics and the opinion leadership of the awardee farmers. Further, to know whether two variables are significantly related or not, t-test is generally carried out. However, the t-test was not conducted for the study, since t-test can only be conducted when a sample is drawn. In the present study, selection of the respondents was based on census method. The values in the Table 2 were calculated through SPSS (Statistical Package for Social Sciences) software, which directly gives the value of coefficient of correlation as well as significance level of the data sets.

RESULTS AND DISCUSSIONS

Profile characteristics of awardee farmers: Regarding the socio-personal characteristics of the awardee farmers, nearly half of the respondents (49.47%) were middle aged, between the age of 35 to 50 years and majority of them were males (82.79%). It was revealed that maximum number of respondents (39.79%) had less than 10 years experience in farming. About 40.86 percent of the respondents belonged to general category, 22.59 percent belonged to scheduled caste/scheduled tribe (SC/ST) and 19.35 percent of the respondents belonged to other backward castes (OBC). Among the respondents, 30.10 percent were educated up to high school and 23.66 percent of them were graduates, whereas 20.43 percent were educated up to pre-university. Regarding the economic characteristics of awardee farmers, it was found that most (29.04%) of awardee farmers had semi medium (5 to 10 acres) land holding and the average land holding of the awardee farmers was 15.69 acres. Almost all the awardee farmers were found to have a diversified cropping pattern so the land use pattern followed by them was mostly "integrated farming". All the respondents belonged to Above Poverty Line (APL) category. Average annual income of the respondents was 20.32 lakhs per year. The highest income earned among the respondents was 1.28 crores, whereas lowest income was 2 lakhs per year.

Extent of opinion leadership of awardee farmers: Opinion leadership is the degree to which an individual is able to influence other individuals' attitudes or overt behaviour informally in a desired way (Rogers, 2003). The opinion leadership of the respondents was measured by the scale developed by Rogers and later modified by Childers (1986). From the analysis of data of Table 1, it can be found that 94 percent of the awardee farmers i.e., 87 among 93 farmers were found to have high opinion leadership. Only 6 percent of the total i.e., six awardee farmers were found to have medium opinion leadership. Interestingly, none of the respondents were found to have low extent of opinion leadership. This proves the fact that awardee farmers command high opinion leadership and

Table 1: Extent of opinion leadership of awardee farmers

Category	Frequency	Percentage
Low (< 19)	0	0
Medium (19 to 29)	6	6.45
High (> 29)	87	93.55
Total	93	100

this has to be tapped by utilizing them in agricultural extension as para-professional agents.

Relationship between selected characteristics of awardee farmers and extent of their opinion leadership: In the present study, twelve independent variables were selected viz: age, education, land holding, farming experience, annual income, media ownership, information seeking behaviour, social participation, communication competence, self confidence, scientific orientation and innovativeness. Out of the twelve independent variables, only three variables i.e., age, farming experience and media ownership were found to have no significant relationship with opinion leadership. The findings are contrary to that of Rogers (2003); Vimalraj (2010) and Echetema (2017) who reported that age, farming experience and media ownership were positively correlated with the opinion leadership of the respondents. The non significant relationship between age and opinion leadership may be due to the fact that most awardee farmers exerted opinion leadership by virtue of their social participation and scientific approach towards farming. Regarding the non significant relationship between farming experience, it was found that opinion leadership was a result of how innovative and scientifically oriented the farmer was and not on how many years of farming he had undertaken. Other farmers consider the opinion of awardees only when they need information regarding a new practice which has little to do with the age or farming experience of farmer. The possible reason of why media ownership does not largely affect the opinion leadership could be that, most awardee farmers seemed to contact formal and interpersonal sources of information like scientists and officials of the State Department of Agriculture for information. They were not totally dependent on mass media for getting new information. Thus, media ownership contributes very little towards the opinion leadership of the awardee farmers.

Out of the other variables, land holding and annual income of the respondents were found to have significant but negative correlation with opinion leadership of the awardee farmers. The findings are contrary to that of Rogers (2003) and Vimalraj (2010) who reported that large size landholdings are one of the characteristics of opinion leaders and that there is a positive, significant relation between the two. The negative but significant relationship between the two variables, in the present study, can be explained by the fact that farmers who earn high annual income also own large land holdings. They were generally inaccessible to farmers with medium to marginal land holdings. The cultivation practices followed by large and high income farmers were found to be significantly different from that of small and marginal farmers. Thus, fewer people contacted them regarding agricultural information. It is worth mentioning that certain programmes like Training and Visit system failed due to improper selection of "contact farmers" who were supposed to disseminate technologies (Hussain *et al.*, 1994). Generally they were large farmers whose conditions were not similar to most of other farmers.

Rest of the selected variables i.e., education, communication competence, information seeking behaviour, social participation, self confidence, scientific orientation and innovativeness were found to have positive and significant correlation with the opinion leadership of the awardee farmers. Education leads to greater exposure to scientific knowledge and procedures, which are readily

Table 2: Correlation values of independent variables with opinion leadership

S.No.	Variable	Coefficient of correlation (r)
1.	Age	0.114 ^{NS}
2.	Education	0.467**
3.	Land holding	-0.329**
4.	Farming experience	0.013 ^{NS}
5.	Annual income	-0.217*
6.	Media ownership	0.095 ^{NS}
7.	Information seeking behaviour	0.572**
8.	Social participation	0.326**
9.	Communication competence	0.301**
10.	Self confidence	0.651**
11.	Scientific orientation	0.701**
12.	Innovativeness	0.556**

*significant at 0.01% level; NS- non significant
**significant at 0.05% level

accepted by the awardee farmers. Due to greater knowledge and higher adoption of improved technologies, the awardee farmers have greater degree of opinion leadership. Also educated individuals are more technically competent and have higher knowledge. The educated individuals are perceived to have better self confidence, communication competence, information seeking behaviour, scientific orientation and innovativeness.

CONCLUSION

The awardee farmers were found to exercise a great amount of opinion leadership, which has remained largely untapped. Farmer to Farmer Extension (F2FE) must be taken up to popularize the awardee farmer's ideas and to utilize the opinion leadership of awardee farmers. There is lot of scope to enhance the innovative behaviour of other farmers as awardee farmers are very effective local sources of innovation diffusion process. It was noted that certain independent variables like education, communication competence, information seeking behaviour, social participation, self confidence, scientific orientation and innovativeness were found to have positive and significant correlation with the opinion leadership of the awardee farmers. These characteristics must be given enough emphasis by relevant agencies to enhance opinion leadership among farmers. The characteristics like large land holdings and higher annual income need not be emphasised while selecting awardee farmers for extension activities. The negative correlation between characteristics like annual income, land holding and opinion leadership prove that large farmers can be avoided in extension activities since they command very less opinion leadership.

REFERENCES

Basanayak, R. 2012. *Innovative behaviour and diffusion of technology by awardee farmers in North Karnataka,* Ph.D. Thesis, University of Agricultural Sciences, Dharwad, Karnataka, India.

Census Report. 2011. *Census of India 2011: Report on Post Enumeration Survey*. Registrar General & Census Commissioner, New Delhi, India.

Central Statistics Office. 2019. First *advance estimates of National Income at 2011-12 prices*. Retrieved from http://statisticstimes.com/economy/sectorwise-gdp-contribution-of-india.php

Dalwai, A. 2017. *Report of the Committee on Doubling Farmers' Income* (Volume XIV). Retrieved from http://farmer.gov.in/imagedefault/DFI/DFI_Volume_14.pdf

Echetama, J.A.; A.O. Ani and P.A. Onoh. 2017. Assessing roles of local leaders in agricultural information dissemination in Owerri Agricultural zone of Imo State Nigeria. *Futo Journal Series,* 3(1): 1-12.

Hussain, S.S.; D. Byerlee and P.W. Heisey. 1994. Impacts of the training and visit extension system on farmers' knowledge and adoption of technology: Evidence from Pakistan. *Agricultural Economics*, 10(1): 39-47.

Kademani, S.B. 2019. *A Study on Opinion Leadership of Awardee Farmers* (M.Sc. Thesis) G.B. Pant. University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Labour Bureau. 2016. *Report on Fifth Annual Employment - Unemployment Survey of 2015-16 (Volume-I).* Ministry of Labour and Employment, Chandigarh, India.

Nain, M.S.; R. Singh; J.R. Mishra and J.P. Sharma. 2015. Utilization and linkage with agricultural information sources: A study of Palwal District of Haryana State. *Journal of Community Mobilization and Sustainable Development*, 10(2): 152-156.

National Commission on Farmers. 2004. Fifth and final report: *Serving Farmers and Saving Farming.* Ministry of Agriculture, Government of India.

NSSO Report. 2005. Situation assessment survey of farmers: Access to modern technology for farming. 59th Round, Report No. 499(59/33/2), National Sample Survey Organization, Ministry of Statistic s and Programme Implementation, Government of India, New Delhi.

Raabe, K. 2008. *Reforming the agricultural extension system in India: what do we know about what works where and why?* International Food Policy Research Institute, Washington, D.C.

Rogers, E.M. 2003. *Diffusion of innovations*. New York: Free Press.

Shilpashree, B.S. 2011. *A study on awardee farmers in North Karnataka* (M.Sc. Thesis). University of Agricultural Sciences, Dharwad, Karnataka, India.

Vimalraj, G. 2010. *An analytical study of best practices and competencies of award winning agripreneurs of Tamil Nadu* (M.Sc. Thesis). Indian Agricultural Research Institute, New Delhi, India.

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Secondary Agriculture: Re-vitaliser for Indian Farming

Madhumita[1] and S.R. Singh[2]
[1]Farm Manager, KVK Sheohar, Dr. RPCAU, Pusa, Bihar
[2]Ex-Professor & Head, Department of Extension Education, BAU, Sabour, Bihar

ABSTRACT

Secondary agriculture or value added agriculture, which is deemed as sunrise sector of economy, holds immense potential for farmers and nation as a whole. Adding value to agriculture has twin benefits of assuring optimum returns to the producers as well as reducing the substantial amount of crop losses otherwise. It is also an enabling factor to retain rural youth to rural areas due to generation of income and employment opportunities, who otherwise migrate to urban areas in search of attractive earning options. In today's global economy of steep competition, it is extremely difficult to solely focus on production and still expect to realize a decent standard of living. Particularly, India has a colossal loss of agricultural produce every year which needs to be utilized rationally. Also, in the wake of ongoing agrarian crisis today, it is essentially needed to adopt farm-income centric approach rather than simply a production approach. India's large market size, ever-changing lifestyles, food habits and customer tastes, create incredible market opportunities for food producers, food processors, machine fabricators, food technologists and service providers in this sector. Hence, owing to these factors greater emphasis on processing and value-addition of raw agricultural produce is required. Government has also helped promote this sector in the form of major plans like Mega-food Parks and Scheme for Cold Chain, Value Addition and Preservation Infrastructure. Also, at smaller level, the government has tried to infuse life to it by plans like MUDRA (Micro Units Development and Refinance Agency), which makes it quite easy to set up processing units. Promoting secondary agriculture will push up country's overall farm growth and will come up in a big way in doubling farmers' income by 2022.

Keywords: Changing life-styles, Employment opportunities, Food and nutritional security, Raised income, Value addition

INTRODUCTION

India is one of the fastest growing economies in the world. The food processing or secondary agriculture is of immense importance for development because of the vital linkages and synergies it promotes between the two pillars of our economy, industry and agriculture. Rightly, deemed as "sunrise sector" of economy, it is witnessing positive wave of change, wherein new conducive policies are being framed up, huge investment flowing in, and all efforts to create a favorable infrastructure and support system are being made. India, endowed with strong resource base of quality raw material and availability of huge manpower at competitive prices, makes it poised to become a global food processing hub in the near future. It is likely to have a significant bearing on Government's set target of doubling farmers' income by 2022, by way of setting up processing industries, which will not only add more value to their farm produce but also assure employment and fair income, also in non-farm days (Anonymous, 2017).

The food processing industry holds vast potential for growth, considering that India has a large food production base. Over the years, agricultural production in India has consistently recorded higher output. India ranks number 1 in total food production globally. With respect to specific commodity it ranks number 1 in the production of milk, bananas, guavas, papayas, ginger, okra, pulses & buffalo meat. Further, India ranks second in the world in the production of green peas, potatoes, tea, tomato, sesame, inland fish production. It is the fifth largest egg producer in the world. But, as far as processing is concerned, only approximately 2 per cent of fruits and vegetables, 8 per cent marine, 35 per cent milk, 6 per cent poultry are processed (Anonymous, 2017). Our country produces almost all types of fruits and vegetables because of its

wide range of agro-climatic conditions. Approximately 40 per cent of fruit and vegetables are wasted every year due to improper handling, transport, storage, marketing and post- harvest losses (Kumar *et al*., 2017).

These huge post-harvest losses are of grave concern. The Government has got a study done on "Assessment of Quantitative Harvest and Post-Harvest Losses of Major Crops and Commodities in India" by ICAR-Central Institute of Post-Harvest Engineering and Technology (CIPHET), Ludhiana. The study has estimated that annual value of harvest and post-harvest losses of major agricultural produces at national level was of the order of Rs. 92,651 crore calculated using production data of 2012-13 at 2014 wholesale prices (Anonymous, 2016).

The reality of agrarian crisis i.e., farmers committing suicide due to reduced income, necessitates the need of transferring the production centric approach to that of income - centric. In face of such scenario, it becomes very much obvious to lay much emphasis on this sunrise sector, especially in view of Government's set target of doubling farmers' income by 2022. Establishment of more processing units particularly in rural areas can provide a large scale of employment opportunities (Joshi *et al.,* 2018).

Advantages vis-a-vis Food Processing sector

- With 127 agro-climatic zones, India has a vast production base of 540 million metric tonnes of agri-horticultural produce. It stands highest in milk production, second largest in cereals, fruits and vegetables, fisheries and sea food.
- Along with being the biggest producer of food, it is also a leading consumer of food in world. With a population of 1.3 billion, where 65 per cent of them is below 35 years of age, with large disposable income and consumer preferences. These demographics are driving the retail sector currently estimated at US $ 6000 billion and it is expected to reach US $1.3 trillion, of which 70 per cent constitutes food.
- Goods & Services Tax (GST) is a path-breaking initiative which is a major step in the direction of one country, one market and one tax. Almost 75 per cent of processed food is below the 12 per cent tax slab (DD News, 2017).
- India's geographical situation gives it the unique advantage of connectivity to Europe, the Middle East, Japan, Singapore, Thailand, Malaysia and Korea.

Food processing scenario in India

Processing Opportunity Processing of various sub segments of food in the country is very low as compared to other developed nations. Only 10 per cent of agricultural produce is processed and rest 90 per cent remains unprocessed (DD News, 2017).Overall processing level of perishable products – India (approx 10%), USA (80%), Malaysia (80%), France (70%), Thailand (30%), Australia (25%) (Make in India, 2016).

The processing levels for perishables in India are:

- Fruits & vegetables ~2%
- Marine produce ~ 23%
- Poultry ~ 6%
- Meat ~ 21%
- Dairy ~35%

Table 1: There is huge unexplored opportunity underlying in the food processing in the country

Segments	Primary Processing	Secondary Processing	Tertiary Processing
Fruits and Vegetables	Cleaning, Cutting, Sorting	Pulp, Flakes, Paste, Frozen, Diced, Canned	Jams, Jellies, Chips Ready to Serve drinks, Indian ethnic drinks
Grains and Cereals	Sorting and Grading	Rice Puff, Flour, baby food (final product/ ingredients)	Cakes, Biscuits, Breakfast cereals, breads, other bakery products, RTC/RTE products
Oilseeds	Sorting and Grading	Cakes, Refined Oils	Soya Oil, Olive Oil, Mustard Oil, Fortified Oil
Milk	Grading and Refrigeration	Packaged milk, Flavored milk, Cream, Milk powder	Yoghurt, Cheese, Ice cream, Curd, Baby food, other value added products
Meat and Poultry	Sorting and Refrigeration	Chilled/Frozen products	Ready to Eat products
Marine Products	Chilled/Frozen products		Ready to Eat products

Source: (Make in India, 2016).

Opportunities ahead

Fruits and Vegetables

- India is the second largest producer of the fruits and vegetables in the world with a production of 256 million MT.
- India is the world's largest producer of bananas, papaya, mangoes and guavas, second largest producer of potatoes, green peas, tomatoes, cabbage and cauliflower.
- Processing levels in F&V currently stand at close to 2%.
- India witnesses nearly 4.6-15.9 per cent wastage in fruits and vegetables annually, due to lack of modern harvesting practices and inadequate cold chain infrastructure (Make in India, 2016).

Why India for Dairy Processing?

- With production of around 146 million MT, India is the largest producer of milk globally. The Indian dairy market is amongst the largest and fastest growing markets in the world. India has managed to attain top position in milk production globally owing to huge bovine population. However, the full potential of Indian milch herd still remains unattained.
- Changing lifestyle patterns, increasing disposable incomes and increasing health consciousness are the key growth drivers for milk and high value milk products in India.
- To tap the surging demand, most dairy players have entered the processed dairy segment with introduction of value added products like ghee, flavored yogurt, butter (with variants), flavored milk, cheese etc.
- ***Example cited:*** Burfi is a popular indigenous heat desiccated milk product made all over India. It is a product of great commercial importance and has a potential to achieve global status. The increasing demand of burfi presents a great opportunity for the organized sector to modernize and scale up its production. Other than the dominant products of fig like fig jam, fig pickle, dried figs, canned figs, fig preserve, fig prash there are also less prominent but delicious fig products which are processed to a little extent and are gaining popularity owing to their excellent quality, growing consumer acceptance and very important qualities like economic production and preservation of products. The products like fig bar, fig leather, fig burfi come under the above-mentioned category (Dharmadhikari, 2000). The utilization of fig paste in burfi will make it healthy enriching food for needy and nutritionally starved children, adults and youth athletes (Matkar *et al.,* 2018).

Meat and Poultry

- India has the world's largest population of livestock. India produces around 5.3 million MT of Meat and 75 billion eggs annually.
- India is the largest producer of buffalo meat and 2nd largest producer of goat meat. The current processing levels in poultry are 6 per cent, while for meat it stands at 21 per cent.
- Poultry is a highly vertically integrated industry in India and matches the efficiency levels of many western countries.
- Government of India has taken steps for modernization of municipal abattoirs to provide safe and hygienic meat to consumers.
- Export oriented units have invested significantly in establishment of large abattoirs-cum-meat processing plants with the latest technology.
- Farm automation, abattoirs, logistics, processing and point of sale cold storage infrastructure are an opportunity in India, given the changing preference of Indian consumers for clean, safe and hygienic meat and meat products.

Why India for Fish Processing?

- India, with a production of 9.6 million MT is the second largest fish producer in the world. Processing levels of marine food in India are currently at 23%.
- India is endowed with abundant geographical resources suited for both marine and inland fisheries, such as long coastline (8118 km), abundant rivers and canals, reservoirs, ponds and tanks, and brackish water.
- The export market is currently valued at USD 5.5 Bn/ 1 Mn MT. Most exports currently are in the frozen form and there is immense potential for exporting value added products.
- Processing of fish into canned and frozen forms is carried out mostly for exports. Besides, there is an increased demand for processed and ready-to-eat marine products in the domestic and overseas market.

Why India for Cold Chain?

- India produces more than 400 million MT of perishables every year (horticultural produce + dairy + meat + poultry + fish).
- The wastage levels in perishables in India are significantly high- 4.6- 15.9 per cent in fruits, 5.2 per cent in inland fish, 10.5 per cent in marine fish, 2.7 per cent in meat and 6.7 per cent in poultry.
- Estimated annual value of losses of agri- produce currently stands at Rs. 92,651 crores.
- Annual value of losses in fruits and vegetables, meat, fish and milk is estimated at Rs. 50,473 crores. Adequate and efficient cold chain infrastructure from farm gate to consumers is required to arrest the high losses in supply chain of perishables.
- Overall average capacity utilization in cold storage is 75 per cent - showing sustainability of the cold chain business in India.
- Large unfulfilled gap exists in the sector for investments in cold storage, CA storage, reefers, ripening chambers, IQF, milk chilling and processing etc. Requirement for cold chain across all states (Make in India, 2016).

Government's initiatives to spur to Food Processing Industry

a) SAMPADA Yojana (Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters)

The Cabinet Committee on Economic Affairs, chaired by the Prime Minister Shri Narendra Modi has given its approval for re-structuring the schemes of the Ministry of Food Processing Industries (MoFPI) under new Central Sector Scheme – SAMPADA (Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters) for the period 2016-20 coterminous with the 14th Finance Commission cycle.

SAMPADA with an allocation of Rs. 6,000 crore is expected to leverage investment of Rs. 31,400 crore, handling of 334 lakh MT agro-produce valuing Rs. 1,04,125 crore, benefit 20 lakh farmers and generate 5,30,500 direct/ indirect employment in the country by the year 2019-20 (Cabinet Approves, 2017).

SAMPADA is a comprehensive package which will result in creation of modern infrastructure with efficient supply chain management from farm gate to retail outlet. It will not only provide a big boost to the growth of food processing sector in the country but also help in providing better process to farmers and is a big step towards doubling of farmers income, creating huge employment opportunities especially in the rural areas, reducing wastage of agricultural produce, increasing the processing level and enhancing the export of the processed foods.

The following schemes will be implemented under PM Kisan SAMPADA Yojana

- Mega Food Parks (ongoing)
- Integrated Cold Chain and Value Addition Infrastructure (ongoing)
- Creation / Expansion of Food Processing & Preservation Capacities (new)
- Infrastructure for Agro-processing Clusters (new)
- Creation of Backward and Forward Linkages (new)
- Food Safety and Quality Assurance Infrastructure (ongoing)
- Human Resources and Institutions (ongoing)

Expected outcome

i) The implementation of PMKSY will result in creation of modern infrastructure with efficient supply chain management from farm gate to retail outlet.

ii) It will provide a big boost to the growth of food processing sector in the country.

iii) It will help in providing better prices to farmers and is a big step towards doubling of farmers' income.

iv) It will create huge employment opportunities especially in the rural areas.

v) It will also help in reducing wastage of agricultural produce, increasing the processing level, availability of safe and convenient processed foods at affordable price to consumers and enhancing the export of the processed foods.

Government has taken various other measures to boost food processing sector as follows:

b.) To provide impetus to investment in food processing and retail sector, govt. has allowed 100% FDI in trading including through e-commerce, in respect of food products manufactured and / or produced in India.

This will benefit farmers immensely and will create back - end infrastructure and significant employment opportunities.

c.) The govt. has also set up a Special Fund of Rs. 2000 crore in NABARD to make available affordable credit at concessional rate of interest to designated food parks and agro processing units in the designated food parks.

d.) Food and agro-based processing units and cold chain infrastructure have been brought under the ambit of Priority Sector Lending (PSL) to provide additional credit for food processing activities and infrastructure thereby, boosting food processing, reducing wastage, create employment and increasing farmers' income (Cabinet Approves, 2017).

e.) The unique portal – Nivesh Bandhu – or "investor's friend" has been launched which brings together information on central and state government policies, and incentives provided for the food-processing sector. It maps resources upto the local level, with processing requirements. It is also a platform for business networking, for farmers, processors, traders, and logistics operators (DD News, 2017).

f.) The Food Safety and Standards Authority of India (FSSAI) plans to invest around Rs 482 crore (US$ 72.3 million) to strengthen the food testing infrastructure in India, by upgrading 59 existing food testing laboratories and setting up 62 new mobile testing labs across the country ("Contract Farming", 2017).

g.) Also there is MUDRA (Micro Units Development and Refinance Agency) Yojna which provides funds upto 10 lakhs to entrepreneurs for setting small business units. Agriculture & Self-employment are the focus areas of Mudra Bank (Mudra Bank, 2016).

h.) Krishi Vigyan Kendras (KVKs) trainings are effective and significantly increases the knowledge level of farmwomen and rural youth about post- harvest technology (Pandey *et al*., 2018).

Challenges in the sector

1. One of the major challenges faced by the sector is the significant post-harvest wastage of agricultural produce, particularly in fruits and vegetables.

2. Apart from infrastructure constraints, the food processors face problems in procurement of raw materials for processing due to restrictive provisions in marketing of agricultural produce.

3. Another major constraint faced by food processors is the lack of availability of processable varieties of fruits and vegetables, due primarily to the inadequate linkage between production and processing (Contract Farming, 2017).

World Food India 2017: Suggestions made

A global, mega event "World Food India 2017" on food processing was held in Vigyan Bhawan, New Delhi, which was attended by over 2,000 participants, over 200 companies from 30 countries, 18 ministerial and business delegations, nearly 50 global CEOs along with CEOs of all leading domestic food processing companies, and representatives of 28 States in India. Germany, Japan and Denmark were Partner Countries to World Food India. Italy & Netherlands are the Focus Countries (India Gears, 2017). The suggestions that came out for giving a surge to the sector are-

- Prime Minister suggested to link India's potential in food processing with world requirement, and India's farmers with world and also the India's tradition with future of mankind.
- Prime Minister stressed investment potential of fruit juice based drinks and nutrition rich agro climate smart crops to boost production and supply of India's coarse grains and millets that 'not only have high nutritional value, but can also withstand adverse agro-climatic conditions'.
- Private sector participation has been increasing in many segments of the value chain. However, more investment is required in contract farming, raw material sourcing and creating agri-linkages.
- There were opportunities in post-harvest management, including in primary processing and storage, preservation infrastructure, cold chain, and refrigerated transportation.
- There was immense potential for food processing and value-addition, especially in niche areas such as organic and fortified foods.
- Focus on Sweet Revolution to boost India's production and export of honey. Presently India ranks six in production and export in the world.

- Each State of India to identify at least one food product for specialisation. Similarly, each district can also select some food items for production, and one item for specialisation.
- The combination of traditional Indian food, with modern technology, processing and packaging, can help the world rediscover the health benefits, and refreshing taste of Indian food ingredients such as turmeric, ginger, and tulsietc (Contract Farming, 2017).

CONCLUSION

India's food processing industry is a sunrise sector that has gained prominence in recent years. It not only adds value to farmer's toil and efforts, but also adds national wealth. The rich availability of raw materials and changing lifestyles with a relaxation in policies has provided sufficient platform for the industry's growth. This sector holds greater promise to provide bumper number of employment as well as income- raising avenues. Its progress will not only ensure attractive remuneration to farming community but also will provide a remarkable boost to our country's economy. When this colossal amount of food wasted is converted to processed items, price fluctuations can be checked and it will also go a long way in meeting out the targets of food and nutritional security for the nation as well as for the globe. Thus it can be said that it has the capacity of serving the entire humanity, in diverse ways.

REFRENCES

Cabinet approves New Central Sector Scheme - "Pradhan Mantri Kisan Sampada Yojana". (2017, August). Retrieved from pib.nic.in/newsite/PrintRelease.aspx?relid=170174

Cabinet approves New Central Sector Scheme – SAMPADA (Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters). (2017, May 7). Retrieved from http://pib.nic.in/newsite/PrintRelease.aspx?relid=161512

Contract farming and food processing sector in India. (2017, November 4). Retrieved from blog.forumias.com/contract-farming-and-food-processing-sector-in-india/

DD News. (2017, November 3). *Film on World Food India* [Video file]. Retrieved from https://www.youtube.com/watch?v=QmpCgVyzCVw

DD News. (2017 November 3). *PM Narendra Modi addresses gathering at the World Food India 2017* [Video file]. Retrieved from https://www.youtube.com/watch?v=3N0EUCcNfVo&t=637s

Dharmadhikari, A.D. (2000). Studies on development of fig (*Ficus carica* L.) burfi. M.Tech. Thesis, VNMKV, Parbhani.

Draft National Food Processing Policy. (2017, March 9). Retrieved from http://mofpi.nic.in/sites/default/files/sejda-52v.pdf

India gears up to welcome Global Food Titans. (2017, November3). Retrieved from http://pib.nic.in/newsite/PrintRelease.aspx?relid=173180

India Organic Food Market by Product Type, Competition Forecast and Opportunities, 2011 – 2021. (2016, September 27). Retrieved from https://www.prnewswire.com/.../india-organic-food-market-by-product-type-competit...

Joshi, V.; S. Gondkar; A.K. Godara and S.K. Mehta. 2018. Determinants of Marketing and management for prospect of small scale food processing units in Haryana. *Journal of Community Mobilization and Sustainable Development*, 13(3): 488-492.

Kumar, N.; B. Bhardwaj; S. Ahmad and Indu. 2017. A survey: To estimate food wastage periodically. *International Journal of Engineering Research & Technology,* 5(11): 1-4.

Make in India, Opportunities in Food Processing Sector. (2016, February18) Retrieved from https://www.yesbank.in/.../make_in_india-_opportunities_in_food_processing_sector....

Matkar, P.; S.G. Narwade and S.P. Poul. 2018. Studies on chemical composition of fig Burfi. *Multilogic in Science,* 7(25).

Mudra Bank – Details, Objectives & Benefits. (2016, May 26). Retrieved from https://www.relakhs.com/mudra-bank-govt-scheme-loans-small-businesses/

Pandey, S.; R.K. Pandey; D. Singh; S.K. Pandey and A.K. Bajpai. 2018. Evaluation of knowledge level of farmwomen and rural youth in post harvest technology. *Journal of Community Mobilization and Sustainable Development,* 13(3): 454-456.

Pradhan Mantri Kisan SAMPADA Yojana. (2017, September 26). Retrieved from mofpi.nic.in/Schemes/pradhan-mantri-kisan-sampada-yojana

Anonymous. 2016. Steps taken to Reduce Post Harvest Food Losses. (2016, February 26). Retrieved from 5 rzpib.nic.in/newsite/PrintRelease.aspx?relid=136922

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A Study on Relationship of Instructional Skills and Immediacy Behaviour of Teachers on Teaching Effectiveness of Extension Teaching in Agricultural Universities

Girijesh Singh Mahra[1]*, S.K. Kashyap[2], Neelam Bhardwaj[3] and V.L.V. Kameswari[4]

[1]Scientist, Division of Agricultural Extension, ICAR-IARI New Delhi

[2]Dean, College of Agriculture, GBPUAT, Pantnagar, Uttarakhand

[3]Head and Professor, [4]Professor, Department of Agricultural Communication, GBPUAT, Pantnagar, Uttarakhand

ABSTRACT

Teaching has always been the core of human resource development and is one of the three important mandates of all agricultural universities besides Research and Extension. This study examines the perception of 210 post graduate students (M.Sc. and Ph.D.) of Extension Education discipline of 10 northern agricultural universities towards instructional skills and immediacy behaviour of teachers who taught them post graduate courses. It was found that majority of the students (79.52%) categorized their teachers in medium category of instructional skills and majority of students perceived that teachers had medium category of verbal immediacy (63.80%) and nonverbal immediacy (71.90). It was found that verbal immediacy and non-verbal immediacy had significant positive relationship with teaching effectiveness at 1 per cent level of significance ($p<0.01$), however instructional skills had significant positive relationship with teaching effectiveness at 5 per cent level of significance ($p<0.05$).

Keywords: Instructional skills, Verbal immediacy, Non-verbal immediacy, Teaching effectiveness

INTRODUCTION

Today in India, Extension researches and teaching are being practiced by teachers and students in more than 61 State Agricultural Universities (SAUs), 4 Deemed to be Universities (DUs), 3 Central Agricultural Universities (CAUs) and 4 Central Universities (CUs) with Agriculture Faculty. In the last two decades, the agricultural situation in India has witnessed a paradigm shift in the light of India's signing the General Agreement on Trade and Tariff (GATT) in 1994. Consequently, the job market for extension trained professional today, now demand quite different competencies than were required in the 1960s, which in turn can be inculcated by diverse teaching methodologies and updated subject knowledge of teachers for ultimately achieving overall teaching effectiveness. National Centre for Agricultural Economics and Policy Research (1996) during National Workshop on Post-Graduate Teaching in Social Sciences, New Delhi, recommended that the Post-graduate teaching should make a balance between theoretical knowledge and practical skills related to Extension Education which requires suitable instructional skills. Fifth Dean Committee report of Agricultural Education Division, Indian Council of Agricultural Research (2017) noted the constraints in teaching effectiveness among agricultural universities and recommended modification of instructional and teaching methodologies. Several researches have suggested that immediacy behaviour of teachers and instructional skills affects teaching effectiveness significantly (Richmond *et al.*, 1987).

MATERIALS AND METHODS

Universities located in North zone were the universe of the present study, which comprises of 23 universities having agriculture as a subject and located in Jammu and Kashmir, Himachal Pradesh, Punjab, Uttarakhand, Uttar Pradesh, Haryana and New Delhi. Ten universities from universe were selected randomly where the present study was conducted. All post graduate students (M.Sc. and Ph.D.) of Extension Education discipline from selected ten universities were the respondents for the present study. Therefore, one stage cluster sampling was followed for

*Corresponding author email id: girijeshmahra22@gmail.com

the present study. The selected ten universities include six State Agricultural Universities (G.B.P.U.A.T, Pantnagar, P.A.U., Ludhiana, C.C.S.A.U., Hisar, S.K.U.A.S.T, Jammu, C.S.A.U.A.T., Kanpur and S.H.U.A.T.S, Naini), three deemed to be universities (I.A.R.I., New Delhi, N.D.R.I., Karnal and I.V.R.I., Bareilly) and one Central University with Agriculture faculty (B.H.U., Varanasi). Thus, there was a representation from each category of university.

Instructional skills refer to the skills possessed by teachers which they used while teaching the course. It was measured on six dimensions proposed by Dosanjh (1971) consisting of twelve statements (two statements on each dimension) on five-point rating scale from 'very often to 'never'. The respondents were categorized into three categories through measurement of mean (34.56) and standard deviation (03.20). Dimensions proposed by Dosanjh (1971) are as follows:

a. Entry behaviour: It refers to the way, purpose, structure, resume and the special comments of the teachers before starting the lecture to prepare the students psychologically to respond positively.

b. Introducing the topic: How a teacher introduces a new topic is a very important aspect of student teaching. Whether a teacher uses quotations, stories personal experiences, relevant examples etc. or not, is of great importance for paving the way for success of the lesson

c. Exposition or lecturing skills: Lecturing is an important aspect of classroom teaching. This was studied under following headings, purpose, vocabulary, fluency, continuity, clarity, sequence, pace, voice, illustrations and repetitions.

d. Questioning skills: Questioning is a very important technique which every good teacher must know thoroughly. It stimulates learning and thinking. Skills of questioning include the type of question, target of questions, encouraging students to ask questions, time given to answer the questions, teacher's reaction to student's responses etc.

e. Teacher response: Responding to students questions appropriately is very important for learning. It motivates students to ask further questions and clarifies any doubt. It also acts as a source of feedback for teachers. Question raising from students is an indicator that students are listening to the teachers and trying to understand the subject.

f. Closure skills: How the lesson is closed is a very important aspect of teaching behaviour as it leaves a lasting impression on the students. It was measured under following: abrupt closure, teacher summarizes the lesson, draws the conclusion or introduces the next lesson.

Immediacy was conceptualized by Mehrabian (1971) as communication behavior that reduces physical and psychological distance between people, in this case between student and teacher. Immediacy can be verbal or non-verbal. In present study verbal immediacy was measured by Gorham's measures of verbal immediacy (1988) consisting of eighteen statements of verbal immediacy on five-point rating scale from 'very often to 'never'. The teachers were categorized into three categories through measurement of mean (68.83) and standard deviation (02.90).

Non-verbal teacher immediacy was measured by Richmond *et al.* measures of non-verbal immediacy (1987) consisting of twelve statements (six positive and six negative) of non-verbal immediacy on five-point rating scale from 'very often to 'never'. The teachers were categorized into three categories through measurement of mean (43.85) and standard deviation (02.20).

Overall teaching effectiveness was measured through student ratings of teachers' attribute. Seven teachers' attributes and one attribute related to the course being taught were identified to measure teaching effectiveness Each attribute was measured by four statements on five-point rating scale (strongly agree, agree, undecided, disagree and strongly disagree). Weighted mean score of all four statements under each attribute was calculated and ranked accordingly. Overall weighted mean scores of all eight attribute were also calculated and ranked accordingly.

The association between instructional skills and immediacy behaviour with teaching effectiveness was calculated through correlation and multiple regression analysis. Pearson correlations were computed between all attributes and overall teaching effectiveness to test for direction and strength of the correlation.

RESULTS AND DISCUSSION

Instructional skills of teachers were measured based on the scores assigned by students under six dimensions: entry behaviour, introducing the topic, exposition or lecturing skills, questioning skills, teacher response and closure skills.

Table 1: Ranking of instructional skills dimensions of teachers based on weighted mean score (WMS) as perceived by students (n=210)

S.No.	Skill	Statements	WMS	Rank
1	Entry Behavior	Teacher greet students	4.59	I
		Teacher shows enthusiasm and energy	3.68	III
2	Introducing skills	Teacher introduce the topic	4.20	II
		Teacher review the last lecture	2.17	VIII
3	Exposition/ lecturing skills	Teacher uses teaching aids with group activity	2.07	IX
		Teacher uses mix of blackboard and PPT	3.12	V
4	Questioning Skills	Teacher ask questions to create interest	2.71	VI
		Teacher ask questions to clear doubts	1.17	XI
5	Teacher Response	Teachers' appreciate student point of view	3.62	IV
		Teacher respond to students promptly	1.12	XII
6	Closure skills	Teacher review the lecture	1.19	X
		Teacher ask students questions	2.65	VII

It is evident from the Table 1 that students ranked the statements 'Teacher greet students after entering the class' and 'Teacher introduce the topic' in first two places which indicates that majority of teachers greeted their students after entering into the class and introduced the topic before lecturing. Table 1 also shows that students ranked the statements 'teacher shows enthusiasm and energy' and 'teachers appreciate student point of view' in third and fourth rank respectively which indicates that majority of teachers had shown energy in class and had appreciates students' points of view.

Out of twelve statements students had ranked the statements 'teacher uses teaching aids with group activity' and 'teacher ask questions to clear doubts' in ninth and eleventh place which indicates that teachers had organized less numbers of group activity in class and had not asked questions to clear the doubts by themselves. Students' had ranked the statement 'teacher review the lecture' in tenth rank which indicates that majority of teachers had not revised the lecture topics while closing the class. The statement 'teacher respond to students promptly' was ranked last by students which indicates that teachers had not responded to students queries promptly.

The teachers were classified into three categories on the basis of instructional skills score assigned by their students. It is evident from the Table 2 that majority of the students (79.52%) categorized their teachers in medium category of instructional skills followed by 12.86 percent of students who categorized teachers under low category of instructional skills. Only 7.62 per cent of students categorized their teachers under high category of instructions skills. Overall, it can be concluded that majority of teachers were under low to medium category of instructional skills. These findings were in conformity with Srivastava (2002) who reported that majority of teachers had low to medium level of instructional skills.

Table 2: Distribution of teachers on the basis of instructional skills as perceived by students (n=210)

Category	Frequency	Percentage
Low (less than 31.36)	27	12.86
Medium (31.36 – 37.76)	167	79.52
High (more than 37.76)	16	7.62
Total	**210**	**100**

[Max= 45, Min=27, Mean=34.56, S.D. = 3.20]

The teachers were classified into three categories on the basis of verbal immediacy score assigned by their students. It is evident from the Table 3 that majority of

Table 3: Distribution of teachers based on verbal immediacy as perceived by students (n=210)

Category	Frequency	Percentage
Low (less than 65.93)	16	7.61
Medium (65.93-71.73)	134	63.80
High (more than 71.73)	60	28.59
Total	**210**	**100**

[Max= 76, Min=52, Mean= 68.83, S.D. = 2.9]

the students (63.80%) categorized teachers in medium category of verbal immediacy followed by 28.59 percent of students who categorized teachers under high category of verbal immediacy. Only 7.61 per cent of students categorized their teachers under low category. This indicates that teachers had good command over the language, had used variety of vocal expression while teaching, had asked questions and encourages students' participation, had provided feedback on individual work, had used different gestures while talking to class and praised students' work/ action.

Overall, it can be concluded that majority of students perceived that teachers had medium to high category of verbal immediacy, which clearly indicates that majority of the teachers had used verbal communication effectively while teaching the subject. These findings were in line with Kumar (1998) who concluded in his study of immediacy behavior of teachers that majority of teachers had medium verbal immediacy.

The teachers were classified into three categories on the basis of non-verbal immediacy score assigned by students. It is evident from the Table 4 that majority of the students (71.90%) categorized teachers in medium category of non-verbal immediacy followed by 19.52 percent of students who categorized teachers under low category of non-verbal immediacy. Only 8.58 per cent of students categorized their teachers under high category. This indicates that very few teachers had used their hands and arms effectively while teaching the class, had maintained good eye contact with students, had coherence between voice and body movements, had used blackboard in efficient manner and used variety of facial expressions. As majority of the teachers were under medium category, this shows that the non-verbal immediacy of teachers can further be improved by adequate training on non-verbal communication. Overall, it can be concluded that majority of teachers had low to medium category of non-verbal immediacy. These findings were in line with Srivastava (2002) who reported while studying the non-verbal immediacy of teachers that majority of teachers had low to medium level of non-verbal immediacy.

Table 4: Distribution of teachers based on non-verbal immediacy as perceived by students (n=210)

Category	Frequency	Percentage
Low (score less than 41.65)	41	19.52
Medium (41.65-46.05)	151	71.90
High (score more than 46.05)	18	8.58
Total	**210**	**100**

[Max= 51, Min=32, Mean= 43.85, S.D. = 2.2]

Overall weighted mean scores of all eight attribute were also calculated and all attributes were ranked. When weighted mean score of all eight attributes was compared then it is evident from Table 5 that the students' had ranked "teachers' fairness", "teachers' attitude towards teaching" and "teachers' attitude towards students" in first three ranks consecutively which indicates that overall, teachers' were fair in grading, had shown high enthusiasm towards teaching, regarded teaching as a noble profession and were responsive to students' questions.

Table 5: Perception of students based on Weighted Mean Score (WMS) with respect to overall teachers' attributes (n=210)

S.No.	Attributes	WMS	Rank
1.	Teachers' Preparedness	3.45	IV
2.	Teaching Pedagogy Of Course	2.42	VII
3.	Teachers' Attitude Towards Students'	3.48	III
4.	Teachers' Attitude Towards Teaching	3.84	II
5.	Teachers' Creativity	2.07	VIII
6.	Teachers' Fairness	4.07	I
7.	Teachers' Availability to Students'	2.97	VI
8.	Course Characteristics	3.24	V

The students had ranked "teachers' preparedness" and "course characteristics" in next two ranks as fourth and fifth with weighted mean score above three. This indicates that students had average satisfaction regarding course requirement coverage, theory integration with practical's, assignment adequacy, up gradation of course curriculum, teachers' preparation of lecture schedule, arriving and leaving time of teachers in class and teachers' preparation for each class.

The students had ranked "teachers' availability to students", "teaching pedagogy of course" and "teachers' creativity" in last three ranks as sixth, seventh and eight respectively with weighted mean scores less than three. This clearly indicates that teachers had not used diverse methods of teaching, had not harnessed multi-media tools effectively and the teaching methods had not generated desired skills among students' up to satisfactory level. The last rank of "teachers' creativity" indicates that majority

Table 6: Correlation and regression coefficients of instructional skills and immediacy behavior with teaching effectiveness

Variables	Estimate (B)	Standard Error	Correlation Coefficient (r)	Significance (p)
Verbal Immediacy	1.562	0.811	0.432118	0.0038**
Non-Verbal Immediacy	0.909	0.277	0.399562	0.0017**
Instructional Skills	0.781	0.286	0.117538	0.02104*

of the teachers' had not used innovative teaching methods and material for generating new ideas.

It is evident from Table 6 that the correlation coefficient (r) of verbal immediacy was 0.432118 with p value (0.0038). This indicates a significant positive relationship between verbal immediacy and teaching effectiveness at 1 % level of significance ($p<0.01$).

The correlation coefficient (r) of non-verbal Immediacy was 0.399562 with p value (0.0017). This indicates a significant positive relationship between non-verbal immediacy and teaching effectiveness at 1 per cent level of significance ($p<0.01$). These finding were in line with Anderson (1979); Moore *et al.* (1996); Kumar (1998) who reported that non-verbal Immediacy of teachers was significantly correlated with teaching effectiveness. The correlation coefficient (r) of instructional skills was 0.117538 with p value (0.02104). This indicates a significant positive relationship between instructional skills and teaching effectiveness at 5 per cent level of significance ($p<0.05$). This finding was in line with Flander (1970); Dosajh (1977), Singhal (1988) and Srivastav (2002) who reported that instructional skills of teachers were significantly correlated with teaching effectiveness.

CONCLUSION

The aim of Extension Education discipline is to prepare students who will have practical skills of their discipline so that they can contribute significantly in agricultural development. Inculcating practical skills among students in social science requires different and diverse instructional skills besides just lecturing (Blum, 1996). Job giving organizations today are looking for those Post Graduates students of Extension Education who have rural management, communication and marketing skills. Past researches and present placement scenario reveal that Extension students had not acquired several essential and core skills especially in areas of 'Extension Management', 'Development Communication' and 'Human Resource Management/ Training'. The present study has clearly shown that Teachers engaged in teaching of Extension education needs to reorient their instructional skills in order to inculcate required Extension skills among students which in turn will make Extension teaching-learning effective. Also, teachers need to establish effective verbal and non-verbal immediacy with post graduate students so that physical and psychological distance between teachers and students get reduced with enhanced balance between verbal and non-verbal communication.

REFERENCES

Andersen, J.F. 1979. Teacher immediacy as a predictor of teaching effectiveness. *In*: D. Nimmo (Ed.), Communication Yearbook 3. pp. 543-559.

Blum, A. 1996. Teaching and Learning in Agriculture; A Guide for Agricultural Educators. Rome, FAO. 155p.

Dosajh, N.L. 1977. Modification of Teachers' Behaviour through Microteaching. Sterling Publ. Pvt. Ltd., New Delhi. 8 p.

Flander, N.A. 1970. Teacher Effectiveness. *In:* Robert L. eds. Encyclopedia of Education Research, 4th Ed. pp. 45-50.

Gorham, G. 1988. The relationship between verbal teacher immediacy behaviour and student learning. *Communication Education*, 37: 40-53.

Kumar, R. 1998. Students Perceptions on classroom teaching behavior of teachers –A study at G.B. Pant University of Agriculture and Technology, Pantnagar. Thesis, M.Sc. G. B. Pant University of Agriculture and Technology, Pantnagar, 62 p.

Mehrabian, A. 1971. Silent Messages (1st ed.). Belmont, CA: Wadsworth. ISBN 0-534-009107.

Moore, A., Masterson, J. Christophel, D.M. and Shea, K.A. 1996. College teacher immediacy and student ratings of instruction. *Communication Education*, 49: 29-39.

National Centre for Agricultural Economics and Policy Research (NCAP). 1996. Proceedings of National Workshop on Post-Graduate Teaching in Social Sciences. New Delhi. 22p.

Indian Council of Agricultural Research. Agricultural Education Division. 2017. Fifth Dean's Committee Report. 63p.

Richmond, V.P., Gorham, J.S. and McCroskey, J.C. 1987. The relationship between selected immediacy behaviours and cognitive learning. *In*: M.A. McLaughlin (ed.), Communication Year Book 10, Newbury Park, Sage. pp. 574-590.

Singhal, S. 1988. Effective Teachers. How good is the student consensus? *Journal of Higher Education*, 13(1-3): 101-107.

Srivastava, N.2002. Classroom Teaching Behaviour of the University Teachers: A study at G. B. Pant University of Agriculture and Technology, Pantnagar. Thesis, Ph.D. G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand. 78p.

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Knowledge of Direct Seeded Rice Method among Farmers of Haryana

Subhash Chander*, Rashmi Tyagi and Jatesh Kathpalia
Department of Sociology, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana

ABSTRACT

The Indian agriculture has changed during the past about 50 years mainly due to development of agricultural technologies. Rice is grown in 18 districts of Haryana. Out of which seven districts are in high productivity group. The study was conducted in Kurukshetra district of Haryana state. From this district, two blocks namely Thanesar and Pehowa were selected randomly. On the whole a total of 200 rice growing farmers were selected, who were using direct seeded rice method (100) and conventional transplanted rice method (100). The findings regarding knowledge level of respondents about various aspects of direct seeded rice method were studied like recommended seed rate, varieties, fertilizer practices, weeds, insect, pest, disease etc. It was found that sixty per cent respondents had high level of knowledge regarding direct seeded rice method. Awareness were found among farmers regarding direct seeded rice method such as increase the yield than conventional, seed is placed in the most fertile zone of the soil i.e. 2-3 cm from surface and recommended variety is used for sowing: Tarawari, CSR-30, Pusa Basmati – 1121 to which they reported 1st, 2nd and 3rd ranks order.

Keywords: Knowledge, Direct seeded Rice, Socio-economic factors

INTRODUCTION

India is the second largest producer of rice after China. The yield is almost at par in case of basmati group if crop is properly managed. The Indian agriculture has changed during the past about 50 years mainly due to development of agricultural technologies. The introduction of improved and high yielding varieties, better cultivation practices, extended irrigation facilities, availability of other inputs such as fertilizers and pesticides, use of farm machinery, etc. have been the prime concern of every government for development of agriculture in India (Desai and Pujari, 2007).

Rice is the major *kharif* crop of India covering 42.8 million ha amounting to 85.7 million tonnes of production. The conventional system of rice production (CT-TPR) in this region is basically water, labour and energy intensive, adversely affecting the environment Therefore, to sustain the long term production of rice, more efficient alternative methods of rice productions are needed. For this, Direct Seeded Rice (DSR) is the technology which is water, labour and energy efficient along with eco-friendly characteristics and can be a potential alternative to CT-TPR (Kumar and Ladha 2011).

Rice is grown in 18 districts of Haryana. Out of which seven districts are in high productivity group, that is, yield more than 2,500 kg/ha (RKMP). It is grown by transplanting during wet season from June to October (Din *et al.,* 2013). Keeping in view of the above facts and importance of this method towards sustainable production of rice for the country as a whole and Haryana in particular, the study was conducted with the objective - To assess the nature, extent and factors associated with knowledge of Direct Seeded Rice (DSR) method.

MATERIALS AND METHODS

Participants: The study was conducted in Kurukshetra district of Haryana state. From this district, two blocks namely Thanesar and Pehowa were selected randomly. On the whole a total of 200 rice growing farmers were selected, who were using direct seeded rice method (100) and conventional transplanted rice method (100). Interview Schedule was prepared as per objectives of the study. Farmers were surveyed with the help of Interview Schedule. Statistical techniques were used as per the nature of data.

Instruments: The questions were framed which clearly indicate their meaning to the respondent and cover relevant

*Corresponding author email id: panwarsubhash786@gmail.com

aspects of problems according to the objectives of the study. Interview schedule was prepared with the help of various books, bulletins, journals, periodicals, government publications etc. After completion the interview schedule, data was collected regarding farmers of Hayana.

Statistical analysis: The collected data were coded, tabulated, analyzed and interpreted according to the objective of the present study with the help of appropriate statistical techniques. The descriptive statistical tools such as frequency, percentage and chi-square had been adopted to draw the inference from the study.

Procedure: In the end, the collected data from the field was analysed in term of identifying various specific objectives.

RESULTS AND DISCUSSION

Nearly three-fifth of the respondents (59.5%) were from 31 to 50 years age group (Table 1). Rest 24.5 percent and 16.0 percent were from up to 30 years age group and above 50 years age group. Distribution of caste among respondents showed that overwhelming majority of the respondents (80.0%) belonged to general caste group. More than half of the respondents (57.0%) were not engaged in any subsidiary occupation. On the other hand, more than one-fifth of the respondents (20.5%) were engaged in business (small scale enterprise).

It was found that more than half of the respondents (51.5%) had semi-medium size of land holding followed by small size of land holding (35.0%). Analysis showed that more than three-fifth of the respondents (60.5%) were from joint family group and 39.5 percent from nuclear family respectively. More than half of the respondents (55.5%) had up to 5 members in the family. On the other hand, 44.5 percent respondents had above 5 members in the family. Educational level of respondents was found low as more than one-fourth of the respondents (26.0%) were up to primary school level followed by illiterate (25.0%) and middle school level (19.5%). Analysis of annual family income showed that half of the respondents (50.0%) had annual income between Rs. 1,00,001/- to 2,00,000/- followed by 34.0 percent between Rs. 45,001/- to 1,00,000/- and 16.0 percent above Rs. 2,00,000/-.

Table 1: Contextual matrix of the respondents

S.No.	Variables	DSR Adopter (n=100)	DSR Non-adopter (n=100)	Total (N=200)
1.	**Age**			
	Up to 30 years age group	25(25.0)	24(24.0)	49(24.5)
	Between 31-50 years age group	59(59.0)	60(60.0)	119(59.5)
	Above 50 years age group	16(16.0)	16(16.0)	32(16.0)
2.	**Caste**			
	General Caste	84(84.0)	76(76.0)	160(80.0)
	Backward Caste	11(11.0)	18(18.0)	29(14.5)
	Scheduled Caste	5(5.0)	6(6.0)	11(5.5)
3.	**Subsidiary occupation of the family**			
	Nil	69(69.0)	45(45.0)	114(57.0)
	Skilled Labour	6(6.0)	12(12.0)	18(9.0)
	Business (small scale enterprise)	8(8.0)	33(33.0)	41(20.5)
	Service	17(17.0)	10(10.0)	27(13.5)
4.	**Size of land holding**			
	Marginal (upto 2.50 acre)	3(3.0)	12(12.0)	15(7.5)
	Small (2.51-5.0 acre)	18(18.0)	52(52.0)	70(35.0)
	Semi-Medium (5.01-10.00 acre)	70(70.0)	33(33.0)	103(51.5)
	Medium (10.01-25.00 acre)	9(9.0)	3(3.0)	12(6.0)
5.	**Type of family**			
	Nuclear	41(41.0)	38(38.0)	79(39.5)
	Joint	59(59.0)	62(62.0)	121(60.5)

Table 1 contd...

S.No.	Variables	DSR Adopter (n=100)	DSR Non-adopter (n=100)	Total (N=200)
6.	**Size of family**			
	Up to 5 member	53(53.0)	58(58.0)	111(55.5)
	Above 5 member	47(47.0)	42(42.0)	89(44.5)
7.	**Education**			
	Illiterate	19(19.0)	31(31.0)	50(25.0)
	Primary school level	24(24.0)	28(28.0)	52(26.0)
	Middle school level	21(21.0)	18(18.0)	39(19.5)
	High school level	15(15.0)	13(13.0)	28(14.0)
	Senior secondary level	11(11.0)	6(6.0)	17(8.5)
	Graduation and above	10(10.0)	4(4.0)	14(7.0)
8.	**Family annual income**			
	Between Rs. 45,000-1,00,000	17(17.0)	51(51.0)	68(34.0)
	Between Rs. 1,00,001 – 2,00,000	62(62.0)	38(38.0)	100(50.0)
	Above Rs. 2,00,000	21(21.0)	11(11.0)	32(16.0)
9.	**Social participation**			
	Low (0 - 1)	58(58.0)	67(67.0)	125(62.5)
	Medium (2 - 3)	33(33.0)	31(31.0)	64(32.0)
	High (4 - 5)	9(9.0)	2(2.0)	11(5.5)
10.	**Mass media exposure**			
	Low (up to 9)	51(51.0)	59(59.0)	110(55.0)
	Medium (10-17)	26(26.0)	29(29.0)	55(27.5)
	High (above 17)	23(23.0)	12(12.0)	35(17.5)
11.	**Extension contact**			
	Low (up to 3)	48(48.0)	57(57.0)	105(52.5)
	Medium (3-6)	30(30.0)	36(36.0)	66(33.0)
	High (above 6)	22(22.0)	7(7.0)	29(14.5)
12.	**Socio-economic status**			
	Low (12-18)	15(15.0)	49(49.0)	64(32.0)
	Medium (19-24)	59(59.0)	39(39.0)	98(49.0)
	High (25-31)	26(26.0)	12(12.0)	38(19.0)

Distribution of respondents as per their level of social participation showed that more than three-fifth of the respondents (62.5%) had low level of social participation. Rest 32.0 percent and 5.5 percent were from medium and high level of social participation respectively. It was found that majority of the respondents (55.0%) had low level of exposure to mass-media. Rest 27.5 percent and 17.5 percent had medium and high level of exposure to mass media respectively. It was found that more than half of the respondents (52.5%) hailed from low level of extension contact. Rest 33.0 percent and 14.5 percent respondents had medium level of extension contact respectively. Analysis clearly revealed that nearly half of the respondents (49.0%) hailed from medium level of socio-economic status. Nearly one-third of the respondents (32.0%) had low level of socio-economic status and high socio-economic status (19.0%), respectively.

Knowledge of farmers about Direct Seeded Rice (DSR) Method: The findings regarding knowledge level of respondents about various aspects of direct seeded rice method were studied like recommended seed rate, varieties, fertilizer practices, weeds, insect, pest, disease etc. in Table 2. Knowledge were found among farmers regarding direct seeded rice method such as increase the

Table 2: Level of knowledge about Direct Seeded Rice method among farmers (n=200)

S.No.	Aspects	Level of knowledge			Total weighted score	Weighted mean score	Rank order
		Strongly Agree	Agree	Disagree			
1.	Increase the yield than conventional method	67	12	21	306	3.06	I
2.	Recommended seed rate used i.e. 8 kg/acre	31	25	44	187	1.87	X
3.	Recommended variety is used for sowing : Tarawari, CSR-30, Pusa Basmati - 1121	74	11	15	259	2.59	III
4.	Preparation and sowing in evening time for DSR method	51	9	40	211	2.11	VIII
5.	Sowing time 2nd to 3rd week of June	57	13	30	227	2.27	VII
6.	Seed is placed in the most fertile zone of the soil i.e. 2-3 cm from surface	79	7	14	265	2.65	II
7.	Interval of irrigation followed as per schedule	68	5	27	241	2.41	V
8.	Time of fertilizers	61	19	20	236	2.36	VI
9.	Recommended fungicides are used for disease control	71	17	12	258	2.58	IV
10.	Recommended insecticides are use for insect pest control	39	19	42	197	1.97	IX

Responses were multiple.

yield than conventional, seed is placed in the most fertile zone of the soil i.e. 2-3 cm from surface and recommended variety is used for sowing: Tarawari, CSR-30, Pusa Basmati – 1121 to which they reported 1st, 2nd and 3rd ranks order. On the other hand, least knowledge were also found among farmers regarding DSR method such as recommended seed rate used i.e. 8 kg/acre, recommended insecticides are use for insect pest control and preparation and sowing in evening time for DSR method given 10th, 9th and 8th rank order. Singh *et al.* (2013) and Mukteshawar and Shehrawat (2015) were also supported the results in his works.

Level of knowledge among farmers regarding DSR method: It was found that more than half of the respondents (60.00) had high level of knowledge regarding direct seeded rice method in Figure 1. Rest 21.00 percent and 19.00 percent had medium and low level of knowledge regarding direct seeded rice, respectively. Rohila *et al.* (2016) was also found the same results.

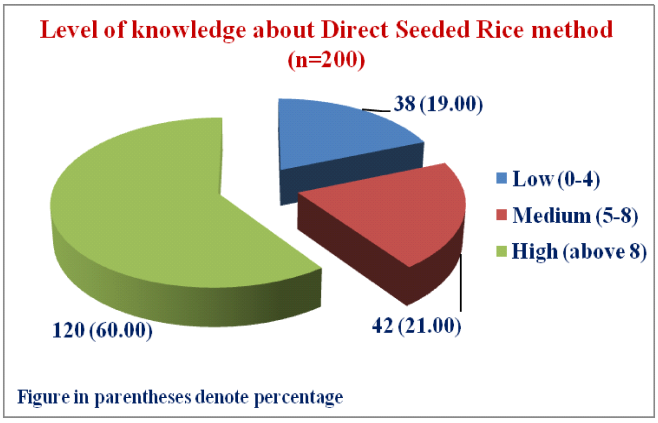

Figure 1: Knowledge about Direct Seeded Rice method

Table 3: Association between socio-economic factors and level of knowledge of farmers regarding Direct Seeded Rice (DSR) Method

Socio-economic variables	χ^2 value
Age	χ^2 *cal* = 11.75*
Family annual income	χ^2 *cal* = 14.62*
Size of land holding	χ^2 *cal* = 14.27*
Social participation	χ^2 *cal* = 14.19*
Mass media exposure	χ^2 *cal* = 12.35*
Socio-economic status	χ^2 *cal* = 29.87*

* Significant at 5 percent level of significance

Factors affecting socio-economic variables: Analysis clearly revealed that significant association was found between age, family annual income, size of land holding, social participation, mass media exposure and socio-economic status of the respondents and level of knowledge among farmers about DSR method (Table 3). Factors like education, income, caste, type of family and size of family of the respondents were found non-significantly associated with level of knowledge of farmers regarding DSR method. Kaur *et al.* (2011) also found the approximately same findings.

CONCLUSION

This paper focuses on the importance of the direct seeded rice method happened to be more eco-friendly and sustainable than traditional method of rice growing. There is need to enhance the knowledge of farmers at regular basis apropos direct seeded rice so that it could replace the water exhaustive transplanting methods generally practiced in irrigated production condition. However, DSR has been found suitable in all conditions with variations in the yield level as per the growing environment.

REFERENCES

Desai, B.K. and B.T. Pujari. 2007. Sustainable Agriculture: A vision for future, New Delhi Publishing Agency, New Delhi.

Din, M.; P. Mishra; S.P. Patel and P.C. Mohapatra. 2013, CRRI Implements for Rice Mechanization, CRRI Bulletins, pp. 8-14.

Kaur, M.; A.K. Mahal and M.K. Sekhon. 2011. Adoption of labour saving technology in paddy transplantation micro-level evidences from Punjab. *Agricultural Economics Research Review,* 24: 568.

Kumar, V. and J.K. Ladha. 2011. Direct seeded rice : Recent development & future research needs. *Advances in Agronomy,* 111: 297-413.

Mukteshawar, R. and P.S. Shehrawat. 2015. Farmers' awareness and perception towards greenhouse gases (GHG) emission. *Annals of Biology,* 31(1): 141-146.

Rohila, A.K.; B.S. Ghanghas; P.S. Shehrawat and P. Kumar. 2016. Socio economic profile of direct seeded rice (DSR) farmers of Haryana. *Journal of Applied and Natural Science,* 8(1): 451–453.

Singh, R.; B.S. Hansra and R. Chand. 2013. Knowledge and adoption level of farmers of Haryana about scientific rice cultivation practices. *Journal of Community Mobilization and Sustainable Development,* 8(1): 24-28.

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Management Practices Followed by the Dairy Farmers in Karnal District of Haryana

Surjya Kanta Roy[1]* and B.S. Meena[2]
[1] Ph.D. Scholar, Division of Agricultural Extension, ICAR-Indian Agricultural Research Institute, New Delhi-110012
[2]Principal Scientist, Dairy Extension Division, ICAR-NDRI, Karnal, Haryana

ABSTRACT

A comparative study was conducted to assess the existing different dairy farm management practices followed by farmers in Karnal district of Haryana state. Management practices regarding daily activities, milk management, calf management, fodder and feed management, cattle shed management were considered for this investigation. Paravet, progressive farmers and VLDA/ stockman were the primary source of consultation regarding management issues. A declining trend of herd size in non-adopted villages reflects more area per animal possession as well as feed and fodder storage capacity in comparison of adopted villages. Few cases like inadequate feeding practices, repeat breeding, calf mortality, animal morbidity, late stage of insemination, knuckling of milking method, poor level of ventilation in cattle shed and poor vaccination schedules were making difference between adopted and non-adopted villages in management context.

Keywords: Dairy Farmer, Management, Farmer, Milking method

INTRODUCTION

The majority of farmers in rural areas facing inadequate service/ infrastructure at their own, still gets trio benefit of balanced food, employment opportunities and regular income to their families. After the economic reform in India, agriculture specifically the contribution of dairy identified as a prior one with the sustainable growth rate. Successful dairy farms are the results of effective and efficient management of available resources, which give a significant contribution to enhance genetic potentiality on animal productive and reproductive performance. Not only that, the management of cattle sheds helps to decrease the probabilities of disease infestation, different contamination, harmful microbial population, and to make a comfortable environment for animals for better yield. Management of dairy farms is needed because it helps to enhance the tolerability power of animals against prevailing biotic and abiotic stresses in nature (Matthewman, 1993). Managing a dairy farm requires a comprehend knowledge about importance of herd management like as calf management, method of milking, disposing of dead animals, proper sanitation, storage of feed and fodder, storage of milk, etc. which helps to make a common understanding of strength, weakness, opportunities and threats of dairy farms. By following a faulty procedure of milking and handling reflects the poor performance of animals where other efforts like feeding, breeding practices are being meaningless to get satisfactory results (Akers, 2002). The main focus of management practices should aim to achieve an optimal milk yield and good health. Appropriate intervention can make a big difference in animal performance and ultimately a better economy can be achieved by taking little effort. On this backdrop, present study was conducted to assess different dairy farm management practices followed by the farmers.

MATERIALS AND METHODS

Present study was purposively conducted in Karnal District of Haryana. Two blocks (Karnal and Indri) were randomly selected and four villages from each block (where two as adopted villages and two as non-adopted villages) were considered as the basic unit area of this study. Total 120 respondents (15 respondents from each village) were sampled for the first-hand knowledge through face to face interview method. Data collection was done through well-structured interview schedule regarding existing different

*Corresponding author email id: surjyakantaroy1995@gmail.com

management practices followed by the respondents in the study area. Data were analysed in term of descriptive statistics like percentage, mean, standard deviation, etc.

RESULT AND DISCUSSION

Existing Management Practices: For consultancy purpose most of the respondents were preferring paravet, followed by progressive farmers and VLDA/ stockman (Table 1). About 66.67 per cent and 70.00 per cent of respondents of non-adopted villages were following daily cleaning of feed manger and twice in a day cleaning of cattle shed, respectively. In the study area, all respondents from adopted villages and 50.00 per cent of respondents from non-adopted villages were getting services from paravet as compared to availability of VAS in village level. Savale *et al.* (2017) observed that 78.00 per cent of respondents preferred to breed their animals after 3-4 months of calving and 90.00 per cent of the respondents were preferred veterinary doctors for breeding and treatment purpose and proper deworming schedule were followed for animals. Municipality/ authorized persons were engaged to take care of dead animal's disposal in Karnal district.

Farmers were maintaining records for calving, A.I., pregnancy diagnosis of animals, and for other aspects like reproductive disorder, service period, dry period, regular record keeping was done by less number of respondents. The concern for record keeping of various aspects of dairying was found high among the respondents of the adopted villages as compared to non-adopted villages.

Management of Cattle shed and Other Available Facilities: Adopted villages were having more area in case of loose house area, feeding manger size, water trough, standing area and open area of cattle shed as compared to non-adopted villages (Table 2).

The area of cattle shed was 23.68 ft. length and 12.65 ft. width in adopted villages and 21.81 ft. length and 12.28 ft. width in non-adopted villages. An area of 22.83 sq. ft. and 64.09 sq. ft. in adopted villages and 21.23 sq. ft and 63.65 sq. ft. area in non-adopted villages was found in case of the water trough and feeding manger, respectively. Regarding open area for the animal, adopted villages were having more (461.98 sq. ft.) area than non-adopted villages (442.40 sq. ft.). Because of low herd size in non-adopted

Table 1: Existing Management Practices (N=60)

Management practices		Adopted village		Non-adopted village	
		Frequency	Percentage	Frequency	Percentage
Consultation	Veterinary Doctors	15	25.00	15	25.00
	VLDA/ Stockman	60	100.00	30	50.00
	Paravet	60	100.00	60	100.00
	Progressive farmer	60	100.00	40	66.67
Dispose-off dead animals	Municipality/ authorised person	60	100.00	60	100.00
Interval of Cleaning feed Mangers	Daily	60	100.00	40	66.67
	Alternate day	0	0.00	20	33.33
Interval of cleaning Cattle shed	Twice in a day	60	100.00	42	70.00
	Once in a day	0	0.00	18	30.00
Availability of Veterinary Aid	Veterinary hospital	15	25.00	15	25.00
	Paravet	60	100.00	30	50.00
Record Maintenance	Calving	60	100.00	13	21.67
	AI	60	100.00	9	15.00
	PD	60	100.00	0	0.00
	Reproductive disorder	39	65.00	0	0.00
	Service period	23	38.33	0	0.00
	Milk yield	23	38.33	0	0.00
	Dry period	23	38.33	0	0.00
	Treatment	39	65.00	6	10.00

Table 2: Management of Cattle shed and Other Facilities (n=60)

Animal Shed area (Sq. Feet)		Adopted Village	Non-adopted Village
Loose house	Length (ft)	23.68±3.63	21.81±3.11
	Width (ft)	12.65±12.28	12.28±2.56
	Total (sq. ft)	298.23±76.84	269.01±71.39
Feeding manger	Length (ft)	23.68±3.63	21.81±3.11
	Width (ft)	2.70±0.57	2.89±0.61
	Total (sq. ft)	64.09 ±16.47	63.65±16.95
Water trough	Length (ft)	5.26±1.49	5.01±1.46
	Width (ft)	4.1±1.54	3.9±1.47
	Total (sq. ft)	22.83±13.63	21.23±13.54
Standing area	Length (ft)	23.68±3.63	21.81±3.11
	Width (ft)	12.95±6.27	9.40±2.27
	Total (sq. ft)	305.97±157.68	205.77±44.33
Area per Animal		29.72±22.48	44.33±32.31
Open area	Length (ft)	29.61±3.74	27.70±3.20
	Width (ft)	15.65±2.86	15.28±2.56
	Total (sq. ft)	461.98±96.19	442.40±90.97

villages, there was more area per animal (44.33 sq. ft.) in the cattle shed. So, it indicates that adopted villages were utilizing their available resources more intensively in comparison of non-adopted villages.

Storage Capacity for Feed and Fodder: For feed and fodder storage on an average 345.66 sq. ft. and 405.83 sq. ft. of storage capacity are available in adopted and non-adopted villages, respectively (Table 3). In the context of a comparison between adopted and non-adopted villages, having less herd size had an impact on per animal storage capacity (89.11 sq. ft) in non-adopted villages. Whereas in adopted villages storage capacity per animal was 35.59 sq. ft.

Existing Housing Management Practices: About housing management (Table 4) in different aspects like the location of the shed, type of floor, the slope of roof, roof material, etc., most of the respondents were having cattle shed dwelling house with concrete (RCC/ Brick paved) non-slippery, good drainage floor pattern, mostly single sloped roof made by asbestos/teen.

Table 3: Feed and Fodder Storage capacity (n=60)

Storage capacity (sq. feet)	Adopted Village	Non-adopted Village
Length (ft)	20.91±2.68	21.08±2.27
Width (ft)	16.65±4.41	19.25±3.42
Total	345.66±94.58	405.83±84.54
Area per animal	35.59±26.13	89.11±68.77

All the respondents were having concrete feeding manger, irrespective of the villages along with 26.67 per cent and 36.67 per cent of respondents having stone slab separately for feeding purpose of animals in adopted and non-adopted villages, respectively. About 75.00 per cent of respondents in non-adopted villages were using rubber mats for their animals in comparison of adopted villages (93.33%), it was a good phenomenon for the non-adopted village with regarding toe to toe comparison with adopted villages. Respondents were mostly using dung as dung cake for fuel, manure for crop farming purpose and Gobar gas plant with 20.00 per cent and 15.00 per cent share in adopted and non-adopted villages, respectively. This refers potential technologies, which were effortlessly adopted by the respondents of Karnal district. Similar results are reported by Savale *et al.* (2017), Sinha *et al.* (2009), Swaroop and Prasad (2009), Sabapara *et al.* (2010), Sharma (1996), Savale *et al.* (2017), Rathore *et al.* (2010), Sohane *et al.* (2004), Patel *et al.* (2005), Singh *et al.* (2009), Himani *et al.* (2016), Prajapati *et al.* (2015), Patel *et al.* (2015) and Meena *et al.* (2010).

Table 4: Housing Management Practices (n=60)

Housing Management		Adopted village		Non-adopted village	
		Frequency	Percentage	Frequency	Percentage
Location	Dwelling house	37	61.00	49	76.66
	Near house	13	21.66	11	18.33
	Separate from dwelling house	10	16.66	3	05.00
Type of floor	Concrete, (RCC/Brick paved)	60	100.00	35	58.33
	Sand bedded (open area)	0	0.00	25	41.67
	Non-slippery good drainage	60	100.00	33	55.00
	Without drainage slippery	0	0.00	27	45.00
Slope of Roof	Single slope	35	58.33	33	55.00
	Double slope	25	41.67	27	45.00
Roof material	Asbestos/ Teen	48	80.00	51	85.00
	Cement concrete	12	20.00	9	15.00
Type of manger	Concrete	60	100.00	60	100.00
	Stone slab	16	26.67	22	36.67
Ventilation	Poor	5	8.33	9	15.00
	Optimum	39	65.00	42	70.00
	Excess	16	26.67	9	15.00
Management of adverse	Dry grass	44	73.33	40	66.67
weather	Paddy straw	60	100.00	60	100.00
	Rubber mats	56	93.33	44	73.33
	Lamp	60	100.00	60	100.00
	Well shed	60	100.00	60	100.00
	Curtain	42	0.00	40	70.00
	Closed	60	100.00	60	100.00
Dung utilization	Dung cake	60	100.00	60	100.00
	Gobbar gas	12	20.00	9	15.00
	Manure	60	100.00	60	100.00

Milking Management Practices: Regarding milking management in the study area (Table 5), the standard method of milking is full hand method of milking followed by stripping at the end of the milking process. In comparison between adopted and non-adopted villages, 56.67 per cent respondents were following knuckling method of milking instead of following full hand method in non-adopted villages, whereas in adopted villages, 86.67 per cent of respondents were following standard method of milking. Rayees *et al.* (2018) observed that 55.00 per cent of dairy farmers were practicing full hand milking followed by 27.50 per cent of farmers following knuckling milking method. All the respondents were milking their animal at the standing area of cattle shed, so there was no such separate place for milking in the study area, irrespective of villages. For the healthy tits of animals and to avoid any sort of contamination, all the respondents were using water (in summer) / hot water (in winter), whereas 63.33 per cent of the respondents in adopted village and 23.33 per cent respondents in non-adopted village used water with $KMnO_4$. Garg *et al.* (2005) mentioned in his study, all the dairy farmers preferred milking their animals at same place. Kumar *et al.* (2006) reported that 84.28 per cent of dairy farmers were cleaning udders before milking and 95.71 per cent of farmer were cleaning their hands and tits of animals before milking. About 60.00 per cent and 20.00 per cent of respondents were using abrupt cessation and incomplete milking for drying of pregnant animal, which was not a satisfactory result from adopted villages. Whereas only 20.00 per cent of respondents in adopted villages

Table 5: Milking Management Practices (n=60)

Milking Management		Adopted Village		Non-adopted Village	
		Frequency	Percentage	Frequency	Percentage
Method of milking	Full hand	52	86.67	26	43.33
	Knuckling	8	13.33	34	56.67
Place of milking	Milking at the same place	60	100.00	60	100.00
Pre milking sanitation	With water	60	100.00	60	100.00
	With hot water	60	100.00	60	100.00
	Water along with $KMnO_4$	38	63.33	14	23.33
Drying of pregnant animal	Abrupt cessation	36	60.00	39	65.00
	Intermittent milking	12	20.00	12	20.00
	Incomplete milking	12	20.00	9	15.00
Calf allowing	Before milking	60	100.00	60	100.00
	After milking	3	5.00	7	11.67
	Both times	3	5.00	7	11.67
	How many months	2.08	2.28		

were following intermittent milking to drying of pregnant animals. Rayees *et al.* (2018) observed that 77.50 per cent of respondents were following complete cessation of milking, 17.50 per cent of respondents by intermittent milking and 5.00 per cent by self-drying process of drying off pregnant animal.

In Buffalo and indigenous cattle, the attachment with calves is more prominent as compared to cross-breed cattle. So, duration of calf allowing before milking is very necessary for indigenous cattle and buffalo for prolonged lactation length. Due to high milk productivity of crossbreed cattle, the duration of allowing the calf to the mother before milking is not following as such. The respondents of the adopted village and non-adopted village were allowing their calf before milking for about 2.08 months and 2.28 months, respectively. Some of the respondents (3% in adopted villages and 7% in non-adopted villages) were allowing calves after milking also. This practice totally depended on the household when they used to allow their calves to milking feeding on their own. After milking, continuous sucking of tits by calves in absence of milk can cause several tits related problems in cattle.

Calf Management Practices: Attentive observation needed in the meantime of parturition of the pregnant animal. With consideration of comparative study between adopted and non-adopted villages, adopted villages were spending more time (14.33 hrs.) than non-adopted villages (10.67 hrs.) (Table 6). Different aspects in newborn calf management like cleaning newborn calf immediately after birth and trimming of hooves, cutting and disinfecting the navel cord of calf, were followed by all respondents

Table 6: Existing Calf Management Practices (n=60)

Calf Management		Adopted Village		Non-adopted Village	
		Frequency	Percentage	Frequency	Percentage
Observation during parturition		60	100.00	60	100.00
Time spend (hrs.)		14.33		10.67	
Clean the calf immediately after birth and trim the hooves		60	100.00	60	100.00
Cut and Disinfect the naval cord of calf		60	100.00	60	100.00
Material used for cleaning	Gunny bag	37	61.67	43	71.67
	Rice husk	12	20.00	9	15.00
	Clean cloth	27	45.00	17	28.33

in present study area. Divekar (2016) stated that dairy farmer are following practices as cleaning of new born calf (77.00%), control of endo-parasite (80.00%) and colostrum feeding within one hour of parturition (56.00%). The materials used for cleaning calf were gunny bag (61.67% and 71.67%), rice husk (20.00% and 15.00%) and clean cloth (45.00% and 28.33%) in adopted and non-adopted villages, respectively. Kumar *et al.* (2018) reported regarding knowledge level of different management practices in dairy farming, mentioned that majority of the dairy farmers were having low level followed by medium level of knowledge in different dairy management practices.

CONCLUSION

Specific training and firsthand knowledge of scientific dairy farming practices can enhance the animal productivity irrespective of their genetical potentiality which is possible only through prevailing extension services in study area. From the present study it can be concluded that, only in few cases like inadequate feeding practices, repeat breeding, calf mortality, animal morbidity, late stage of insemination, knuckling of milking method, poor level of ventilation in cattle shed and poor vaccination schedules were making difference between adopted and non-adopted villages. Other than these aspects all practices were more or less similar in between adopted and non-adopted villages.

REFERENCES

Akers, R.M. 2002. Lactation and the mammary gland. Iowa: Wiley-Blackwell.

Bafanda, R.; N. Rakesh; K. Shafkat; M. Sheikh; C. Farzana and T. Lucky. 2018. Analysis of milking management practices followed by dairy farmers of R.S. Pura Block in Jammu District. *Advances in Research,* 15: 1-7. 10.9734/AIR/2018/40011.

Divekar, B. 2016. Determinants of adoption of improved animal husbandry practises by the dairy farmers of Kheda and Panchmahal districts of middle Gujarat (Doctoral dissertation, Ph. D. Thesis AAU, Anand (Gujarat)).

Garg, M.K.; L.S. Jain and J.L. Chaudhary. 2005. Studies on housing, feeding and milking management practices of dairy cattle in Baran district of Rajasthan. *Indian Journal Dairy Science,* 58(2): 123-128.

Himani, T.; K. Sanjay; R. Rajashree and T. Kalpna. 2018. Existing housing and breeding management practices adopted by dairy farmers in Tarai region of Uttarakhand, India. *Indian Journal of Animal Research*, 52(3): 449-453.

Kumar, A.; R. Singh; D.K. Singh; A. Gupta and V. Kumar. 2018. Knowledge Level of Dairy Farmer in Roorkee Block of District Haridwar. *Journal of Commodity Mobilization and Sustainable Development*, 13(1): 197-201.

Kumar, U.; R.K. Mehla; R. Chandra and B. Roy. 2006. Studies on managemental practices followed by the traditional owners of Sahiwal cows in Punjab. *Indian Journal Dairy Science,* 59(2): 100-105.

Matthewman, R.W. 1993. Dairying. The Tropical Agriculturalist. The Macmillian Press, London, UK. pp. 32–80.

Meena, B.S.; S. Pandey; P. Sharma and A.U.M. Tak. 2010. Technological Gap in Feeding Practices of Dairy Animals in Jhansi District. *Journal of Community Mobilization and Sustainable Development,* 5(2): 19-22.

Patel, A.R.; L.T. Kapur and R.F. Thakor. 2015. Adoption of livestock management practices for crossbred cows by members of milk cooperatives. *Journal of Community Mobilization and Sustainable Development,* 10(2): 195-198.

Patel, J.B.; N.B. Patel; K.B. Prajapati and K.G. Brahmxatri. 2005. *Animal Husbandry practices for dairy animals in semi-arid region of Patan District.* National seminar on 'Recent advances in conservation of Bio-diversity and augmentation of reproduction and production in farm animals held 5-7 March 2005 at Sardar Krushinagar Dantiwada Agricultural University, Sardar Krushinagar, pp. 253.

Prajapati, V.S.; G.M. Chaudhari; V.L. Parmar; R.R. Singh and N.B. Jadav. 2016. Management Practices of Dairy Animals in Navsari District of South Gujarat. *Indian Journal of Veterinary Sciences & Biotechnology*, 12(1).

Rathore, R.S.; R. Singh; R.N. Kachwaha and R. Kumar. 2010. Existing management practices followed by the cattle keepers in Churu district of Rajasthan. *Indian Journal of Animal Science,* 80(8): 798-805.

Sabapara, G.P.; P.M. Desai; V.B. Kharadi; L.H. Saiyed and R.R. Singh. 2010. Housing and feeding management practices of dairy animals in the tribal area of South Gujarat. *Indian Journal of Animal Science,* 80(10): 1022–1027.

Savale *et al.* 2017. Scientific Dairy Farming Practices Adopted by Dairy Farmers in Wayanad District of Kerala. *Global Journal of Bio-science and Biotechnology*, 6(4): 683-686.

Sharma, P.R. 1996. *Study on dairy management practices in rural areas of Haryana. Ph.D. Thesis,* Haryana Agricultural University, Hisar.

Singh, B.P.; M.C. Sharma and R. Tiwari. 2009. Feeding resources and management among poor livestock keeper : A field study in linkage villages. *Indian Journal of Animal Science,* 79(12): 1263-1264.

Sinha, R.R.K.; T. Dutta; R.R. Singh; B. Bhushan; M. Singh and S. Kumar. 2009. Feeding and housing management practices of dairy animals in Uttar Pradesh. *Indian Journal of Animal Sciences,* 79: 829-833.

Sohane, R.K.; P.B. Jha and A. Kumari. 2004. Land utilization, feed recourses, feeding practices, milk production and disposal pattern in the management of buffaloes in selected villages of Punjab. *Indian Journal of Animal Science,* 53(7)*:* 771-772.

Sohane, R.K.; P.B. Jha and A. Kumari. 2004. Land utilization, feed recourses, feeding practices, milk production and disposal pattern in the management of buffaloes in selected villages of Punjab. *Indian Journal of Animal Sciences,*53(7): 771-772.

Swaroop, D. and J. Prasad. 2009. *Housing systems of dairy cattle and buffaloes in rural area of trans Yamuna Allahabad district.* Indian society of animal production and management national symposium, pp. 178.

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Peasants' Confusion in the Process of Technology Socialization: The Agro-economic and Sociocultural Analysis

N.K. Sharma[1]* and S.K. Acharya[2]

[1]Assistant Professor-cum Junior Scientist, Department of Extension Education, BPSAC, Purnea, Bihar, India

[2]Professor and Former Head, Department of Extension Education, BCKV, Mohanpur, Nadia, West Bengal, India

ABSTRACT

In agrarian economy country like India, it is very important to have regular interaction between peasants and researchers for the technological development and its effective application. As a effect of modernization, farmers are more responsive and active recipient of technology, hence utmost care must be taken to observe their cognitive behavior viz conflict, confusion, discontinuance, dissonance, reinvention and disagreement. Peasants need to enhance their investment in the hope of doubling production, which are not only difficult but also denting task both for peasants as well as researchers and policy makers despite subsidies and soft or even interest free loan. The present empirical research has focused on peasant confusion while participating in the process of technology socialization in the locale of study, Ghoragachha, a village where farmers have become accustomed with taking risk with innovation. It has been found that predictor viz. occupation (x_8), fuel consumption (x_{15}), innovation proneness (x_{20}), risk orientation (x_{21}) and information seeking behavior (x_{29}) are positively and significantly correlated with the predicted variable confusion index (y) at 0.05 level of significance. In a stepwise regression analysis, occupation (x_8) and information seeking behavior (x_{28}) have been retained at the last step of regression of confusion index (y). It has also found that information seeking behavior (x_{29}) produced highest total direct effect and utilization of cosmopolite source of information (x_{28}) produced highest total indirect effect in path analysis of predicted variable confusion (y) with 32 predictors. Henceforth, research design for technology to be socialized by the multifaceted and highly informed peasant necessarily be developed while considering the cognitive behavior of participating peasant.

Keywords: Adoption, Cognitive behavior, Technology socialization, Post modernization

INTRODUCTION

Agriculture is the most important sector of Indian economy but farming occupation for small and marginal farmers are even more adversely affected by climate vulnerability and nearly 42 percent of them are ready to quit their faming occupation. In the post-modern era, farmers are dependent on various external agencies for seed, credit, and farm advisory on new technologies as well information on market price, market place. In this situation farmers behavior need to be studied carefully as new problem has cropped up as farmers' suicide. This suicide is ultimate behavior of farmers, whose, precursor is lying in their negative cognitive behavior such as confusion, disagreement dissonance, chaos, conflict, discontinuance in their socio-technological development process. Seeds, innovative instruments, technologies provided by many profiteering agencies misled the farmers causing confusion among them suggesting single window approach adoption by Agricultural universities and institutes. It provide the farmers access to appropriate information available at one place. ATIC were established at SAUs and ICAR institutes for providing diagnostic services like soil testing, plant-livestock health, and supply research product like plants, seeds, innovative planting materials, breeds of animals, processed products (Sharma *et al.,* 2008)

Experience in king chilly cultivation, total size of land holding, size of operational land holding, land under king chilly cultivation, type of house, material possession, annual income and income from agricultural sector, income from king chilly cultivation has positively and significantly correlated for characterizing the modernization level of king chilly cultivation. The value of age, educational status and occupation of the respondents were positively correlated for modernization level of king chilly cultivation (Patra, 2019).

*Corresponding author email id: narendrashrma358@gmail.com

In 2008, interviews were conducted with 63 individuals from the apple, dairy and agricultural consultant communities in Tasmania and Australia for recording peoples 'perception and feelings and perception on climate change supported that few peasants were confused about the concepts of greenhouse gases, ozone depletion and weather and often conflating these with climate change. This group was unable to name any greenhouse gases and believed the hole in ozone layer was related to climate change (Aysha and Frank, 2009).

Irrigated agriculture is facing rising competition worldwide for access to reliable, low cost, high quality water. In England farmers are under regulatory pressure to improve irrigation efficiency, demonstrating efficient water use is now a prerequisite for renewing an irrigation abstraction license. However, there are differences between the concepts of efficient water use as viewed by scientist regulators and farmers, further confused by the overlap of similar terminology with both precise technical and wider less specific meanings. Most farmers' concept of water efficiency are linked to maximizing the farmers' economic productivity rather than saving water per se, except perhaps when their own allocated resources may be inadequate (Nox *et al.,* 2012).

Agriculture was a major stumbling block to immigration reform, largely because Congress was unwilling to assign explicit priorities to the competing goals of protected American workers and admitting supplemental immigrant farmworkers. The special agricultural worker (SAW) legalization programme that generated 700,000 applications in California and the hypothetical calculations required to determine whether Replenishment Agricultural workers (RAW) will be admitted to the United States to do the farm work, but immigration reform did not resolve the century old debate over agriculture's "need" for alien workers, instead SAWs and RAWs contributed to confusion on farm labor (Martin, 1990).

Agricultural land reform policy points out that management scale of the land owners, reasons for land reclamation, management scale of tenants and the rate of approval by agricultural land committees for land owners' applications for land reclamation. The problems of land reclamation was caused by political pressure of the anti-reform movement of land owners'. The farm land committees were strict and did not give permission easily. Often land reclamation was caused by confusion and economic distress of the small land owners. The farm land committees made fair decision, taking into consideration into difficulties of small land holders. Land reclamation occurred frequently previously. There were many land owners who lived in their own villages and cultivated a part of their own land. These people had many difficulties that were created by economical – social confusion at that time. There were remarkable difference in approval rate of land reclamation from prefecture to prefecture. This means that the attitude of each prefectural farm land committee also had a great influence on the approval of rate of land reclamation (Noda, 2006).

MATERIALS AND METHODS

Ex-post facto method of research design was adopted for conducting research in village from West Bengal named, Ghoragacha, selected purposely. Structured interview schedule was pretested and taken as a tool for conducting survey with the 75 farmers from the village. Data collected, tabulated and analyzed with the help of statistical tools viz., Step down regression. Independent variables were Age (x_1), Education (x_2), Family Education Status (x_3), Educational Aspiration (x_4), Family Size (x_5), Male: Female Ratio (x_6), Urbanization Index (x_7), Occupation (x_8), Cropping Intensity (x_9), Farm Size (x_{10}), Expenditure Allotments (x_{11}), Credit Load (x_{12}), Annual Income (x_{13}) , Electricity Consumption (x_{14}), Fuel Consumption (x_{15}), Irrigation index (x_{16}), Adoption leadership (x_{17}), Scientific orientation (x_{18}), Independency (x_{19}), Innovation proneness (x_{20}), Risk orientation (x_{21}), Economic motivation (x_{22}), Orientation towards competition (x_{23}), Management orientation (x_{24}), Production orientation (x_{25}), Market orientation (x_{26}), Social participation (x_{27}), Utilization of cosmopolite source of information (x_{28}), Information seeking behavior (x_{29}), Training received (x_{30}), Distance matrix (x_{31}), Drudgeries (x_{32}), whereas, dependent variable was confusion index (y).

RESULTS AND DISCUSSION

Table 1 presents the Correlation coefficient of dependent variable, confusion index (y) with 32 independent variables of Ghoragacha. The following independent variables *viz.* occupation (x_8), fuel consumption (x_{15}), innovation proneness (x_{20}), risk orientation (x_{25}), information seeking behavior (x_{29}) have been recorded positive and significant correlation with the dependent variable, confusion index (y).

Table 1: Correlation coefficient of Confusion Index (y) with 32 independent variables of village, Ghoragachha, West Bengal (N = 75)

Variables	Coefficient of Correlation (r)
Age (x_1)	0.196
Education (x_2)	-0.017
Family Education Status (x_3)	-0.002
Educational Aspiration (x_4)	0.013
Family Size (x_5)	0.070
Gender (x_6)	-0.123
Urbanization Index (x_7)	-0.051
Occupation (x_8)	0.294*
Cropping Intensity (x_9)	-0.056
Farm size (x_{10})	0.093
Expenditure Allotment (x_{11})	0.053
Credit Load (x_{12})	-0.061
Annual Income (x_{13})	0.099
Electricity Consumption (x_{14})	0.023
Fuel Consumption (x_{15})	0.247*
Irrigation Index (x_{16})	0.131
Adoption Leadership (x_{17})	0.229
Scientific Orientation (x_{18})	0.107
Independency (x_{19})	0.025
Innovation Proneness (x_{20})	0.243*
Risk Orientation (x_{21})	0.246*
Economic Motivation (x_{22})	0.055
Orientation Towards Competition (x_{23})	0.012
Management Orientation (x_{24})	0132
Production Orientation (x_{25})	-0.088
Market Orientation (x_{26})	0.121
Social Participation (x_{27})	0.068
Utilization of Cosmopolite Source of Information (x_{28})	0.141
Information Seeking Behavior (x_{29})	0.277*
Training Received (x_{30})	-0.154
Distance Matrix (x_{31})	-0.068
Drudgeries (x_{32})	-0.070

*Significant at 0.05%

The interpretation of the table reveals that the variable, occupation (x_8) has been positively and significantly correlated with the dependent variable, confusion index (y), which indicates that the movement along with the ladder of occupation in a social echelon has added 'confusion' as to whether pursue farming as profitable venture or to sit elsewhere. While off-farm occupation along with service sector are dominating over core agricultural based occupation and some 42 percent of the farmers ready to quit farming occupation. It is to infer that occupational security as well as complexity has elicited some confusion from within the farming system.

The variable, fuel consumption (x_{15}) is an indication of rate of impact of urbanization and modernization. So, with the increase of fuel consumption only site its cognate impact of modernization, the confusion index has also been influenced.

The table also shows that the variable, Innovation proneness (x_{20}) and risk orientation (x_{21}) have recorded positive effect of confusion. The higher the Innovation proneness and faster the journey through innovation, the higher will be the confusion as well as this has been reflected by another variable also.

The variable, information seeking behavior (x_{29}) is positively and significantly correlated with the dependent variable, confusion index (y) of the respondents of village, Ghoragachha which indicates that more of information, more of choices supposed to crop up and as a whole more of confusion would simmer up.

Table 2 presents the stepwise regression analysis of the dependent variable, confusion index (y) versus 32 independent variables. The two predominating variable, occupation (x_8) and information seeking behavior (x_{29}) have been retained at the last step. R^2 being 0.218, it is to infer that these two predominating variables retained, have explained 22 percent variance embedded in the predicted variable, confusion index (y).

Table 2: Stepwise regression analysis Confusion index (y) versus 32 independent variables of village, Ghoragachha, West Bengal: Predominating variables retained at the last step (N = 75)

Predictors	B	S.E.	Beta	t	R	R^2	R square Adjusted	SE Estimated
Occupation (x_8)	0.436	0.121	0.389	3.609**	0.467	0.218	0.196	1.08
Information seeking behavior (x_{29})	0.403	0.116	0.375	3.484**				

Table 3: Path Analysis of Confusion index (y) versus 32 exogenous variables of village, Ghoragachha, West Bengal (N = 75)

Variables	TE	TDE	TIE	Substantial Indirect Effect		
				I	II	III
Age (x_1)	0.196	0.073	0.123	-0.055(x_3)	**0.049(x_{29})**	0.046(x_8)
Education (x_2)	-0.017	0.150	-0.167	0.145(x_4)	-0.142(x_3)	-0.072(x_{28})
Family Education Status (x_3)	-0.002	-0.303	0.301	0.266(x_4)	0.070(x_2)	**0.067(x_{29})**
Educational Aspiration (x_4)	0.013	0.335	-0.322	-0.240(x_3)	0.065(x_2)	-0.045(x_{28})
Family Size (x_5)	0.070	0.119	-0.049	0.085(x_4)	**0.075(x_{29})** -0.075(x_3)	-0.066(x_{28})
Gender (x_6)	-0.123	-0.080	-0.043	-0.023(x_{20})	-0.022(x_{32})	0.020(x_{15}) -0.020(x_{13})
Urbanization Index (x_7)	-0.051	-0.077	0.026	**0.092(x_{29})**	-0.042(x_{12})	0.038(x_{13})
Occupation (x_8)	0.294*	0.331	-0.037	**-0.110(x_{29})**	0.036(x_3)	0.021(x_{15})
Cropping Intensity (x_9)	-0.056	-0.045	-0.011	0.043(x_{28})	-0.033(x_8)	-0.032(x_4)
Farm size (x_{10})	0.093	0.116	0.209	0.0169(x_{15})	**0.110(x_{29})**	0.097(x_{13})
Expenditure Allotment (x_{11})	0.053	-0.090	0.143	0.114(x_{15})	0.085(x_{13})	-0.084(x_{10})
Credit Load (x_{12})	-0.061	-0.091	0.030	**0.080(x_{29})**	-0.070(x_8)	0.051(x_{13})
Annual Income (x_{13})	0.099	0.130	-0.031	0.111(x_{15})	**0.100(x_{29})**	-0.087(x_{10})
Electricity Consumption (x_{14})	0.023	0.016	0.007	0.055(x_{15})	-0.048(x_3)	0.035(x_4)
Fuel Consumption (x_{15})	0.247*	0.293	-0.046	**0.090(x_{29})**	-0.067(x_{10})	-0.066(x_3)
Irrigation Index (x_{16})	0.131	0.071	0.060	**0.095(x_{29})**	-0.046(x_{22})	0.045(x_{20})
Adoption Leadership (x_{17})	0.229	0.062	0.167	**0.233(x_{29})**	-0.087(x_{28})	-0.070(x_{22})
Scientific Orientation (x_{18})	0.107	0.054	0.053	**0.197(x_{29})**	-0.088(x_{28})	-0.052(x_3)
Independency (x_{19})	0.025	-0.081	0.106	**0.078(x_{29})**	-0.057(x_8)	-0.045(x_3)
Innovation Proneness (x_{20})	0.243*	0.285	-0.042	**0.138(x_{29})**	-0.084(x_{22})	-0.065(x_{28})
Risk Orientation (x_{21})	0.246*	0.089	0.157	**0.103(x_{29})**	0.068(x_{19})	-0.038(x_3)
Economic Motivation (x_{22})	0.055	-0.188	0.243	**0.166(x_{29})**	0.127(x_{20})	-0.050(x_{28})
Orientation Towards Competition (x_{23})	0.012	0.022	-0.010	**0.156(x_{29})**	-0.155(x_8)	0.050(x_{24})
Management Orientation (x_{24})	0132	0.118	0.014	**0.132(x29)**	0.099(x20)	-0.061(x8)
Production Orientation (x_{25})	-0.088	-0.135	0.047	-0.097(x_3)	0.079(x_4)	**0.050(x_{29})**
Market Orientation (x_{26})	0.121	-0.090	0.211	**0.145(x_{29})**	0.121(x_{20})	-0.076(x_3)
Social Participation (x_{27})	0.068	-0.083	0.151	**0.134(x_{29})**	0.111(x_4)	-0.094(x_3)
Utilization of Cosmopolite Source of Information (x_{28})	0.141	-0.228	**0.369**	**0.267(x_{29})**	0.082(x_{20})	-0.079(x_3)
Information Seeking Behavior (x_{29})	0.277*	**0.435**	-0.158	-0.140(x_{28})	0.090(x_{19})	-0.084(x_8)
Training Received (x_{30})	-0.154	-0.102	-0.052	0.080(x_{20})	0.071(x_3) (x_{28})	-0.051(x_8)
Distance Matrix (x_{31})	-0.068	-0.074	0.006	0.052(x_{20})	-0.049(x_{22})	-0.045(x_{15}) (x_{28})
Drudgeries (x_{32})	-0.070	-0.114	0.044	0.059(x_4)	**0.050(x_{29})**	-0.037(x_3)
Residual Effect			0.7414			
Highest count			Information seeking behavior (x_{29}): 23			

Transforming occupation with the up-search of nonfarm sectors which is coming after the transformation of farm based occupation has added to generation of occupation as to why and how to on with farm based occupation. So, also, the information seeking behavior after being confronted with lot of option and innovation might have had a deleterious effect in the prescribed utility of conventional technology.

Table 3 presents the path analysis of the dependent variable, confusion index (y) versus 32 exogenous variables. The variable, information seeking behavior (x_{29}) has exerted the highest total direct effect on confusion index (y), whereas utilization of cosmopolite source of information (x_{28}) has exerted the highest total indirect effect on confusion index (y). It has also been found that the variable, information seeking behavior (x_{29}) has routed the highest individual dominating effect as many as 23 times to characterize the consequent variable, confusion Index (y). Residual effect being 0.7414, it is to infer that even with the combination of 32 exogenous variables, 26 percent of the variance embedded in confusion index (y) has been explained so far.

The farmers with high Information seeking behavior (x_{29}) and high utilization of cosmopolite source of information (x_{28}) cannot any longer focus on 'mundane' agricultural occupation. He wants to move elsewhere rather than getting him glued to the parental pursuits. This is a kind of contradiction between what may be called conflict between harsh reality and perceived happiness.

It has been found that the variable, information seeking behavior (x_{29}) has routed highest indirect effect with 23 variables to state as companionship with other variable to the consequent variable, confusion index (y). Higher information flow or information shortfall may lead to information dissonance which we may called confusion faced by information seeker.

The residual effect being 0.7414, it is to infer that even with the combination of 32 exogenous variables 26 per cent of variance embedded in the consequent variable, confusion index (y) has been explained so far.

CONCLUSION

Analysis of peasant behavior is key to prevent their confusion and formulation of sound policies so that new agricultural practices can be made sustainable and profitable. Peasants action is in their socio-ecological context is necessary to identify intervention areas and policies for enhancing socio-technical changes and innovation. Peasant farmers' of the Goragachha are risk taker in running their farming enterprise. Information they are seeking, receiving and utilizing those information are no more profit generating adequately. They are behaving aberrantly and displaying negative cognitive behavior such as confusion regarding new agricultural practices Peasant farmers' confusion need to be observed carefully and addressed urgently to enhance their participation in the process of technology socialization.

REFERENCES

Aysha, F. and F. Vanclay. 2009. Farmers Responses to Climate Change and sustainable agriculture. A review. https://hal.archives-ouvertes.fr/hal-00886547/document.

Sharma, J. P. *et. al.* 2008. Farm Advisory Services of Agricultural Technology Information Centre, IARI. *Journal of Community Mobilization and Sustainable Development,* 3(2): 15-20.

Knox, J.W.; M.G. Kay and E.K. Weatherhead. 2012. Water regulation, Crop Production and Agricultural water management - Understanding farmers' perspectives on irrigation efficiency. *Agriculture Water Management*. *Elsevier*, 108: 3-8. https://www.sciencedirect.com/science/article/abs/pii/S0378377411001405

Martin, P.L. 1990. Harvest of confusion: Immigration Reform Californian Agriculture. *International Migration Revien,* 24(1): 4-33.

Noda, K. 2006. Natural Resource Economic Review. *Kyoto University,* 12: 51-71.

Patra, N.K. *et al.* 2019. Assessing Socio-economic and Modernization Status of King Chilly (Capsicum spp.) Growers: Evidence from Nagaland, North East India. *Journal of Community Mobilization and Sustainable Development*, 14(1): 97-103.

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Use of Improved tool (Revolving *Pihri*) for Milking of Dairy Animals by Farm Women

Anjuly Sharma[1]*, Prahlad Singh Tanwar[2] and Suryendra Singh[3]

[1,3]Assistant Professor, [2]Associate Director, Krishi Vigyan Kendra, Barnala, Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana-148107, Punjab

ABSTRACT

Dairy farming involved backbreaking tasks as all the activities are carried out in difficult posture. The women adopt difficult static postures for some of the activities, which increase the static muscular effort resulting in physiological cost and low productivity. Researchers proved that any work design or work environment that helps to perform the work with minimum energy and put minimum stress on cardiovascular system and muscular system is the best design of work. So, working posture becomes an important factor while designing ergonomically sound tools and equipment. Use of improved tools for performing the selected activities reduce the angle of deviation of the back and minimize the muscular efforts to perform the task. Lower muscular efforts lead to lower fatigue. Therefore, improved tools for performing the selected activities are beneficial because they lead to the reduction of drudgery and reduce the muscular stress and help the women to adopt correct posture work and also reduce the angle of deviation. Dairy farming is subsidiary occupation of rural women in Handiaya of Barnala district. The study was conducted to know the physiological workload and change the posture so as to reduce the musculoskeletal problems of the women respondents performing milking activity. A representative sample of 30 women was selected as sample under the study for observation and ergonomic assessment of milking by using traditional method and revolving stool. Selection of sample for experiment was based on their age i.e., 25-35 years. Women were asked to do milking activity by putting their feet in flat position. They were not able to exert pressure while milking and this method had stress on worker. So, due to this work load increased and the milk output was decreased. "Pihri" was provided to the respondents to facilitate milking process and reduce perceived exertion. "Pihri" was introduced to the women and were asked to use it. Women accepted the "Pihri" as with the use of this tool women felt high relief from body stress because it improves the work posture from squatting to sitting, Provision of wheels makes the movement easy and it reduces the musculoskeletal problems while performing the milking activity. There was a significant reduction in energy, physiological parameters, time taken and body angles when the activity was carried out by using drudgery reducing tool i.e., revolving stool for milking activity.

Keywords: Dairy activities, Ergonomic assessment, Drudgery reduction

INTRODUCTION

Rural women perform various indoor and outdoor animal husbandry activities which are extremely tedious, time taking and labour intensive leading to drudgery and fatigue. Milking is one of the strenuous indoor activities wherein majority of the women are involved. They adopt long static squatting postures for milking of animals without realizing harmful effects on the body which increase the static muscular effort resulting in high physiological cost and low work productivity. This also invariably leads to various health hazards like injury, fatigue, exhaustion etc. To ensure better health and safety, to improve work efficiency and to reduce the drudgery of rural women, a revolving stool for milking an animal for cattle developed by KVK *Barnala* was introduced in the study area and efforts have been made to study the comparative ergonomics of milking performed with traditional and improved methods on buffalo. The present study has been carried out to assess the percentage reduction of ergonomic cost of work, physiological cost of work energy expenditure, perceived exertion *etc.* with the use of improved method of milking using the revolving stool.

*Corresponding author email id: anjuly1392@gmail.com

MATERIAL AND METHODS

Thirty rural women within the age group of 25-35 years were identified for field experiment from Barnala district of Punjab to assess and test the feasibility of the revolving *pihri* to study the percentage reduction of ergonomic cost of rural women. Suitability of the experimental women was ascertained by measuring the body temperature (not more than 990 F), blood pressure (120:80 ± 10) and heart rate (70-90 bpm). Experimental women were asked to perform a prefixed activity of milking with the traditional method *i.e.* squatting position and ergonomic data were recorded and in second phase revolving stool was given for performing the same activity in fixed time for which again ergonomic data were collected. Heart rate was measured with the heart rate monitor and other parameters were determined from heart rate values. Rate of perceived exertion was determined by using a modified 5 point scale ranging from 1-5 (1-Very light, 2-Light, 3-Moderately Heavy, 4- Heavy and 5-Very heavy) of perceived exertion developed by Varghese *et al.* (1994). Energy expenditure was calculated from the average heart rate (AHR) by using the formula given by Varghese *et al.* (1994). Physiological workload was also classified based on the heart rate and energy expenditure. Total Cost of Work (TCCW) and Physiological Cost of Work (PCW) were determined by using the average heart rate during rest at work, recovery and duration of work.

RESULTS AND DISCUSSION

Use of revolving "Pihri" for milking buffalo by farm women: Dairy farming is a back breaking activity as it stresses almost all parts of the body. It involves 10-12 minutes at one time per animal (morning or evening) so both times include 20-25 minutes activity per animal per day to each animal. This activity is a routine activity which affects any worker's capacity. Use of improved tools for performing the selected activities reduces the muscular efforts leading to maximum efficiency in terms of health and output.

While talking about general practices of milking activity, it was studied that on an average, a woman took out milk from 2 animals at one period. The milking was done for self use and commercial use. She devoted 10 minutes to one animal at one time and she took out 09 lit of milk from one animal at one time, it means in 10 minutes she got 09 litres of milk from one animal. Majority of women used steel container and all had done activity in squatting position. For milking of animal only one worker is sufficient. On an average women made 46 strokes for milking one animal in 9 min. and took out 10.4 lit. of milk. with revolving pihri but in case of squatting position, she took out only 8.6 lit, of milk in 41 strokes per animal , it shows that with revolving pihri women could make more strokes and took out more milk as compared to traditional way of milking in squatting position, more strokes means more efficiency.

Physiological workload while performing the milking activity with traditional method and by using Drudgery Reducing Tools (DRT) is depicted in Table 2. It is evident from the Table 1 that average working heart rate (110 beats/min), recovery heart rate (96 beats/min) and peak heart rate (129 beats/min) was more in traditional method of milking activity than by using DRT (104, 91 and 119 beats/min, respectively). On an average 5.45 per cent (6 beats/min) of reduction was observed in working heart rate, 5.20 per cent (5 beats/min) of reduction was observed in recovery heart rate and 10 beats per min (7.75%) of reduction was observed in peak heart rate while working by using drudgery reducing tool.

Table 2 also reveals that the efficiency of the women workers increased over the traditional way of milking

Table 1: Activity profile of women

Parameters		Value
1.	No. of animals	02
2.	Time spent (min)	10
3.	Quantity of milk (kg)	09
4.	Material of vessel used for milking (%)	
(a)	Steel	80
(b)	Aluminium	20
5.	Posture adopted for milk (%)	
(a)	Squatty	100
(b)	Sitting on (Patra, Stool, Pihri)	-

Table 2: Milking on buffalo

Parameters	Revolving Stool	Traditional Method
Number of workers required	01	01
Average Stokes/min.	46	41
Heart rating during work (b/m)	104	110
Peak heart rate (b/m)	119	129
Average recovery heart rate (b/m)	91	96
Avg. quantity of milk taking out (Lit)	10.4	8.6
Total time worked	9.00 min.	11.00 min.

Table 3: Work load evaluation

Parameters	Existing (Milking with flat feet)	New tool pihri	Difference
Average work load	Heavy	Light	-
*Rated perceived exertion	4	2	02

*RPE Scores: 1. Very Light 2. Light 3. Moderately heavy 4. Heavy 5. Very heavy

Table 4: Risk assessment of women respondents based on REBA while performing milking activity in traditional method and by using drudgery reducing tool (N=30)

Level of risk with scores	Milking activities		Inferences based on REBA Scores
	Traditional method	Using stool	
Negligible risk (1)	-	25 (83%)	Tech. acceptable
Low risk (2-3)	-	05 (16%)	Change may be needed in the tool
Medium risk (4-7)	-	-	Further investigation
High risk (8-10)	30 (100%)	-	Change the posture soon
Very high risk (11+)	-	-	Implement change

*REBA: Rapid Entire Body Assessment (Scale)

animal. The women worker took out 104 lit. of milk in 9 min. from one animal with revolving pihri as compared to the traditional way of milking animal who took 11.00 min. for milking 8.6 lit. of milk from one animal. So, time spent on activity decreased in 'pihri' method as compared to squatting method.

Table 3 indicates the load faced by women worker while doing milking activity. Women were asked to do milking activity by putting their feet in flat position. They were not able to exert pressure while milking and this method had stress on worker. So, due to this, work load increased and the milk output was decreased (as given in above tables). "Pihri" was provided to the respondents to facilitate milking process. Pihri" was introduced to the women and were asked to use it. Women accepted the "Pihri" as with the use of this tool women felt high relief from body stress because of right posture. Rate of perceived exertion was determined by using a modified 5 point scale ranging from 1-5 (1-Very light, 2-Light, 3-Moderately Heavy, 4- Heavy and 5-Very heavy). By using drudgery reducing tool (pihri), Majority of the respondents rated milking activity as light and Maximum women worker rated milking activity in traditional method as heavy.

The higher percentage of women (83%) rated milking activity in new method (using pihri) as having no risk at all and acceptable by all. Only 16 per cent said that change is required only in circumference of 'pihri' as Punjab women are slightly heavier than other state's women. While milking with tradition method i.e., on flat feet, all the women rated that activity having high risk, so they all are suggested to use "pihri" for avoiding pain in feet. Same results are supported by Naik *et al.* (2015) that revolving milking stool for milking of animal has reduced the cost of work to a great extent. This could be recommended to use drudgery reducing tool.

CONCLUSION

It is concluded that use of "pihri" is very effective in taking out milk when compared with traditional method (in squatting position). It is useful in reducing human cost of work, body pain and helpful in increasing work efficiency. It improves the work posture from squatting to sitting; provision of wheels makes the movement easy and reduces the musculo-skeletal problems while performing the activities.

REFERENCES

Bhuyan, M. *et al.* 2018. Knowledge level of farm women in scientific dairy farming. *Journal of Community Mobilization and Sustainable Development,* 13(3): 507-512.

Naik, D. and P.R. Sumangala. 2015, Ergonomic assessment of women respondents performing dairy activities. *Karnataka Journal of Agriculture Science,* 28(2): 248-251.

Uppadhyay, S. *et al.* 2011. Participation of farm women in Animal Husbandry in Anand District of Gujrat. *Journal of Community Mobilization and Sustainable Development,* 6(2): 117-121.

Vargese, M.A.; P.N. Saha and N. Atreye. 1994. A rapid appraisal of occupational work load from a modified scale perceived exertion. *Ergonomics,* 37: 485-495.

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Impact of RSETI EDPs on Income and Employment Generation

Amandeep Kaur Makkar[1] and Sukhdeep Kaur Mann[2]
[1]M.Sc. Student, [2]Assistant Professor, Department of Extension Education and Communication Management, Punjab Agricultural University, Ludhiana, Punjab

ABSTRACT

On the economic development front, increasing unemployment is the biggest challenge for India. India is one of those developing countries which continue to have the problem of unemployment and underemployment despite continuous policy emphasis and programmes to eliminate the problem. There is a need for promoting self-employment for the unemployed youth, especially for those living below the poverty line and enhance their skills through proper entrepreneurship training. Millions of unemployed youth particularly from rural and semi-urban areas who could not get access to higher/professional education, yet more oriented towards white collar jobs, are driven to despair by not finding suitable jobs. The Government of India has undertaken lot of initiatives for employment in the country. In order to surmount the critical situation of unemployment, a different initiative was taken in the form of Rural Self Employment Training Institute. The study was conducted on the beneficiaries of RSETI, from Ludhiana district of Punjab state who were engaged in income generation activities. The results of the study indicated that most of the beneficiaries had increased their annual income after establishing an enterprise and they were able to generate employment for others also. The data revealed that majority of the male family members and paid employees were engaged in an enterprise as compared to female family members and paid employees. Variables like family annual income and family size had a significant relation with the income and employment generation.

Keywords: Entrepreneurship development programme, RSETI, Self-employment, Beneficiary and Unemployment

INTRODUCTION

India is a country inhabited by more than 1.31 billion people, and by 2022, it is projected to replace China as the most populated nation in the world. With the increase in population, a large amount of pressure is exerted on the available resources for growth and development. This huge size of the population has also resulted in the scarcity of jobs for its citizens. According to the Centre for Monitoring Indian Economy (CMIE, 2019), the unemployment rate in February 2019 was 7.2 per cent. This was higher than the 7.1 per cent unemployment rate in January 2019 and much higher than the 5.9 per cent unemployment rate in February 2018 or the 5 per cent in February 2017 (Anonymous, 2018a).

On the economic development front, increasing unemployment is the biggest challenge for India. The Government of India has undertaken lot of initiatives for employment in the country. Various schemes like Skill India, Make in India, *Prime Minister's Employment Generation Programme* (PMGEP), *Pradhan Mantri Rojgar Protsahan Yojana*, and *Pradhan Mantri Kaushal Vikas Yojana* has been implemented by Government. In order to surmount the critical situation of unemployment, a different initiative to reduce the problem of unemployment was taken in 1982 jointly by Sri Dharmasthala Manjunatheshwara Educational Trust, Canara and Syndicate bank under the leadership of Dr. D. Veerendraheggade, Dharmadhikari of Dharmasthala. The cumulative thinking gave concrete shape in giving an institutional framework in the form of Rural Development and Self Employment Training Institute (RUDSETI) in 1982. It was first implemented in village *Ujire* near Dharmasthala in Dakshina Kannada district of Karnataka state, for training unemployed youth to adopt self-employment (Anonymous, 2018b).

At present, 586 RSETIs are working in the country, covering 32 States/UTs with the participation of 31 Sponsor Banks. Nearly thirteen lakh out of total twenty two lakh trained youth have started their own enterprises and out these trainees, six lakh has been provided with credit linkage through banks (Anonymous, 2018c). In view

of large-scale input and resource utilization for setting up of such schemes and the emphasis on skill India, it was felt important to assess the impact of RSETIs on the beneficiaries.

MATERIAL AND METHODS

The present study was conducted on the beneficiaries of RSETI, Ludhiana district of Punjab state, who were engaged in income generation activities. A list of beneficiaries who were registered for EDP trainings during the year 2012-14 was taken from RSETI office, Ludhiana. Total 800 beneficiaries undertaken training under RSETI during these years. One hundred and fifty beneficiaries were taken as a sample for the study. Dependent variables were the income and employment generation. Employment generation was measured as number of mandays generated through selected enterprise, The mandays were calculated by the procedure of one manday is equal to eight hours of work per day and engagement of family members and other paid employees by the beneficiaries in different enterprises and income generation was measured in terms of financial input and its output an enterprise, and rate of increase in income after getting training from RSETI. The data were collected from each beneficiary through interview schedule method. The analysis of the data is done through frequencies, percentages, rate of increase in income and correlation.

RESULTS AND DISCUSSION

The data incorporated in Table 1 reveals that 43.33 per cent of the beneficiaries engaged one to two male family members in their enterprise. While, 19 per cent of the beneficiaries engaged females of their family in an enterprise. Table further shows that majority of the beneficiaries from agricultural (86.66%) and other enterprises engaged male members of their family whereas, none of the female member was engaged in these enterprises.

Nearly half of the beneficiaries from agricultural (46.66%) and other enterprises (46.15%) employed 1-2 male employees followed by process (32.25%) and product (21.05%) enterprises. Nearly 30 per cent of the beneficiaries from the other enterprises generated medium level of employment with 3-4 employees. However, high level of employment for males was generated by only few of the beneficiaries in product (7.89%), other (7.69%) and process (3.22%) enterprises. In general enterprises, none of the beneficiary employed any other person excluding female family members in their enterprise. So, it can be concluded

Table 1: Distribution of beneficiaries according to number of persons engaged in an enterprise

Category	Type of training enterprise					
	Agricultural enterprise (n=15)	Product enterprise (n=38)	Process enterprise (n=62)	General enterprise (n=22)	Other enterprise (n=13)	Total (n=150)
Family member						
1-2						
Male	13(86.66)	15(39.47)	30(48.38)	–	07(53.84)	65(43.33)
Female	–	13(34.21)	12(19.35)	03(13.63)	–	28(18.66)
Other than family members						
Low (1-2)						
Male	07(46.66)	08(21.05)	20(32.25)	–	06(46.15)	41(27.33)
Female	–	7(18.42)	10(16.12)	–	–	17(11.33)
Medium (3-5)						
Male	02(13.33)	06(15.78)	08(12.90)	–	04(30.76)	20(13.33)
Female	–	02(5.26)	–	–	–	02(1.33)
High (6-8)						
Male	–	03(7.89)	02(3.22)	–	01(7.69)	06(4)
Female	–	–	–	–	–	–

(Figure in parenthesis denotes percentage)

that except general enterprises, more number of males were employed than females in all the enterprises.

A perusal of data in Table 2 reveals the change in annual income of beneficiaries before and after starting / expanding an enterprise. Table indicates that maximum rate of increase in income was reported by agricultural enterprise (60.63) followed by general (53.81), product (31.17) and process (43.89) enterprises. However, minimum increase in income was found in other enterprise (30.54). The study on income generation by women self-help groups, Sidhu *et al.* (2018) stated that the average income in individual activities was found to be very low but income increased in the case of entrepreneurial activities. So, it can be concluded that all the beneficiaries reported increase in income after establishing an enterprise. The findings are also in line with the findings of Mavi *et al.* (2006) and Bhakar *et al.* (2007) and Sharma (2009).

Table 2: Distribution of beneficiaries according to their annual income before and after starting/expanding an enterprise

Type of training enterprise	Average annual income (lakhs)		Rate of increase
	Before	After	
Agricultural enterprise	316,666	508,666	60.63
Product enterprise	297,236	449,342	51.17
Process enterprise	367,258	528,467	43.89
General enterprise	7,045	15,254	53.81
Other enterprise	312,307	407,692	30.54

Data in Table 3 indicates the enterprise wise employment generated by the beneficiaries of RSETI. Maximum employment was generated from other enterprises with an average of 629 mandays / annum followed by 468 and 515 mandays by product and process enterprises respectively. These three enterprises are in demand in all the seasons which increases the number of mandays of work. Nearly 385 mandays of employment was generated by agricultural enterprise. Whereas, in general enterprises employment generation was nil. The reason for this might be that these enterprises were small units and beneficiaries were able to handle these units independently.

Table 3: Employment generation according to enterprise (n=150)

Type of training programme	Average mandays per annum
Agricultural enterprise	385
Product enterprise	515
Process enterprise	468
General enterprise	–
Other enterprise	629

Relationship of socio-economic profile of the beneficiaries with income and employment generation was also studied. Karl Pearson's co-efficient of correlation was applied to test the significance of relationship between the independent variables such as age, educational qualification, family annual income, family size and mass media usage with income and employment generation.

Table 4: Relationship between independent variables and income generation by the beneficiaries

Variables	r value
Age	0.196*
Educational qualification	0.104^{NS}
Family annual income	0.201*
Family size	0.217*
Mass media usage	-0.185^{NS}

*Significant at 5 per cent level of significance; NS = Non significant

It can be observed from Table 4 that the variables like age, family annual income and family size had a significant positive relation with the income generation. This can be contributed to the fact that as younger age is characterized by dynamism and determination to work hard it leads to increase in income. Further, better family income provide scope for investment in an enterprise and with the increase in family size, they can get support and involvement of other family members which results in more income from an enterprise. Whereas, educational qualification and mass media usage were negatively and non-significantly related with income generation.

Table 5: Relationship between independent variables and employment generation by the beneficiaries

Variables	r value
Age	0.129^{NS}
Educational qualification	-0.181^{NS}
Family annual income	0.232*
Family size	0.291*
Mass media usage	-0.208*

*Significant at 5 per cent level of significance; NS = Non significant

It is evident from Table 5 that family annual income and family size were found to have significant relationship with the employment generation. The possible reason might be that the cooperation of the family plays a vital role in creation of employment as they get encouragement by the other family members. This leads to greater engagement of the family members in an enterprise and hence these two variables were significantly related. While, age and educational qualification were found to be non-significantly related with employment generation.

CONCLUSION

The entrepreneurship development programmes organized by RSETI plays a significant role by providing them employment opportunities. The present investigation shows that there is a positive impact on income and employment generation of the beneficiaries through various entrepreneurship development programmes conducted by RSETI. It was also observed that male members were more engaged in different enterprises. So, there is a crucial need to focus on women participation in various enterprises.

REFERENCES

Anonymous. 2018a. Rise of unemployment rate, retrieved from https://www.cmie.com/kommon/bin/sr.php?kall=warticle&dt=2019-05...40 on June 12,2019.

Anonymous. 2018b. *Course Module* on entrepreneurship development *Training,* retrieved from www.nird.org.in/rseti/banks/documents/RSETI_Modular_final.pdf on June 9, 2018.

Anonymous. 2018c. National Academy of RUDSETI, retrieved from www.rudsetacademy. org on June 5, 2018.

Bhakar, R.; Banafar; N.P. Singh and Gauraha. 2007. Income and employment pattern in rural area of Chhattisgarh: A micro view. *Agri Eco. Res. Rev.,* 20: 395-406.

CMIE. 2019. Employment rate falls in February 2019, retrieved from https://www.cmie.com / *kommon/› bin/Sr.php o*n June 9, 2018.

Mavi, K.S.; J.P.S. Chauhan and B.C. Das. 2006. Impact of self employment programme on dairy farming. *Rural India,* 70: 47-49.

Sharma, J. 2009. A study on impact of *Swarnjayanti Gram Swarozgar Yojna* (SGSY) on income generation among the beneficiaries in Sihora block of Jabalpur district (M.P.), M.Sc. (Agri.) Thesis, Jawaharlal Nehru Agricultural University, Jabalpur, India.

Sidhu, K.; M. Kaur and S. Sharma. 2018. Income generation by women self help groups. *Journal of Community Mobilization and Sustainable Development,* 13: 113-117.

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Measuring Effectiveness of WhatsApp Messenger in Dissemination of Technological Information Among e-farmers in Madhya Pradesh

S.R.K. Singh[1]*, Anupam Mishra[2], Venkteshwar Jallaraph[3], A.A. Raut[4], R.K. Singh[5] and Sarvesh Kumar[6]

[1]Principal Scientist, [2]Director, [4]Scientist, [3]SRF, (NEMA), [5]Scientist, KVK Khargone, Madhya Pradesh, [6]Scientist, KVK Harda, Madhya Pradesh, ICAR-Agricultural Technology Application Research Institute, Zone–IX, Jabalpur-482004, Madhya Pradesh

ABSTRACT

WhatsApp sends real-time messages and is one of the world's most popular communication applications of the 21st century. The social media-enabled WhatsApp is helping farmers to solve farming related problems more efficiently by making them digitally literate as they perceived in the study that the whatsapp messages used were clear and satisfactorily for them. WhatsApp isn't only used as a dissemination tool but it has also created a kind of support network among farmers. The present study was conducted to assess the effectiveness of WhatsApp Messenger in dissemination of agricultural technology in two districts of Madhya Pradesh with a sample size of 180 e-farmers. The study revealed that majority (66.67 %) of e-farmers reported about high effectiveness of WhatsApp Messenger in dissemination of agricultural technology. This indicates the role of social media like WhatsApp in faster dissemination vis-à-vis changing knowledge and perception of the farmers apropos improved agricultural technology.

Keywords: e-farmers, WhatsApp, ICT, Digital technology, Technology dissemination

INTRODUCTION

India is the world's second-most populous country with 1.27 billion populations (FAO). Agriculture, with its allied sectors, is the largest source of livelihoods in India, where 70 per cent of its rural households still depend primarily on agriculture for their livelihood, with 82 per cent of farmers being small and marginal. Information and communication technology in agriculture also known as e-agriculture focuses on the enhancement of agricultural and rural development through improved information and communication processes. ICT is ruling the world in all walks of life and access to mobile phones and internet facility is growing in India at a rapid rate in recent years. However, the access to internet-based technologies have confined primarily to the urban areas but the rural population in our country still have difficulties in accessing crucial information in the forms they can understand to make timely decisions for better farming. Indian cultivating network is at present confronting huge number of issues to boost crop efficiency. The use of information is wide and multifarious. However, a very wide gap exists between the research level and actual practices. ICT like web portals, mobile phones and social media are the most popular and most widely used and can enhance the interaction among researchers, extension personnel and farmers and also it can help farmers to seek information on farm operations, clarify their doubts on plants/ livestock disease symptoms and can have immediate access to market-related information. Research indicts mobile access has somewhat contribute to the improvements of poor lives and supported poverty reduction (Silva and Zainudeen, 2007). WhatsApp sends real-time messages and is one of the world's most popular communication applications in the 21st century. Therefore, in the backdrop of the issues discussed above, the present investigation has been planned to examine the effectiveness of WhatsApp Messenger in the dissemination of agricultural technology as an effective tool for agricultural development.

MATERIAL AND METHODS

The present survey was undertaken in two districts of Madhya Pradesh State viz. Jhabua (22.7697° N and 74.5921° E) and Khargone (21.8335° N and 75.6150° E) to find out the effectiveness WhatsApp Messenger in dissemination of agricultural technology. From the above two districts of Madhya Pradesh 180 e-farmers, i.e. 90

*Corresponding author email id: singhsrk@yahoo.co.in

from each district were selected for the study. For assessing the effectiveness a schedule was developed and responses of e-farmers were recorded in three-point continuum scales for every six aspects and scores were assigned to each of them.

RESULT AND DISCUSSION

In a survey of 180 e-farmers, for finding the effectiveness of WhatsApp in dissemination of agricultural technology, in two districts of Madhya Pradesh viz. Jhabua and Khargone, following results, were revealed:

Table 1: Distribution of e-farmers according to perception towards WhatsApp Messenger based agriculture technology (N = 180)

	Low	Medium	High
Jhabua	3 (3.33)	23 (25.56)	64 (71.11)
Khargone	4 (4.44)	17 (18.89)	69 (76.67)
Total	7 (3.89)	40 (22.22)	133 (73.89)

Perception is our sensory experience of the world around us and involves both recognizing environmental stimuli and actions in response to these stimuli. The perusal of Table 1 shows that, majority (73.89%) of the e-farmers of district Jhabua and Khargone had high perception towards WhatsApp Messenger based agricultural technology, followed by medium (22.22%) and low perception (3.89%). Further, it was revealed that, in contrast with district Jhabua (71.11%), higher percentage of the e-farmers (76.67%) having high perception towards WhatsApp Messenger based agricultural technology were of locale Khargone. Even though use of WhatsApp Messenger for agricultural information was fairly high among the e-farmers, there were some major concerns for not using it intensively for the purpose. Also, lack of authentic information, lack of awareness about its use, lack of competence in using the WhatsApp properly, unavailable or erratic internet connections, and biased information and advertisements were found to be acting as deterrents among the e-farmers in using whatsapp. Similar result was reported by Naruka *et al.* (2017).

The data presented in Table 2 indicated that, knowledge level of more than fifty per cent (56.11%) of the e-farmers of district Jhabua and Khargone, towards WhatsApp based agricultural technology was high. While, 32.78 per cent and 11.11 per cent e-farmers were categorized under medium and low knowledge level, respectively. Further, it was revealed that, in contrast with district Jhabua (50.00%), higher percentage of e-farmers (62.22%) having high knowledge level towards WhatsApp Messenger based agricultural technology were of district Khargone.

Table 2: Distribution of e-farmers according to knowledge level towards WhatsApp based agriculture technology (N=180)

	Low	Medium	High
Jhabua	12 (13.33)	33 (36.67)	45 (50.00)
Khargone	8 (8.89)	26 (28.89)	56 (62.22)
Total	20 (11.11)	59 (32.78)	101 (56.11)

Table 3: Distribution of e-farmers according to extent of utilization of WhatsApp Messenger for seeking agricultural related information (N = 180)

	Low	Medium	High
Jhabua	11 (12.22)	20 (22.22)	59 (65.56)
Khargone	8 (8.89)	19 (21.11)	63 (70.00)
Total	19 (21.11)	39 (43.33)	122 (67.78)

Table 3 revealed that, majority (67.78%) of the e-farmers of district Jhabua and Khargone were highly utilized WhatsApp Messenger for seeking agricultural related information, followed by medium (43.33%) and low utilization (21.11%) of WhatsApp Messenger for seeking agricultural information. Further, it was revealed that, in comparison to district Jhabua (65.56%), higher percentage of e-farmers (70.00%) were expressed that they constantly used WhatsApp Messenger for seeking agricultural related information were of district Khargone. This finding is in agreement with result of Sandhu *et al.* (2012) and Sharma *et al.* (2018).

The results displayed in Table 4 indicated that, 38.33 per cent of the e-farmers of district Jhabua and Khargone always disseminated the agricultural information to other farmers using WhatsApp, followed by 32.78 per cent of e-farmers, who never disseminated agricultural information

Table 4: Distribution of e-farmers according to extent of dissemination of agricultural information through WhatsApp Messenger (N = 180)

	Never	Sometime	Always
Jhabua	32 (35.56)	28 (31.11)	30 (33.33)
Khargone	27 (30.00)	24 (26.67)	39 (43.33)
Total	59 (32.78)	52 (28.89)	69 (38.33)

to other farmers. Whereas 28.89 per cent of them expressed that, they sometimes disseminated the agricultural information via WhatsApp. Further, it was revealed that, in comparison to district Jhabua (33.33%), higher percentage of the e-farmers (43.33%) always disseminating agricultural information to other farmers using WhatsApp were of district Khargone. The main purpose of dissemination of agricultural information through WhatsApp was to make farmers aware of the usefulness of modern crop management practices in enhancing a crop's productivity and subsequently to convince the farmers to adopt the technologies communicated. Similarly, it has been stated that although WhatsApp Messenger can help in disseminating agricultural information to improve the farm productivity and rural incomes, trustworthiness of information is one of the important aspects that need to be considered while delivering to farmers to meet their needs and expectations Mittal and Tripathi (2009) and Sharma *et al.* (2018).

Table 5: Distribution of e-farmers according to understanding level of WhatsApp Messages based on agricultural technology (N = 180)

	Not understanding	Difficult to understand	Easy to understand
Jhabua	0 (0.00)	15 (16.67)	75 (83.33)
Khargone	0 (0.00)	10 (11.11)	80 (88.89)
Total	0 (0.00)	25 (27.78)	155 (86.11)

Understanding of any technical information before its actual adoption is essential field. The data given in Table 5 indicated that, majority (86.11%) of e-farmers of district Jhabua and Khargone said that, WhatsApp Messenger based agricultural information was easy to understand, followed by 27.78 per cent of e-farmers agreeing with the fact that, it was difficult to understand. While, none of the e-farmers got difficulty in understanding messages. Further, it was revealed that, percentage of e-farmers who effectively comprehend the WhatsApp Messenger based agricultural information was somewhat progressively (88.89%) in Khargone when contrasted with Jhabua (83.33%).

It could be noted from Table 6 that, higher percentage (77.22%) of the e-farmers of district Jhabua and Khargone were getting timely information from WhatsApp messages, followed by 34.44 per cent of the e-farmers agreeing with the fact that, only sometimes receiving information timely.

Table 6: Distribution of e-farmers according to the timeliness of WhatsApp Messenger based agricultural technology (N = 180)

	Never timely	Sometime timely	Always timely
Jhabua	4 (4.44)	15 (16.67)	71 (78.89)
Khargone	6 (6.67)	16 (17.78)	68 (75.56)
Total	10 (11.11)	31 (34.44)	139 (77.22)

While 11.11 per cent of e-farmers said that, they are not receiving agricultural information timely. Further, it was revealed that, in contrast with locale Khargone (75.56%), higher percentage of e-farmers (78.89%) expressed that they always receiving agricultural information timely through WhatsApp were of district Jhabua. Timeliness of agricultural information is very crucial to farmers' success. Farmers need to be provided with the information at the right time so as to apply that information in their farming activities for better farm productivity. This finding is in agreement with the results of Sandhu *et al.* (2012), Kumar *et al.* (2014), Naruka *et al.* (2017) and Sharma *et al.* (2018).

Table 7: Overall effectiveness of WhatsApp Messenger in the dissemination of agricultural technology (N = 180)

Level of effectiveness	Frequency	Percentage
Low	19	10.55
Medium	41	22.78
High	120	66.67
Total	180	100

Effectiveness was assed on the basis of cumulative scores of the e-farmers on various parameters considered for effect assessment. It could be noted from Table 7, majority 66.67 per cent of the e-farmers indicated that dissemination of agricultural related information via WhatsApp Messenger found to be highly effective, followed by medium (22.78%) and low effective (10.55%). For effectiveness of ICTs (WhatsApp), Raksha *et al.* (2017) suggested that the strategy was planned in an integrated manner covering the important aspects like polices, institutions, stakeholders, ICT knowledge centre, ICT infrastructure, content development, blending, innovative leaders, ICTs upgradation, refinement and innovation and monitoring and evaluation. This finding is in agreement with result of Sandhu *et al.* (2012).

CONCLUSION

The study concludes that, the overall effectiveness of WhatsApp Messenger in dissemination of agricultural technology to e-farmers was high. The social media-enabled WhatsApp is helping farmers to solve farming related problems more efficiently by making them digitally literate as they perceived in the study that the whatsapp messages used were clear and satisfactorily for them. WhatsApp isn't only used as a dissemination tool but it has also created a kind of support network among farmers. On the level of daily interaction, the WhatsApp groups are successful at providing a sounding board of assistance and in motivating farmers.

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REFERENCES

FAO. India at a glance. http://www.fao.org/india/fao-in-india/india-at-a-glance/en/

Kumar, S.; S.R.K. Singh and R.C. Sharma. 2014. Impact of Kisan Mobile Advisory Service on Transfer of Agricultural Technologies. *International Journal of Extension Education*, 10: 70-72.

Mittal, S. and G. Tripathi. 2009. Role of mobile phone technology in improving small farm productivity. *Agricultural Economics Research Review*, 22: 451-459.

Naruka, P.S.; S. Verma; S.S. Sarangdevot; C.P. Pachauri; S. Kerketta and J.P. Singh. 2017. A study on role of whatsapp in agriculture value chains. *Asian Journal of Agricultural Extension, Economics & Sociology,* 20(1): 1-11.

Raksha, I.; S. Rao and S.N. Meera. 2017. Integration of ICTs in agricultural extension: Possible strategies. *Journal of Community Mobilization and Sustainable Development,* 12(1): 129-135.

Sandhu, H.S.; G. Singh and J. Grover. 2012. Analysis of Kisan mobile advisory service in South Western Punjab. *Journal of Krishi Vigyan,* 1(1): 1-4.

Sharma, A.; J.S. Gill and H.S. Brar. 2018. Assessment of satisfaction level towards farm magazines-A case study of Punjab Agricultural University. *Journal of Community Mobilization and Sustainable Development,* 13(3): 463-465.

Silva, H.D. and A. Zainudeen. 2007. Tele use a shoestring: Poverty reduction through telecom access at the bottom of the pyramid. Retrieved from Lirneasia: www. Lirneasia.Net/project/current-project/bop-teleuse/.

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Consumer Opinion on Post Purchase Use and Care of Rugs and Carpets in India

Sudha Babel and Sirisha Deepthi Sornapudi*
Department of Textiles and Apparel Designing, College of Community and Applied Sciences, MPUAT, Udaipur, Rajasthan

ABSTRACT

Carpets and rugs are the best and easiest way to augment any floor space. Besides having several functional properties like thermal insulation, slip resistance, protective layer to floors; carpets and rugs can help in styling a home and enhance the home decor. Owing to dearth of information regarding consumer opinion on post purchase use and care of carpets and rugs in India, this study was planned. Information gathered is presented under post purchase use, care and maintenance, labels and tags and problems encountered in use.

Keywords: Carpets, Rugs, Cleaning, Maintenance, Labels and tags

INTRODUCTION

Carpets and rugs are a quintessential item in an Indian household. The terms 'carpet' and 'rugs' are used interchangeably in many countries, however there are differences. Both of them are floor coverings. While carpet is a wall to wall floor covering, which adds to the charm and warmth of a room; rug is a partial floor covering a smaller area, hence termed area rugs. In addition to having functional properties, both carpets and rugs add to the aesthetics of a home. Further they lend a protective layer to flooring and are considered as prized possessions in many households. People living in the colder climates use carpets and rugs to ward off excessive cold. The demand for carpets and rugs is highest in developed countries. As per research report on the global carpets and rugs market (Transparency Market Research, 2019), this trend has changed in the last few years, with more and more consumers spending more money on bringing about aesthetic improvements to their homes or office spaces.

It is interesting to note that floor coverings can affect how consumers make their purchase decisions. The shopping behaviour of consumers is influenced by the flooring under their feet (Meyers-Levy *et al.,* 2010). Carpeting evokes a greater sense of physical comfort than tiled flooring. These bodily sensations elicited by flooring are transferred to people's assessments of products that they perceive while shopping.

Such studies have greater implications to the entire value chain of carpet and rugs. Numerous research studies on manufacturing, branding, and child labour in carpet industry have been reported, but none on post purchase use and care of rugs and carpets in India Hence this study was planned to gather information under various aspects like product type used, care and maintenance, tags and labels, stain removal, washing procedures and general problems encountered.

MATERIALS AND METHODS

This study was undertaken to know the post purchase use and care practices followed by homemakers of Udaipur city, Rajasthan. The city experiences around four winter months in a year (November to February), during which most homemakers usually use the rugs and carpets to withstand excessive cold and to give an additional layer of warmth to frequently used spaces in their homes. The study covers the responses of 30 homemakers interviewed in March 2019, using a pretested questionnaire. Willingness to participate in the study and compulsory use of rugs/ carpets were prerequisites for selection of respondents for study. Respondent's views were personally collected; data was coded, tabulated and analysed.

RESULTS AND DISCUSSION

Post purchase and Use of carpets and rugs: All the respondents used carpets/rugs in their homes. Respondents

*Corresponding author email id: ssdeepthi@gmail.com

felt that the carpets add to the character of a room, make great show pieces and enhance the look and feel of the space; they also feel very comfortable under the feet. The areas in the house where the respondents used them are indicated in the Figure 1. Drawing room (87%) seems to be the most preferred place for use of rug/carpet, followed by pooja room (33%) which shows the use of area rugs and bed room (30%).

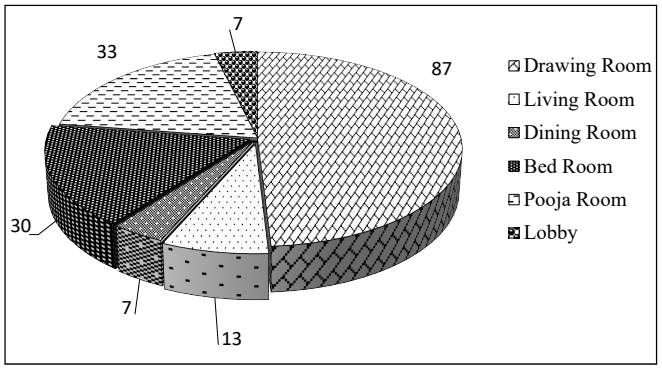


Figure 1: Area of the house where rugs and carpets are used expressed as percent

Majority of the respondents (77%) purchased the rugs and carpets locally either in shops, Shilpgram, an annual exhibition organised in December and other local exhibitions. Shilpgram ustav is known to showcase traditional rural arts, crafts and artifacts from pan-India. Rural products are distinctive, innovative, have good utility and value (Saurabh *et al*., 2019). Offbeat responses given include door to door sellers (13%), whom the respondents vouch for the quality and resale; online purchases (7%) and made by the septuagenarian (3%) of the household as indicated in Table 1. The age of the rugs and carpets owned by the respondents ranges from lowest of one year to maximum of twenty five years, while the price paid ranged from a lowest of Rs. 2000/- to a highest of Rs. 25,000/- depending on the type of the rug/carpet.

With regards to the type of material in the rugs and carpets owned, the responses are indicated in Table 2. Synthetic rugs users are 53 per cent, followed by Synthetic

Table 1: Place of purchase of rugs and carpets

Place of purchase	No. of responses	Percent
Local shops	23	77
Door to door sellers	4	13
Online	2	7
Septuagenraian	1	3

Table 2: Type of material of the rugs/carpets owned by the respondents

Type of material	No. of responses	Percent
Synthetic	16	53
Synthetic + Wool	6	20
Wool	5	17
Cotton	2	7
Jute	1	3

and wool (20%), Wool (17%), Cotton (7%) and Jute (3%). This indicates that the synthetic rugs/carpets have penetrated the market, are accessible and are cheaper when compared to the ones made with natural materials like cotton, wool and Jute.

The production method indicated by the respondents was machine made (83%), handmade (7%), both machine made and handmade (10%). The construction style indicated ranged from tufted, hand knotted and flat woven. Cent percent of the respondents owned a rectangular shaped rug, while very few also owned round, square and oval shaped rug/ carpet in addition to the rectangular one. Fifty per cent of the designs were of traditional type and the modern type included around 37 per cent, while the rest 13 per cent were of both traditional and modern designs. This indicates that the consumers preferred traditional designs for their carpets/rugs, representing their culture and heritage. A majority of the respondents (77%) indicated that their rugs had non slip backing. None of them reported that their rugs had a built in rug pad.

Care and maintenance: Most of the respondents (83%) took care of their rugs/carpets on their own, while the rest (17%) took professional help in cleaning them. Forty per cent of the subjects' air out the carpets/rugs in sunlight in order to disinfect them, 33 per cent air out and wash, 17 per cent air out and vacuum clean and the rest 10 per cent wash them out as when they are soiled as indicated in Figure 2. The frequency of airing out is indicated as under in Table 3. None of the homemakers had any idea about protecting the rugs with a rug pad.

A majority of the housewives (83%) change the rugs/ carpets as per season, while 17 per cent use the same one all through year. This indicates that consumers like variety in their home decor. When not in use, the floor coverings are stored in the following way as indicated in Table 4. None of the homemakers seem to know that wrapping

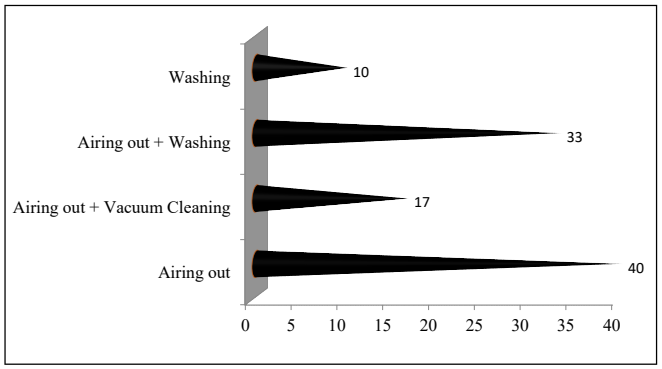


Figure 2: Type of care and maintenance given by the homemakers

Table 3: Airing out of rugs/carpets by the respondents

Frequency of airing out	No. of responses	Percent
Once in a week	4	13
Once in 15 days	6	20
Once in a month	13	43
Once in 2 months	4	13
Once in 6 months	3	10
Once in a year		0

Table 4: Storage the rugs when not in use

Storage the rugs when not in use	No. of responses	Percent
Vacuum Clean and store	7	23
Wash and store	16	53
Wrap in an old cloth	2	7
Warp in a newspaper	0	0

in newspaper keeps the dust and insects away from the floor coverings. The ink in the newspaper acts as insect repellent.

The common place for storage when the floor coverings were not used was wooden box (46%), followed by cupboard (17%), chajja (13%), under the bed in the built in storage space (7%) and in the store room (7%) including 10 per cent of no responses Figure 3.

Labels and tags: With regards to care labels and tags, majority of the homemakers (83%) revealed that they have not received any labels or tags with the items purchased from the domestic market, while 17 per cent reported that they have received care instructions in the form of labels. Customers who bought from door to door salesmen have received oral instructions with regards to general care and maintenance. It is evident that products sold in the domestic market do not carry the labels and tags which is mandatory in the export market. There is every need to educate the domestic consumers just like the overseas consumers. Those consumers who have received some form of instructions (verbally or on labels) did follow the care instructions.

Both carpets and rugs attract soil, dust and accidental spillages. To maintain the floor coverings in their pristine condition, careful planning, regular maintenance, and professional cleaning is required. Data collected reveals that 77 per cent of the homemakers take care of stains on their own, while 23 per cent rely on professional services. The stained areas are worked in the right manner from outside of the stained area to the inside by 13 per cent of the respondents. It is heartening to note that 53 per cent of the respondents do check if the products bought are colourfast. Simple tests like rubbing a wet rag over the coloured areas, dry rubbing with fingers are employed by the women while shopping. It was earlier indicated that 17 per cent use professional services for cleaning the floor coverings for which money in the range of Rs. 200 to Rs. 500 per wash for vacuum cleaning is paid. Cent percent of the respondents seemed to be satisfied with the care regime they have employed – either self care or professional care.

Problems encountered in use: Responses with regards to the problems encountered with use of rugs and carpets at home are indicated in Figure 4. While majority of the respondents (77%) struggled with dust accumulation on the carpets, around 30 per cent had no problems with their rugs and carpets. Other problems disclosed included difficulty in maintenance (30%), colour fading (23%), yarn slippage (10%). Some of the respondents felt that the rugs they had in possession were too hot in summers (10%), hence they changed their rugs as per season.

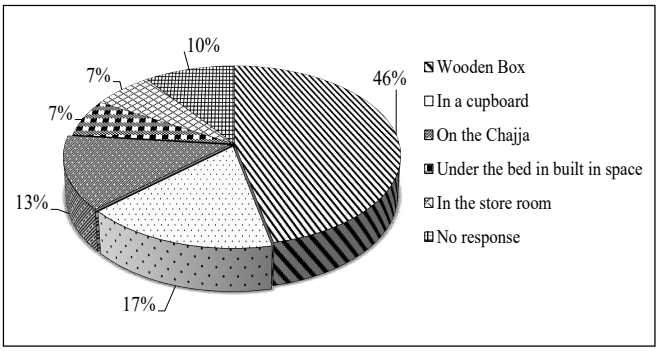
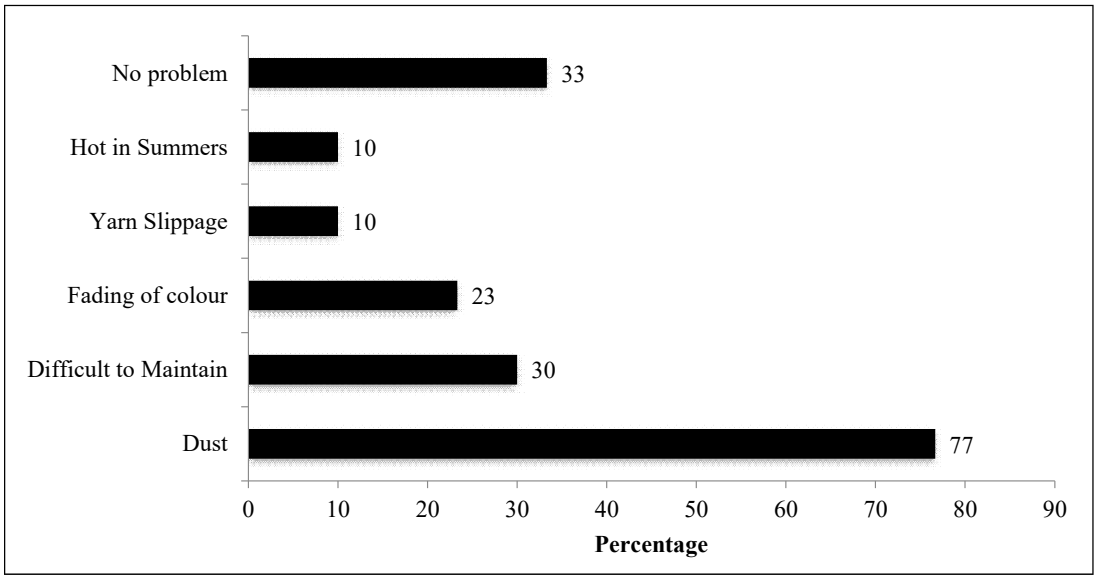


Figure 3: Place of storage of floor coverings when not in use

Figure 4: Problems encountered with use of rugs and carpets



None of the consumers reported any fall/ injuries associated with rugs and carpets probably due to the less usage area in India. A study conducted in USA (Rosen *et al.,* 2013) characterised nonfatal, unintentional fall-related injuries associated with rugs and carpets in adults aged 65 years and older. Hospital emergency department's retrospective data analysis revealed that falls were associated with carpets and rugs. Majority of the falls occurred at home and women seemed to the worst affected. The transition between carpet/rug and non-carpet/rug, on wet carpets or rugs, and while hurrying to the bathroom were the areas in the home that were more vulnerable for a fall/injury.

CONCLUSION

Carpets and rugs are a desirable accessory for home décor, as is evident from the survey wherein cent per cent of the respondents used them in their homes. This study, a first of its kind, provides valuable insights to the carpet and rug industry with regards to post purchase use and care on various aspects like product type used, care and maintenance, tags and labels, stain removal, washing procedures and general problems encountered. Findings reveal a lack of proper labelling. It is necessary to follow stringent labelling of the carpets/rugs released into the domestic market on par with the export market. Producers need to realise that a consumer retained is a consumer gained. It is imperative that the manufactures realise that in addition to supplying good quality designer products, good after sales service will go a long way in retaining the customers.

REFERENCES

https://www.transparencymarketresearch.com/carpets-and-rugs-market.html

Meyers-Levy, J.; R. Zhu and L. Jiang. 2010. Context effects from bodily sensations: examining bodily sensations induced by flooring and the moderating role of product viewing distance. *Journal of Consumer Research*, 37(1): 1–14. https://doi.org/10.1086/649028

Rosen, T.; K.A. Mack and R.K. Noonan. 2013. Slipping and tripping: fall injuries in adults associated with rugs and carpets. *Journal of Injury & Violence Research*, 5(1): 61–69. doi:10.5249/jivr.v5i1.177.

Saurabh, D.S.; A.S. Srivastava; S.K. Dubey and U.S. Gautam. 2019. Lac based agri-entrepreneurship development model of district Sitapur in Uttar Pradesh. *Journal of Community Mobilization and Sustainable Development,* 14(1): 1-4.

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Adoption Gaps in Chilli Production Technology in Baramulla district of Jammu and Kashmir

Anjali Tomar[1]*, Shijaatt Hussain Bhat[2] and Farhana[3]
[1]P.G. Student, [3]Ph.D. Student, [2]Assistant Professor, Division of Agriculture Extension and Communication, SKUAST-Kashmir, Wadura, Jammu & Kashmir

ABSTRACT

The research study was conducted in Agricultural Zone Sopore of Baramulla district of Jammu and Kashmir state of India. In this research, the adoption of recommended package of practices of chilli cultivation by growers were studied. Majority of the growers had sown the chilli crop on small area of land and earned low level of annual income. All the growers had grown the recommended variety, but used more seed rate. Majority of the growers applied the FYM more than the recommended rate, Urea at less than the recommended rate, DAP at less than the recommended while MOP was applied by less number of growers. Majority of growers applied the urea as ½ at initial and other ½ at transplanting stage. Majority of growers adopted the non-recommended flat bed method for raising the nursery of chilli. Majority of the growers performed the recommended number of hoeing operations and had applied the Nuvan (non-recommended) as an insecticide whereas majority of the growers didn't apply insecticide. Majority (57.00%) of the growers had medium level of adoption, followed by the low (24.00%) and high (19.00%) level of adoption respectively.

Keywords: Adoption, Chilli, Cultivation, Growers

INTRODUCTION

Agriculture has been and will continue to be the life line of the Indian economy. As the largest private enterprise in India, agriculture contributes nearly one fourth of the national Gross Domestic Product (GDP), sustains livelihood of about two third of the population and is the backbone of agro-based industry. In food sector alone, agriculture contributes about 250 thousand crore rupees annually. Through the update of modern agricultural technology, India has moved from an era of chronic food shortage and begging bowl in 1960 to food self-sufficiency and has also attained even food exports by the year 1986 when FPO was established. The productivity gain is nearly 3.3 times in food grain, 1.6 times in fruits, 2.1 times in vegetables, 5.6 times in fish, 1.8 times in milk and 4.8 times in eggs (Anonymous, 2004).

Chilli *(Capsicum annum* L.) is one of the most important commercial vegetable cum spice crop grown almost in all the parts of temperate, tropical and subtropical regions of the world. It's botanical name is "*Capsicum annum*" and it belongs to the family Solanaceae. The world's hottest chilli "Naga Jolokia" is cultivated in hilly terrain of Assam in a small town Tezpur, India. Chilli occupies an important place in human diet. It is an indispensable item in the kitchen, as it is consumed daily as a condiment in one form or the other. Currently, Chillies are used throughout the world as a spice and also in the making of beverages and medicines. Some varieties of Chillies are famous for red colour because of the pigment 'capsanthin,' others are known for biting pungency attributed to 'capsaicin'. Chillies are rich in vitamins A and C. They are also rich in potassium, magnesium and iron. Chillies have long been used for pain relief as they are known to inhibit pain messengers. It is also reported that they have the power to boost immune system and lower cholesterol (Goudappa *et al.,* 2012). In Asia, India is the world leader in chilli production followed by China, Thailand and Pakistan (Geetha *et al.,* 2017).

In Jammu and Kashmir, the total area under vegetable crops is about 62.63 thousand ha and production 1386.37 thousand tonnes. The area under chilli crop in Kashmir valley is about 3080 ha with production of 48072 metric tonnes (Anonymous, 2015).

*Corresponding author email id: tomar.anjali1997@gmail.com

Table 1: State wise area, production and productivity of chilli in India during 2015-16

State	Area (000' ha)	Production (000' tonnes)
Andhra Pradesh	210.02	685.15
Karnataka	100.73	107.00
Maharashtra	99.50	45.60
Odisha	75.60	70.00
Tamilnadu	50.67	23.06
West Bengal	63.60	100.00
Madhya Pradesh	54.41	93.57

Source: National Horticulture Board Database 2015-16

Baramulla is the most important chilli growing district of Kashmir valley due to favourable climatic conditions and availability of proper marketing facilities as compared to other districts. In district Baramulla, Sopore Sub-Division has the highest area 85.55 ha under chilli and other vegetables (SDAO, Sopore).

MATERIAL AND METHODS

To seek the answers of the questions, an ex-post-facto research design was used in the investigation because it is a sort of fact-finding operation with adequate interpretation. Kashmir valley consists of 12 districts and the present study was conducted in Baramulla district of Jammu and Kashmir. District Baramulla comprises of six Agricultural Sub Divisions and among these Sub Divisions, Agricultural Sub Division Sopore was selected purposively on the basis of maximum area under Chilli crop. Agricultural Sub Division Sopore consists of four Agricultural Zones and among these Agricultural Zones, Zone Sopore was selected for the present study having maximum area under Chilli cultivation. Agricultural Zone Sopore consists of sixty villages, out of which only five villages were selected having maximum number of growers. Out of the selected villages, a total of 100 chilli growers were selected for present study by proportionate allocation method of sampling.

RESULTS AND DISCUSSION

1. Adoption of recommended package of practices by chilli growers

1.1 Adoption of improved varieties

From the Table 2, it is clear that 68.00 per cent of the chilli growers were cultivating recommended variety of chilli (Kashmir long-1) whereas 21.00 per cent of the chilli growers cultivated the recommended variety (Shalimar long) and 11.00 per cent of the growers had adopted other (local) varieties of chillies.

Table 2: Distribution of growers on the basis of adoption of different varieties of chillies for nursery growing (N=100)

Varieties adopted	Growers	
	Frequency	Percentage
Recommended		
Kashmir long 1	68	68.00
Shalimar long	21	21.00
Non-recommended		
Local	11	11.00

Table 3: Distribution of growers on the basis of type of beds adopted for raising nursery for chilli cultivation (N=100)

Type of bed adopted	Growers	
	Frequency	Percentage
Recommended		
Raised bed	04	04.00
Non-recommended		
Flat bed	96	96.00

From the Table 3, it is clear that majority (96.00%) of the chilli growers used flat bed for raising chilli nursery followed by 4.00 per cent of the growers used raised bed for raising chilli nursery.

Table 4: Distribution of growers on the basis of suitable time for raising the nursery for chilli cultivation (N=100)

Level of adoption	Growers	
	Freq.	%
Recommended time (April-May)	89	89.00
Less than recommended (before April)	11	11.00

The data presented in Table 4 reveals that majority of the growers (89.00%) had sown the seed for raising the nursery for chilli cultivation on recommended time (April-May) followed by 11.00 per cent of the growers who had sown seed for raising nursery before the recommended time.

The data presented in Table 5 reveals that one third (74.00%) of the growers had used more than

Table 5: Distribution of growers on the basis of seed rate used for raising nursery (N=100)

Level of adoption	Growers	
	Freq.	%
Recommended seed rate (75-100 g/kanal)	23	23.00
Less than recommended seed rate (40-70 g/kanal)	03	3.00
More than recommended seed rate (150-250 g/kanal)	74	74.00

recommended seed rate whereas, 23.00 per cent of the growers had used recommended seed rate (75-100 g/kanal) and only 3.00 per cent of the growers had used less than recommended seed rate for nursery growing.

Table 6: Distribution of growers on the basis of age of seedling used for transplanting (N=100)

Level of adoption	Growers	
	Freq.	%
Recommended (30-35 days)	43	43.00
Less than recommended (20-28 days)	04	4.00
More than recommended (36-45 days)	53	53.00

The data given in Table 6 reveals, that more than half (53.00%) of the growers had transplanted seedlings beyond the recommended time of planting and 43.00 per cent of the growers had transplanted seedlings as per the recommended time (30-35 days). Whereas, 4.00 per cent of the growers had transplanted seedlings before recommended time.

Table 7: Distribution of growers on the basis of spacing adopted for transplanting of seedlings (N=100)

Level of adoption	Growers	
	Freq.	%
Recommended (25×30 cm)	14	14.00
Less than recommended (15×18 cm)	84	84.00
More than recommended (30×30 cm)	02	2.00

From Table 7, it is clear that the more than one third (84.00%) of the growers had transplanted seedlings in less than recommended spacing, 14.00 per cent of the growers had adopted the recommended spacing (25×30 cm) for transplanting chillies, while as only 2.00 per cent of the growers had adopted more than the recommended spacing.

1.2 Adoption of manures and fertilizer application

From Table 8 it was observed that majority (82.00%) of the chilli growers had applied more than recommended dosage of FYM per kanal followed by 16.00 per cent of the growers who had applied recommended (1-1.5 t/kanal) dosage of FYM and only 2.00 per cent of the grower applied less than recommended dosage of FYM per kanal to chilli fields.

Table 8: Distribution of growers on the basis of quantity of FYM applied to the chilli crop (N=100)

FYM applied	Growers	
	Freq.	%
Recommended (1-1.5 t/kanal)	06	6.00
Less than recommended (0.5-0.8 t/kanal)	02	2.00
More than recommended (2-3 t/kanal)	92	92.00

Table 9: Distribution of growers on the basis of quantity and number of doses of application of urea for chilli crop (N=100)

	Growers	
	Freq.	%
Quantity of application of urea		
Recommended (6 kg/kanal)	33	33.00
Less than recommended (3-5 kg/kanal)	49	49.00
More than recommended (7-8 kg/kanal)	18	18.00
Number of doses of application		
Recommended (2 dose)	66	66.00
Less than recommended (1 dose)	05	5.00
More than recommended (3-4 dose)	29	29.00

From Table 9, it is clear that majority (49.00%) of the growers had applied less than recommended dosage of urea, followed by 33.00 per cent of the growers applied recommended dosage of urea (6 kg/kanal) whereas only 18.00 per cent of the growers applied more than recommended dosage of urea.

The data in same table, further revealed that majority (66.00%) of chilli growers had applied urea in recommended (2) number of split doses, followed by 29.00 per cent of growers had applied urea in more than recommended number of split doses. While as, only 4.00 per cent of the growers had applied urea in a single or less than recommended number of split doses to chilli fields.

From the Table 10, it was observed that majority (47.00%) of chilli growers had applied less than the

Table 10: Distribution of growers on the basis of quantity of application of DAP to chilli crop (N=100)

Quantity of DAP applied	Growers	
	Freq.	%
Recommended (4.15 kg/kanal)	31	31.00
Less than recommended (3-4 kg/kanal)	47	47.00
More than recommended (4.3-4.6 kg/kanal)	05	5.00
Don't apply	17	17.00

recommended dosage of DAP followed by 31.00 per cent of the chilli growers who had applied the recommended dosage (4.15 kg/kanal) of DAP. However, 17.00 per cent of the growers had not applied DAP at all to chilli crop whereas 5.00 per cent of the chilli growers had applied more than the recommended dosage of DAP.

Table 11: Distribution of growers on the basis of quantity of application of Murate of potash (MOP) by chilli crop (N= 100)

Quantity of MOP application	Growers	
	Frequency	Percentage
Recommended (3 kg/kanal)	11	11.00
Less than recommended (2 kg/kanal)	25	25.00
Don't apply	64	64.00

From the Table 11, it was observed that the majority of growers (64.00%) had not applied murate of potash (MOP) at all. While as, 25.00 per cent of chilli growers had applied less than the recommended dosage of MOP, and 11.00 per cent of growers had applied recommended dosage of MOP (3 kg/kanal).

1.3 Adoption of Intercultural practices

From Table 12, the data revealed that 91.00 per cent of the chilli growers had done hoeing as per the recommendations (2-3 times) and 6.00 per cent of chilli growers had done hoeing less than recommendations, whereas only 3.00 per cent of the chilli growers had done hoeing more than recommended times.

Table 12: Distribution of growers on the basis of adoption of Hoeing practices by chilli growers (N=100)

Hoeing	Growers	
	Frequency	Percentage
Recommended (2-3 times)	91	91.00
Less than recommended (1 time)	06	6.00
More than recommended (4-5 times)	03	3.00

1.4 Adoption of plant protection measures

The data in Table 13 indicated that 29.00 per cent of the growers faced the problem of cutworms and none of the growers faced any other problem. Whereas, out of 29 growers who faced the problem of cutworm 58.62 per cent of the growers had applied non recommended insecticides (Nuvan), while as 41.37 per cent of the growers did not apply any insecticide to the crop. None of the chilli growers had applied recommended insecticide (Carbofuran) to their chilli crop.

Table 13: Distribution of growers on the basis of pest management practices by chilli growers (N=100)

Pests	Growers who faced the problem	
	Frequency	Percentage
Cutworm	29	29.00
Control measures adopted by the growers (N= 29)		
Recommended (Carbofuran 1 ml/lt)	00	00
Non recommended (Nuvan/ DDVP)	17	58.62
Don't apply	12	41.37

The data in Table 14 indicated that the majority of the growers i.e. 24.00 per cent faced the problem of anthracnose, while as 23.00 per cent of growers faced the problem of wilt followed by 11.00 per cent of growers who faced the problem of damping off and 19.00 per cent of the growers faced the problem of both wilt + anthracnose. The remaining 42.00 per cent did not face any of the above problems.

The data also revealed that 24 growers who faced problem of anthracnose, 66.66 per cent of the growers applied recommended fungicide (carbendazim) for controlling the disease, while 4.16 per cent of the growers had applied non-recommended fungicide and 29.16 per cent of the growers did not apply any fungicide at all. During the study it was observed 23 growers who faced problem of wilt, 60.86 per cent out of them had applied recommended fungicide (carbendazim) for controlling the wilt and 39.13 per cent of the growers did not apply any fungicide at all. Furthermore, 11 growers who faced problem of damping off only 36.36 per cent of the growers applied recommended fungicide (mancozeb), while as only 18.00 per cent of the growers applied non-recommended fungicide and 45.4 per cent of the growers did not apply any fungicide to their chilli crop. The results also show that none of the growers had applied

Table 14: Distribution of growers on the basis of disease management followed by chilli growers (N=100)

Diseases	Problems faced	
	Freq.	%
Wilt	23	23.00
Damping off	11	11.00
Anthracnose	24	24.00
Wilt + Anthracnose	19	19.00
No diseases incidence	42	42.00
Control measures	**Adoption of control measures**	
Wilt	**N = 23**	
Carbendazim (recommended)	14	60.86
Non adoption	09	39.13
Damping off	**N = 11**	
Mancozeb (recommended)	04	36.36
Non recommended	02	18.18
Non adoption	05	45.45
Anthracnose	**N = 24**	
Carbendazim (recommended)	16	66.66
Non recommended	02	8.33
Non adoption	06	25.00
Doses for spraying fungicide		
Carbendazim for Wilt	**N = 14**	
Recommended (0.1%)	00	00
More than recommended	14	100
Mancozeb 75 WP for Damping off	**N= 04**	
Recommended (0.3%)	00	00
More than recommended	04	100
Carbendazim for Anthracnose	**N=16**	
Recommended (0.05%)	00	00
More than recommended	16	100

**Multiple response*

recommended dose of fungicide for controlling these diseases.

1.5 Overall adoption level of growers

From Table 15, it is evident that, majority of the growers (57.00%) belonged to medium level of adoption, whereas 24.00 per cent and 19.00 per cent of the growers were belonged to low and high level of adoption respectively. The findings are in line with the results of Gandhi *et al.* (2008); Tekale *et al.* (2013); Kumar *et al.* (2016) and Sanap *et al.* (2016).

Table 15: Overall adoption level of growers (N=100)

Variable	Categories	Growers	
		Freq.	%
Adoption	Low (below mean- S.D) (<20.42)	24	24.00
	Medium (btwn mean ± S.D) (20.42- 26.54)	57	57.00
	High (above mean + S.D) (>26.54)	19	19.00

CONCLUSION

The data in the study revealed that 68.00 per cent and 21.00 per cent of the chilli growers were adopting recommended variety of chilli Kashmir long-1 and Shalimar long respectively. Majority (89.00%) of the growers had followed the recommended time for raising the nursery for chilli cultivation (April-May), only 4.00 per cent of the chilli growers had adopted recommended raised bed for raising chilli nursery, 23.00 per cent of the growers had adopted recommended seed rate (75-100 g/kanal), 43.00 per cent of the growers had transplanted seedlings of recommended age (4-5 weeks), 14.00 per cent of the growers had adopted recommended (25×30 cm) spacing, 16.00 per cent of the growers who had applied recommended (1-1.5 t/kanal) dosage of FYM, 33.00 per cent of the growers had applied the recommended dosage (6 kg/kanal) of urea, 31.00 per cent of the chilli growers had applied the recommended dosage (4.15 kg/kanal) of DAP, 11.00 per cent of growers had applied recommended dosage (3 kg/kanal) of MOP, Majority (91.00%) of the chilli growers had done hoeing as per the recommendations (2-3 times), none of the growers had applied recommended chemical measures (Carbofuran) to control cutworm, 66.66 per cent of the growers applied recommended fungicide (carbendazim) to control anthracnose, 60.86 per cent of growers had applied recommended fungicide (carbendazim) for controlling the wilt and only 36.36 per cent of the growers applied recommended fungicide (mancozeb) to control damping off to their chilli field. In this study large adoption gap was found in sowing method, seed rate, age of transplanting seedling, spacing, dosage of FYM, DAP, MOP and use of pesticides and less adoption gap was found in variety of chilli, time for raising nursery, hoeing practices and use of fungicides.

REFERENCES

Anonymous. 2004. Agricultural Production Report 2004-05, 4 p.

Anonymous. 2015. Jammu and Kashmir Department of Agriculture.

Anonymous. 2015-16. National Horticulture Board Database.

Gandhi, R.V.; S.N. Hanchinal; T.V. Krishna; M.S. Shivamurthy and S. Hittalmani. 2008. Knowledge level of vegetable growers with respect to ipm practices of tomato crop in Kolar district. *Mysore Journal of Agriculture Sciences,* 42(2): 718-719.

Geetha, R. and K. Selvarani. 2017. A study of chilli production and export from India*, IJARIIE,* 3(2): 205-210.

Goudappa, S.B. and R. Bairathi. 2012. Technological gap in chilli cultivation perceived by growers. *Research Journal of Extension Education,* 20: 171-174.

Kumar, S.; A. Sharma and S.K. Jha. 2016. Adoption of production technologies among jute growers in West Bengal. *Journal of Community Mobilization and Sustainable Development,* 12(2): 216-222.

Sanap, J.G. and R.P. Kadam. 2016. Adoption of improved farm implements recommended by Vasantrao Naik Marathwada Krishi Vidyapeeth. *Journal of Community Mobilization and Sustainable Development,* 11(2): 242-246.

Tekale, V.S.; N.G. Jalit and C.J. Gaikwad. 2013. Adoption of recommended chilli cultivation practices by the growers. *Journal of Emerging Technologies in Computational and Applied Sciences,* 6(3): 235-238.

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Standardization of Grafting Methods and Time of Walnut (*Juglans regia* L.) in Mid Hill Conditions of Poonch under Different Environmental Conditions

Muzafar Mir, Sudhir Jamwal*, Ajay Gupta, Muneeshwar Sharma and Pawan Kumar Sharma
KVK-Poonch of Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu-185101, Jammu & Kashmir

ABSTRACT

Grafting success rate in walnut (*Juglans regia* L.) is lower than most other fruit species which adversely affects nurseries in India. Studies were made to determine the most successful grafting method and optimum grafting period of walnut in Poonch district of Jammu division (J&K), during two consecutive years 2017 and 2018. Two different methods of grafting *viz,* wedge and tongue with two different timings *viz,* 2nd and 3rd week of February were carried out under poly house conditions at fruit plant nursery of KVK, Poonch of Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu. The same experiment was repeated in field conditions with same methods of grafting but with two different timings viz., 4th week of February and 1st week of March. The two years data indicated that under poly house, the maximum grafting success (78.66%) was obtained through wedge method of grafting followed by (76.33%) when performed during 3rd week of February. The grafting success was comparatively low in case of field conditions. In this case only 38.66 per cent success was obtained through wedge grafting done in 1st week of March. The higher grafting success in wedge grafting recorded could be due to the favourable temperature and relative humidity at the time of grafting and rapid flow of sap in stock and scion that might have favoured the healing process and established the continuity of cambial and vascular tissues for the graft take. Significant affects were also noticed on shoot length, shoot diameter, number of branches, number of leaves/shoot and percentage of sealable plants.

Keywords: Environment, Grafting, Methods, Propagation, Time, Walnut

INTRODUCTION

Walnut belongs to the family Juglandaceae and has wide adoptability to grow in temperate regions of the world between "1200 to 2150 m" above sea level. It is extensively grown almost in all the temperate countries of the world where the summers are not too cool or too hot. In India it grows in Jammu & Kashmir, Uttrakhand and Himachal Pradesh. Jammu & Kashmir is principal walnut growing state having monopoly in the production of export quality nuts with an area of 84777 ha with annual production of 279422 MT (Anonymous, 2018). The exiting plantations in the world are generally of seedling origin and notably variable in production and nut quality (Ozkan *et al.,* 2001). For a long time in the past, propagation through seed was only method available for walnut multiplication though this practice resulted into plants of great variability (Mir and Sharma, 2013). Generally walnut does not respond favourably to the vegetative propagation techniques under normal conditions, the way other temperate fruits do (Vahdati, 2006). Although walnut is a very popular nut fruit crop, yet its cultivation in our country has remained confined in few states. The non-availability of the quality planting materials (rootstock and scion) and lack of efficient propagation techniques, suitable time and other information on the performance of cultivars under different agro-climatic condition of temperate hilly regions are the major constraints in the expansion of walnut cultivation in India. Temperature and humidity have major effects on the process of walnut graft uniting (Sutyemez, 2007). Various methods of vegetative propagation in walnut have been reported to give varying degree of success under different climatic conditions in India and abroad. The variations are dependent on different environmental conditions to which the plants are subjected before and

*Corresponding author email id: sudjam1362@gmail.com

after propagation (Ibrahim *et al.,* 1978; Awasthi *et al.,* 1982; Qureshi *et al.,* 1985).

Poonch district of Jammu and Kashmir have favourable environmental conditions for intense walnut production, but current production does not satisfy market demand for this fruit species, the reason for this being the generative propagation of walnut from natural populations over the last several decades, resulting in the presence of populations with a pronounced biotype-specific polymorphism. No systematic work has so far been done on their survivability and morphological performance in relation to propagation methods (grafting) with suitable time under the mid hill conditions of district Poonch of Jammu and Kashmir. The best technique to increase the production of grafted plant material is to adopt vegetative propagation under polyhouse. Therefore, keeping in view the above points into consideration, the present investigation was under taken on "Standardization of methods and time of walnut (*Juglans regia* L.) grafting under mid hill conditions of Poonch under different growing conditions". Moreover, there is a dire need to demonstrate new technologies on farmers' fields for yielding greater social and economic benefits as already revealed in several studies (Sharma and Prakash, 2015; Arora *et al.,* 2019).

MATERIALS AND METHODS

The experiment was conducted on different grafting methods and timing on grafting success under different environmental conditions at experimental block of fruit plant nursery of Krishi Vigyan Kendra, Poonch of Sher-e-Kashmir University of Agricultural Sciences and Technology, of Jammu, during two consecutive years 2017 and 2018. The experiment site is situated in between 33° 25' North latitude and 73° East longitudes. The experiment was carried out under polyhouse and in open field conditions with same methods viz., wedge and tongue grafting, but with different timing viz., 2nd and 3rd week of February under poly house conditions and 4th and 1st week of February and March in open field conditions, respectively. One year old seedlings raised from thick shelled nuts were used as rootstocks in the study. The seedling rootstocks of 1-1.5 cm thickness were utilized for the purpose. The scion material was taken from a local walnut selection of "Loran" area of the same district. The bud sticks used for grafting were one year old terminal shoots. The zero energy polyhouse used under experiment was iron made structure that was covered with white polythene. To provide the suitable relative humidity for the success of walnut grafts, water was sprayed one or two times a day. However, to increase the temperature no additional aid was fitted. In open field conditions, natural environment prevailed.

The experiment was laid in a Randomized Block Design (RBD) using three replications. The observations were recorded on bud bursting/leafing out, average shoot length, shoot diameter, number of leaves/shot length, number of branches, grafting success (%) and total number of saleable plants (%). The experimental data were analyzed for ANOVA using RBD as per the procedure suggested by Cochran and Cox (1957).

RESULTS AND DISCUSSION

Data on the effect of different methods and time on grafting in walnut under polyhouse conditions shows in Table 1. Minimum days taken to bud bursting were recorded in case of wedge grafting (20.66) followed by tongue grafting (22.25) performed during 3rd week of February. The earlier bud bursting in wedge grafting performed during the 3rd week of February may be due to early and superior contact of cambial layers of stock and scion, resulting in early callus formation. These finding are in conformity with those of Mir and Sharma (2011) who reported that wedge grafting took minimum days to bud sprouting when performed during 4th week of February under polyhouse conditions. Whereas, in open field conditions, maximum (47.23) days were taken to bud bursting in tongue grafting, performed during 4th week of February (Table 2).

The maximum grafting success (78.66%) was recorded in case of was wedge grafting, when employed during 3rd week of February followed by tongue grafting (76.33%), when performed on the same time. Minimum grafting success (71.66%) was recorded in tongue grafting, performed during 2nd week of February. The maximum grafting success in wedge grafting might be due to the fact that the favourable temperature and relative humidity at the time of grafting and rapid sap flow in stock and scion favoured the healing process and established the continuity of cambial and vascular tissues for the graft success. These results are in conformity with those of Ibrahim *et al.* (1978) who reported that maximum success was recorded in cleft grafting when performed during February and also with those of Pathak and Shrivastava

Table 1: Studies on the effect of grafting methods and period on various parameters of walnut under polyhouse

Methods of grafting	Period of grafting	Bud bursting (days)	Grafting success (%)	Shoot length (cm)	Shoot diameter (cm)	No. of branches	No. of leaves/ branch	Sealable plants (%)
Wedge grafting	2nd week of February	24.10	73.66	121.25	5.54	22.45	6.12	73.25
Wedge grafting	3rd week of February	20.66	78.66	124.67	6.56	25.58	8.43	78.14
Tongue grafting	2nd week of February	23.33	71.66	119.55	5.13	21.24	5.21	71.45
Tongue grafting	3rd week of February	22.25	76.33	123.54	5.68	24.36	7.13	76.12
CD ($p \leq 0.05$)		0.97	2.89	1.47	0.84	1.10	0.05	0.90

Table 2: Studies on the effect of grafting methods and period on various parameters of walnut under open field conditions

Methods of grafting	Period of grafting	Bud bursting (days)	Grafting success (%)	Shoot length (cm)	Shoot diameter (cm)	No. of branches	No. of leaves/ branch	Sealable plants (%)
Wedge grafting	4th week of February	45.25	33.33	99.25	5.20	19.40	5.33	33.25
Wedge grafting	1st week of March	42.33	38.66	103.67	6.56	23.50	7.66	34.14
Tongue grafting	4th week of February	47.23	32.33	97.55	4.13	18.25	4.24	31.45
Tongue grafting	1st week of March	44.33	35.45	101.10	5.68	21.23	6.12	32.66
CD ($p \leq 0.05$)		1.94	2.84	2.14	0.99	1.52	0.81	0.56

(1975), who observed wedge grafting to be superior to tongue and side grafting methods in order to achieve the maximum success. However, Mir and Sharma (2011), reported that maximum success (76.66%) was recorded in wedge grafting, performed during 4th week of February under polyhouse conditions, whereas, Bhat *et al.* (2014) reported that wedge grafting in walnut recorded the highest graft success percentage performed during last week of January under polyhouse and lowest during 4th week of February under open field. A good graft success using different methods with different time of grafting has also been reported by several researches (Chauhan and Sharma, 1982; Dar, 2003; Sharma *et al.,* 2003; Mir and Sharma, 2011; Wani *et al.,* 2017). However, in open field conditions, the highest percentage of success (38.66) was recorded in wedge grafting followed by tongue grafting (35.45) when employed during 1st week of March, but the success percentage was quit low as compared to polyhouse conditions.

The different growth parameters of grafted walnut plants shows significant differences in average shoot length. Highest shoot length (124.76 cm) was recorded in wedge grafting performed during 3rd week of February under polyhouse and was statistically significant from rest of the dates, while as lowest shoot length (97.57 cm) was observed in tongue grafting performed during 4th week of February under open field conditions. With regarding to shoot diameter, which was found significant, maximum shoot diameter (6.56 cm) was observed in wedge grafting performed during 3rd week of February and the lowest shoot diameter (4.13 cm) was recorded in tongue grafting employed during 4th week of February under open field conditions. Data in Table 1indicated that maximum number of branches (25.58) were recorded in wedge grafting performed during 3rd week of February under polyhouse, whereas, minimum number of branches (18.25) were recorded in tongue grafting performed during 4th week of February under open field conditions (Table 2). Regarding number of leaves per shoot, highest values (8.43) was recorded in wedge grafting followed by tongue grafting (7.13) performed during 3rd week of February. The proportion of sealable plants was significantly influenced by different methods and timings of grafting (Table 1). Highest proportion of sealable plants (78.14%) was obtained by wedge method of grafting when employed during 3rd week of February (Table 1).

The highest number of shoots, leaves, scion diameter and proportion of sealable plants might be due to quick union formation, early bud sprouting. Based on this study it is recommended that the best method for grafting of

walnut is wedge grafting followed by tongue grafting performed during 3rd week of February under polyhouse and grafting under field conditions is not remunerative on commercial scale.

REFERENCES

Anonymous. 2018. Statement showing area and production of walnut in Jammu and Kashmir state. Department of Horticulture, Govt of J&K.

Arora, R.K.; P.K. Sharma; P. Kumar; R. Singh and V.P. Chahal. 2019. Evaluation of Recommended Maize Production Technology in Kandi Areas under Farmer FIRST Programme, *Journal of Community Mobilization and Sustainable Development*, 14(1): 131-136.

Awasthi, D.N.; M.M. Sinha; R.P. Srivastava and R.S. Misra. 1982. Evaluation of epicotyle grafting in walnut in relation to success and survival. *Progressive Horticulture***,** 14: 178-179.

Bhat, M.Y.; F.A. Banday; I.A. Wani and A. Lone. 2014. Effect of grafting time on graft success of walnut (*Juglans regia*) in zero energy polyhouse. *Indian Journal of Agricultural Sciences*, 84(2): 205-208.

Chauhan, J.S. and S.D. Sharma. 1982. Veneer grafting a new technique for walnut propagation. *Fruit Science Reports*, 7: 45-48.

Cochran, W.G. and G.M. Cox. 1957. *Experimental designs*. John Willey and Sons, New York, U.S.A.

Dar, M.Y. 2003. Studies on walnut grafting as affected by rootstocks thickness, nut hardiness and environmental conditions. *M.Sc. Thesis* submitted to the Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, J&K, India.

Ibrahim, M.; C.M. Sidiq and C.M. Idris. 1978. Experiment on comparative studies on different propagation techniques in English walnut (*Juglanus regia* L). *Journal Agricultural Research Pak*istan, 16(2): 205-209.

Mir, M. and A.K. Sharma. 2011. Effect of different methods, time and environmental conditions on grafting in walnut. *International Journal of Farm Sciences*, 1(2): 17-22.

Ozkan, Y. and A. Gumus. 2001. Effects of different applications on grafting under controlled conditions of walnut. *Acta Horticulturae*, 544: 515-520.

Pathak, R.K. and R.P. Srivastava. 1975. Walnut propagation by vegetative method. *Indian Horticulture*, 19(6): 45.

Qureshi, A.S. and M.A. Dalal. 1985. Status of nut crops in Jammu and Kashmir state. *Progressive Horticulture*, 17: 197-205.

Sharma, A.K.; S.R. Singh; K.K. Srivastava and A.S. Sounduri. 2003. Studies on success of walnut grafting as affected by time and environment. *Indian Journal of Ecology,* 18: 123-125.

Sharma, P.K. and S. Parkash. 2015. Economic evaluation of technology for promoting pulses production in Poonch district of Jammu & Kashmir. *Journal of Community Mobilization and Sustainable Development,* 10(1): 29-33.

Sutyemez, M. 2007. Determination of pollen production and quality of some local and foreign walnut genotypes in Turkey. *Turkish Journal of Agriculture,* 31: 109-114.

Vahdati, K. 2006. Evaluation of Side up and hypocotyle grafting efficiency for walnut propagation in Iran, *Acta Horticulturae*, 705: 347-351.

Wani, R.A.; J.A. Baba; G. Zaffar; S.A. Hakeem; I. Umer; M.A. Mir; B.A. Alie; S.U. Nissa; S. Bashir; N.A. Dar and M. Zubair. 2017. Grafting take success in walnut (*Juglanus regia* L.) under different environmental conditions. *International Journal of Current Microbiology and Applied Sciences,* 6(7): 2195-2201.

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Farmer's Perception and Constraints Analysis in Usage of Soil Health Card: A Case study of Andhra Pradesh

R.H. Ankhila[1]*, Alka Singh[1], Pramod Kumar[1], Rashmi Singh[2], Suresh Kumar[1] and Prabhakar Kumar[1]
[1]Division of Agricultural Economics, [2]Division of Agricultural Extension, ICAR-Indian Agricultural Research Institute, New Delhi-110012

ABSTRACT

Soil health card (SHC) is the most ambitious scheme of Government of India launched in 2015, to correct the fertilizer imbalances across farmer's fields. The present study was carried out in Andhra Pradesh to analyze the farmer's perception regarding soil health card as well as to see the constraints faced by farmers and non-farm stakeholders for effective implementation of the scheme in the study area. Likert scale technique and Garrett ranking techniques were used for the analysis. Based on farmers perception it is evident that majority of the farmers are well aware of the scheme in the area and also perceive reduced fertilizer consumption in terms of macro nutrients which in turn has decreased their cost of cultivation and clear improvement in micronutrients application was evident as it was complemented to farmers along with SHC. But the certainty of yield and timely scientific guidance to farmers was missing and lack of timely availability of SHC was hindering the trust worthiness of farmers in the scheme and in extension officials. Difficulty in understanding the recommendations and lack of effective extension services to farmers were hindering the scheme progress. Institutional constraints in terms of lack of adequate infrastructure and trained technical staff hindered the rapid progress and adaptation of SHC scheme among all the farmers. Thus efforts should be focused to remove the institutional constraints to aid the farmers for better use of SHC via more participative training sessions.

Keywords: SHC, SFM, Likert scale, Garrett ranking, STL

INTRODUCTION

Soil is the most fundamental component of plant health. It acts as the sole source of nutrients which the plants can uptake along with water and produce quality yield at the sink. Thus to practice sustainable agriculture soil health plays a vital role. However due to imbalanced use of fertilizers soil health has been deteriorating and has been a cause of concern. It has led to sub-optimal utilization of farm resources as a result of highly skewed application of chemical fertilizers to the soil. So as to get more yields by following intensive agricultural practices after the boom of green revolution, farmers have been using chemical fertilizers indiscriminately, thus destroying the inherent soil capacity. Srivastava and Pandey (1999) reported that based on research studies most of the farmers are continuously using excess of chemical fertilizers so as to get more output without even knowing the fertility status of their soils in field. A study by Yadav *et al.* (2006) says that knowledge level and adoption of Soil Fertility Management (SFM) practices are relatively less; in their study it was found that 65 per cent of farmers had no knowledge about SFM practices and only 8 per cent of the farmers had actually adopted SFM practices in their fields.

With this background being aware of soil health and its nutrient status is the need of the hour so as to maintain crop productivity and sustainability of our lands. Thus the year 2015 was declared as the International year of soils by the united nations general assembly to create awareness about soil health and its wider role in food security, agriculture and sustainable development .To meet the above purpose GOI launched the most ambitious scheme of Soil Health Card (SHC) on 19 February 2015 to distribute SHCs to all the famers based on soil test recommendations of the farmers plots. So that farmers can go for optimal use of fertilizers and maintain soil and crop productivity in the long run. But the extent to which the farmers will participate and make use of the intervention like Soil Health Card depends on the perception of the farmers regarding

*Corresponding author email id: ankhila.ankhe@gmail.com

the new technology or intervention which is the key determinant in adoption. Farmer's perception in turn is influenced by the ease of adoption or clarity with which the intervention is communicated to the recipient population (Boahene *et al.*, 1999). To make effective dissemination of new intervention there will be many constraints in the way to implement it, which in turn will affect the perception and at last adoption. Since perception refers to an individual's current appraisal of a program, assessing farmer's perception as well as the constraints faced by them is an important means to evaluate the knowledge level on a particular issue (Hikson and Keith, 2000). Thus the present study was undertaken to assess the perception of farmer's as well as constraints faced by the farmers and non-farm stakeholders in adoption of Soil Health Cards in Andhra Pradesh. The study will in turn throw light on ways to overcome the constraints and change the farmer's perception for effective implementation of soil health card programme in the study area.

MATERIALS AND METHODS

The study was conducted based on primary data about socio-economic aspects of sample farmers, which were collected through personal interview with the help of specially structured pre-tested interview schedule. Different statements regarding knowledge/awareness level of SHC and its adoption in study area were enlisted and farmer's perceptions were recorded. Perception about constraints in SHC adoption, access to training and extension contact were also recorded. Multi stage sampling method was used to collect data. In Andhra Pradesh two districts namely Chittor and Nellore were randomly chosen, then three blocks each were chosen based on the SHC distribution list to the farmers which were procured via the respective KVKs. Then from sampling frame of villages in the chosen blocks of the districts, 120 SHC holders and 60 Non-SHC holders were chosen randomly which constituted total sample size of 180 farmers for the study.

Perception Analysis – Likert scale technique: To assess the perceptions about the SHC scheme among the farmers, likert scale technique was made use. Likert scale is a psychometric response scale primarily used in questionnaires to obtain participant's preferences or degree of agreement with a statement or set of statements. Likert scales are a non comparative scaling technique and are uni-dimensional (only measure a single trait) in nature. Various statements were constructed to see the perception of farmers like awareness of SHC, timely availability, ease of understanding of SHC, input availability, trustworthiness of farmers. Respondents were asked to indicate their level of agreement with a given statement by way of an ordinal scale of 1-3 which ranges from Agree, Undecided and Disagree about the statements made.

Constraints Analysis –Garrett's ranking technique: To analyze the constraints faced by stake holders in availing the benefit of Soil health card scheme and its implementation, various pre-structured statements were asked to the farmers as well as non-farm stakeholders like AEO, AO, KVK/STL (Soil testing lab) staff etc. The constraints were ranked and then weighed by Garrett's score. Garrett's ranking is a noble technique that provides change of orders of constraints and advantages into numerical scores. The prime advantage of this technique over simple frequency distribution is arrangement of constraints based on their importance from the point of view of respondents. It is also helpful when the same number of respondents on two or more constraints have been given different ranks. Prioritization of constraints using Garrett's ranking technique:

$$\text{Percentage position} = \frac{100\ (R_{ij} - 0.50)}{N_j}$$

Where, R_{ij} = Rank given for the i^{th} item by the j^{th} individual

N_j = Number of items ranked by the j^{th} individual.

The percentage position of each rank will be converted into scores using Garrett table given by Garrett and Woodworth (1969). For each constraint, scores of individual respondents will be added together and divided by total number of respondents for whom scores will be added. Thus, mean score for each constraint would be ranked by arranging them in the descending order. In the same manner, opinion about further prospects will be obtained from stakeholders and then Garrett's ranking technique will be used for prioritizing the statements.

RESULTS AND DISCUSSION

Changes in farmers perception about various socio economic and ecological indicators after SHC: Based on the socio economic characteristics of farmers, set of statements were asked to see the perception of farmers towards the SHC scheme in the study area. Adoption of any technology is dependent on attitude level and openness of stakeholders towards that technology. Thus various statements trying to capture the social, economic and

Table 1: Farmer's perception of usage, savings and ecological benefits after SHC

	Agree (%)	Undecided (%)	Disagree (%)
Usage of SHC			
Awareness level about SHC and fertilizers	77	12	11
SHC information, easy to understand	48	23	29
Extension agency access has increased after SHC	64	12	24
Training programs of SHC are conducted at village	71	15	14
Officials do explain SHC information to farmers	67	12	21
Input savings on SHC			
Reduced expenditure on fertilizers after SHC	57	18	25
Pesticide expenditure reduced after SHC	51	30	19
SHC has led to increased yield at farmers filed	41	22	37
Increased income of SHC users	49	09	42
Ecological benefits of SHC			
SHC has led to reduced use of Nitrogenous fertilizers	52	21	27
SHC has led to reduced use of Phosphorous fertilizers	57	18	25
SHC has led to increased use of Potash (K) fertilizers	43	26	31
SHC has led to increased use of micro nutrients	78	16	6
Pesticide consumption has reduced after SHC	41	29	30
Reduced water pollution in nearby water bodies because of SHC	35	46	19

ecological perception about the SHC scheme were posed to farmers and their responses were recorded on ordinal scale with the help of likert scale technique.

Based on usage of SHC given in Table 1, more than three fourth i.e. 77 per cent of farmers have responded that their knowledge of fertilizers has increased after SHC, the results are consistent with findings of Reddy (2017) where 80 per cent of farmers were found to have good awareness level about SHC even Patel *et al.* (2013) found that less than one fourth of farmers to be having low knowledge level of SHC and fertilizers. But only 48 per cent felt that the SHC information provided is easy to understand, so half of the farmers had difficulty to calculate fertilizer doses based on SHC. 64 per cent expressed that extension agency access has increased while 71 per cent agreed of SHC related training programmes in village and only 67 per cent said that officials do explain the SHC information to farmers. Based on the input savings given in Table 1 after SHC usage, 57 per cent of farmers agreed that their fertilizer consumption has reduced than without SHC. Results are in consistent with findings of Reddy (2017) where he found reduced fertilizer usage after SHC especially in nitrogen. Marginally half of farmers i.e. 51 per cent reported that their pesticide expenditure cost too has reduced while 30 per cent were still undecided about the usage, optimum fertilizer dose reduces pest incidence would be the reason for reduced pesticide expenditure. 41 per cent farmers perceived increased yield after SHC although the increase in yield was moderate. 49 per cent felt that their incomes have increased after SHC mainly on account of reduced cost of cultivation. Similar results were found by Makadia (2012) and Bordoloi and Das (2017) in rice yields after SHC in their studies. Reddy (2017) too reported increased income of farmers up to 30 per cent to be evident after SHC use by farmers. Table 1 related to ecological benefits of SHC greater majority 78 per cent of farmers said increased application of micro nutrients and even gypsum 52 per cent and 57 per cent of farmers reported decreased use of nitrogenous and phosphorous fertilizers while only 43 per cent said increased use of potash fertilizers, the results are in agreement with Mukati *et al.* (2018) and Reddy (2017). In Andhra Pradesh micronutrients are freely supplied as subsidy to farmers along with SHC to encourage application thus majority (78%) had better application of micronutrients after SHC. Farmers were not able to decide about the changes in water pollution

levels due to usage of SHC thus 46 per cent farmers had neutral or undecided opinion on reduced water pollution levels due to SHC, 41 per cent said reduced pesticide application after SHC while only 35 per cent said yes to reduced water pollution levels after usage of SHC as a result of reduced fertilizer and pesticide use.

Many trainings programmes were conducted at village level by the extension workers of KVK and RSK's and SAU departments to make farmers aware about the SHC and make them familiar with use of SHC, thus opinions of farmers holding SHC cards towards the training programme were recorded on various statements and changes perceived after SHC were measured based on agreement or disagreement of farmers for the statements.

Table 2: Farmer's perception of SHC scheme through SHC trainings

Statements	Agree (%)	Neutral (%)	Disagree (%)
Sample representative of all soils in the field	54	24	22
SHC gives exact information	68	15	17
Practical recommendations are given	61	19	20
Inputs are easily available in market	76	17	7
Satisfied with the SHC training or scheme	73	8	19

Based on Table 2 of farmer's perception of SHC scheme after SHC camps or trainings the following outcomes stood out, more than half of the farmers showed positive response to the SHC trainings and felt that their knowledge level has increased with respect to various doubts regarding SHC. 54 per cent farmers agreed that the sample represents their soils well and nearly 70 per cent farmers felt SHC gives prompt information but 20 per cent felt that the recommendations given are not practical for them while 61 per cent agreed that the SHC recommendations were relevant. More than 75 per cent of farmers agreed that inputs and fertilizers told are easily accessible to them in nearby shops. Over all nearly three fourth of the farmers (73%) felt satisfied with the SHC scheme or its usefulness through the trainings provided to them. results of farmers satisfaction with SHC and its information given are in consistent with findings of Chowdary and Theodore (2016) where in their study of Andhra Pradesh they found nearly 67 per cent farmers to be highly satisfied with SHC and its recommendations. These findings also matched with the results of Patel and Chauhan (2012); Pagaria (2011); Yadav *et al.* (2006) and Srivastava and Pandey (1999).

Constraints faced by farmers and non-farm stakeholders in SHC adoption: Various statements were asked with the help of questionnaire to farmers as well as nonfarm stakeholders like officers of KVK, extension workers, AO and AEO's and staff of soil testing labs. Garrett ranking technique was used to rank the constraints based on their decreasing order of difficulty.

Table 3: Perceived constraints by farmers in adoption of SHC

Particulars	Average score	Garrett ranking
Samples collected in farmers absence	72.41	1
Lack of timely availability of SHC	72.03	2
complex to understand/ adopt the recommendations	64.97	3
No certainty of gain in yield	57.8	4
Irregular extension services	45.9	5
No proper scientific and timely guidance	45.54	6
High cost of micro and macro nutrients	40.56	7
Lack of training about SHC	39.41	8
Lack of inputs nearby to farmer	33.74	9
Lack of awareness of SHC and its use	25.51	10

Based on the mean scoring and obtained Garrett rankings, it's evident from Table 3 that samples collected in farmers absence and lack of timely availability of SHC before the sowing were found to be the major constraints with first and second ranks. Complexity to understand or calculate and no guarantee of yield occupied third and fourth ranks in order of constraints faced. Lack of timely guidance by experts and access to extension services also were placed among top six constraints.

While being aware of SHC was not a problem as almost all had heard or aware of SHC and availability of inputs nearby and high cost of inputs were placed at eighth and ninth rankings as it did not make much problem to farmers. Similar results were found by Reddy (2017) where farmers did not feel that the soil samples belonged to their field as major constraint and many did not understand the contents hence could not follow the recommendations. The study had similar opinion about the extension access as a constraint where they found that only 44 per cent

farmers mentioned that extension officers explained the content. An early study by Datta *et al.* (1985) too pointed out to the lack of extension services as a major constraint in West Bengal for optimum fertilizer consumption. Study by Mukati (2016) too emphasized that complexity to calculate the recommendations and sample collection in farmer's absence and untimely dispatch of SHC as major problems in effective implementation of SHC. Study by Chowdary and Theodore (2016) also had similar results with inadequate follow up by extension as major constraint and also no visible results in yield. Our findings were also in consistent with major study by Fishman *et al.* (2016) in Bihar regarding SHC impact assessment where, lack of understanding of SHC recommendations by farmers and lack of reliability of SHC samples to be their own field samples as major constraint in hindering the adoption of recommended doses of SHC. Similar results were found by Mahendrasinh (2016) in his study of SHC in Gujarat's district. Understanding capacity for adoption and lack of demonstrations or trainings for the SHC intervention were among the top ten constraints listed, which corroborates with the results of study made to assess famers adoption of innovations and its spread by Hema *et al.* (2018).

In case of nonfarm stakeholders like extension workers, Agriculture officers (AO's and AAO's) and KVK staff including Subject matter specialists were asked about the constraints faced by them in effective implementation of SHC program. The constraints were ranked based on Garrett ranking technique, as given in Table 4, lack of skilled human resource to train farmers about SHC and lack of required physical infrastructure for soil testing and inadequate funding for the same were the major constraints which need immediate attention. Deficit of training support to staff for soil testing and man power for effective distribution of SHC during the season, which in turn resulted in heavy burden on the staff leading to untimely allocation of SHC to farmers were the other major problems faced by the staff. The results are consistent with the findings of Reddy (2017) where lack of skilled manpower, poor physical infrastructure and instruments for soil testing and lack of training support to STL workers were hindering the capacity of the program. Arun *et al.* (2017) in their study pointed out to the lack of timely and adequate funding by the government, as major constraint in government led program like Mahatma Gandhi national rural employment guarantee scheme and the constraint holds true in implementation of SHC program also, delaying effective implementation of SHC as top fourth constraint in our study. Patel (2013) in his studies pointed to lack of qualified staff and supporting human resource as major constraint of SHC along with sophisticated facilities at lab. Dubey (2018) had got similar results in her study of SHC in Madhya Pradesh district regarding constraints faced by farmers as well as staff of SHC scheme in effective implementation of the scheme.

Table 4: Perceived constraints by the Nonfarm stakeholders (AO, AAO, KVK and STL)

Particulars	Average score	Garrett ranking
Lack of skilled HR (Human resource) to train farmers	71.62	1
Inadequate physical infrastructure for Soil testing	65.86	2
Lack of man power for distribution of SHC in season	62.38	3
Inadequate funding by government	59.64	4
Lack of training support to staff for soil testing	56.28	5
Excessive burden on staff	53.86	6
Lack of printing and laminating facilities	40.56	7

CONCLUSION

Soil health card is a novel scheme of Government of India, which aims for sustained production system by streamlining optimum use of fertilizers among farmers so as to meet the long term goals of cleaner, safer and sustainable agriculture production. Based on the study it can be concluded that there is quite good awareness levels among farmers within short span of 3 years of the program which was launched across India in 2015. But practical participation of farmers is not so high in exposure visits and meetings .More campaigns need to be held to make them familiar with SHC use and how out reduces cost and thus change in their profitability levels though yield gains may be at moderate levels .Successful famers or lead farmers can be chosen and incentivized to train the fellow farmers or exposure visits to such fields and farmers must be made on regular basis to believe the facts.

On the whole it can be concluded based on farmer's perceptions that, there is reduced use of fertilizers in terms of nitrogen and phosphorous which is encouraging to correct the skewed fertilizer ratio towards nitrogen and even pesticide application has reduced to some extent. Significant change can be seen in micronutrients application where majority have adopted to use micronutrients which they did not do before SHC, it can be attributed to free

supply of micronutrients along with SHC in Andhra Pradesh. Such incentives need to be taken up in other states also in initial years to encourage farmers to go for micronutrients and realize their benefits on crop growth.

There is dire need to strengthen the extension machinery to train farmers and be easily accessible for them and also make timely availability of SHC to farmers as it decides the trustworthiness of the scheme among existing SHC holders. From the institutional side strong support system in terms of human resource and physical infrastructure and sophisticated machinery, trained technical staff is lacking and needs immediate attention for the success of the program in coming days. Finally given the constraints of time and resource availability government should focus more on quality of the SHC than just mere quantity of SHC to cover all the farmers which may not lead to success in the long run. Hence trust building in the initial years should be the key for effective implementation of the scheme and to make the farmers realize the worth of the optimum fertilizer usage in the long run.

REFERENCES

Acess: http://www.aau.ac.in/data/reports/Impact-of-Soil-Health-Card-Scheme.pdf

Anil, K.; P. Singh; S. Kumar; A.K. Gautam and A.P. Singh. 2017. Constraints perceived by officials and non-officials associated with mahatma gandhi national rural employment guarantee programme. *Journal of Community Mobilization and Sustainable Development,* 12(2): 272-276.

Baliwada, H.; J.P. Sharma; R.R. Burman; M.S. Nain; P. Venkatesh and A. Kumar. 2018. A study on instigation of farmer-led innovations and its spread. *Journal of Community Mobilization and Sustainable Development*, 13(1): 17-26.

Boahene, K.; T.A.B. Snijders and H. Folmer. 1999. An integrated socio-economic analysis of innovation adoption: The case of cocoa in Ghana. *Journal of Policy Model*, 21(2): 167-184.

Bordoloi, J. and A.K. Das. 2017. Impact of soil health card scheme on production, productivity and soil health in Assam. Study No.148. Agro-Economic Research Centre for North-East India, Assam agricultural University, Jorhat-Assam.

Chowdary, K.R. and R. Theodore. 2016. Soil health card adoption behaviour among beneficiaries of *Bhoochetana* project in Andhra Pradesh. *Journal of Extension Education*, 28(1): 5588-5597.

Datta, S.K.; S. Bhattacharya and R. Pattanaik. 1985. Constrains to use fertilizer in West Bengal agriculture, A register of research in India, Published by National Institute of Rural Development, Ministry of Agriculture, Government of India, Hyderabad. p-14.

Dubey, M. 2018. Impact assessment of soil health card scheme on income and nutrient management practices in major crops among the farmers of raisen district in Madhya Pradesh. M.sc. (Ag.Ext) Thesis, Indira Gandhi Krishi Vishwavidyalaya Raipur, Chhattisgarh.

Fishman, R.; A. Kishore; Y. Rothler and P. Ward. 2016. Can Information Help Reduce Imbalanced Application of Fertilizers in India? Experimental Evidence from Bihar (No. 235705). Agricultural and Applied Economics Association.

Garret, H.E. and R.S. Woodworth. 1969. Statistics in Psychology and Education. Vakils, Feffer and Simons Pvt. Ltd., Bombay. p-329.

Hikson, M. and Keith, L. 2000. The attitudes and perceptions of high school administrators toward agricultural science teachers in Texas. Proceedings of the Southern Agricultural Education Research Conference. Lexington, KY.

Mahendrasinh, C.J. 2016. Perception and efficiency of soil health card by the farmers of Navsari district. M.Sc. (Ag.) Thesis, Navsari Agricultural University, Gujarat.

Makadia, J.J. 2012. Regional imbalance and impact of Soil health Card on Fertilizer consumption in Gujarat. Ph.D. Thesis, Navsari Agricultural University, Gujarat.

Mukati, A. 2016. Farmer's perception regarding soil health card- a study in Tikamgarh district of Madhya Pradesh. M.Sc. (Ag) thesis, Jawaharlal Nehru Krishi Vishwavidyalaya, Madhya Pradesh.

Mukati, A.; K. Bisht; S.P. Singh and S. Raghuwanshi. 2018. Farmers perception regarding soil health card. *International Journal of Chemical Studies*, 6(6): 307-310.

Pagaria, P. 2011. Knowledge and attitude of small and marginal farmers towards soil testing. *Journal of Advances in Developmental Research*, 2(2): 171-173.

Patel, J.K. and Chauhan, N.B. 2012. Attitude of farmers towards soil health card (SHC) programme. *Asian Journal of Soil Science*, 7(1): 114-116.

Patel, N.G. 2013. Attitude of the farmers towards soil health card programme. M.Sc. (Ag), Anand Agricultural University, Gujarat.

Reddy, A.A. 2017. Impact Study of Soil Health Card Scheme, National Institute of Agricultural Extension Management (MANAGE), Hyderabad-500030, pp.210.

Srivastava, Y.C. and Pandey, A.P. 1999. Knowledge and Attitude of Small and Marginal Farmers towards Soil Testing. *Agricultural Extension Review*,11(6): 3-6.

Yadav, V.P.S.; R.S. Raman and R. Kumar. 2006. Knowledge and attitude of farmers towards soil testing practices. *Indian Research Journal of Extension Education,* 6(3): 1-3.

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Group Dynamics Effectiveness among the Women Self Help Group Members of New Alluvial Zone of West Bengal, India

Sanchita Garai* and Sanjit Maiti
Division of Dairy Extension, NDRI, Karnal–132001, Haryana

ABSTRACT

Group dynamics is the internal nature of the group as to how they are formed, what their structure and process are, how they function and affect individual members, group and the other organization. The present study was designed in purposively selected district of Nadia, West Bengal, India to understand the group dynamics among the Self Help Group members. A sample of 200 Self Help Group members were randomly selected from 20 credit linked SHGs of the district. Majority of the Self Help Group members were in medium category of group dynamics effectiveness. Personal characteristics like extension contact, age of the Self Help Group members, cosmopoliteness-localiteness, number of training attended and economic motivation were important to predict group dynamics effectiveness among the Self Help Group members.

Keywords: Group dynamics, Self help groups

INTRODUCTION

The concept of Self Help Groups (hereinafter SHG) gained significance, especially after 1976 when Prof. Mohammed Yunus of Bangladesh began experimenting with micro-credit and women SHGs. The strategy made a quiet revolution in Bangladesh in poverty eradication 'by empowering the poor women'. In India, Kerala showed the way of empowering women through self help group approach. In India, this concept of SHG gained momentum during IX Five Year Plan (1997-2002) with the Planning Commission giving impetus to women empowerment through formation and operation of the self help groups (Jayaraman, 2008; Lina *et al.*, 2008; Sreedaya *et al.,* 2008; Gopal *et al.,* 2010; Rana and Ansari, 2019). Usually SHGs comprises of 10-20 homogenous women or men, organized through initiatives by Governmental Department or Non-Governmental Organization (NGOs), usually aimed at some development intervention at the grass root level.

The success of any group activity depends on the group dynamics. Group dynamics is the interaction and interpersonal relationships between members of a group and the ways in which groups form, function, and dissolve. Group dynamics is an important aspect of successful teamwork and is a factor influencing the outcome of any form of group activity. Issues of power, influence, and interpersonal conflict all affect dynamics and group performance (Gopal *et al.,* 2010). Group cohesiveness, group sustainability, cooperation among group members and confirmation to group norms are the factors mostly affecting the functioning of the groups in getting good profits (Shivamurthy *et al.*, 2007). Improper selection of group activities, lack of cooperation and zeal among the members of the group, non-availability of adequate amount of raw materials, lack of demand of the products and lack of marketing facilities are a few problems confronting the performance of self help groups (Rao, 1999 and Anand, 2004). In this present backdrop, the study was designed to address the scenario of group dynamics effectiveness among the SHG members and to trace out the most important personal characteristics of SHG members for better group dynamics in the group.

MATERIALS AND METHODS

Locale of the study: The present study was conducted in the purposively selected state of West Bengal, India. As the study demanded an in-depth analysis of members of the self help groups and their micro-financing activities, then, a thorough knowledge of the local culture, language and tradition prevailing in the area was inevitable. Hence, the state of West Bengal was selected because researcher

*Corresponding author email id: sanchita.bckv@gmail.com

was well acquainted with the local socio-cultural scenario. There are 15 climatic zones in India (Planning Commission, 1989). Among these 15 zones, 3 zones are fallen in West Bengal. These three zones are 1) Eastern Himalayan region 2) Eastern plateau & hilly region 3) Lower gangetic plain region. Again these three zones are subdivided into six sub agro climatic zone. Out of six sub agro climatic zones, the New Alluvial Zone was selected purposively for present study as this zone is the heart of West Bengal in terms of agricultural productivity, animal husbandry proficiency and efficient in all terms of development for the sustainable livelihood security of rural people.

The New Alluvial Zone of West Bengal is consist of whole Nadia district, western part of Malda and South Dinazpur, Southern part of North Dinazpur, Eastern part of Mursidabad, Burdwan, Hooghly and Howrah, and Northern part of North & South 24 Parganas. So, from above lay out, it is easily understandable that only whole Nadia district fallen in New Alluvial zone. Hence, Nadia District was selected purposively for this study.

Selection of the sample: There are four sub-divisions in Nadia District namely Ranaghat, Sadar Krishnagar, Tehatta and Kalyani. Among these four sub-division, two sub-division i.e. Ranaghat and Sadar Krishnanagar were selected purposively as these two sub-divisions had the highest number of credit linked SHGs. Further, four community development blocks namely Ranaghat–I and Ranaghat–II block from Ranaghat sub-division; and Krishnanagar-II and Nakashipara block from Sadar Krishnanagar sub-division were selected purposively as these four blocks from two sub-divisions had the highest number of credit linked SHGs at the time of data collection. So, a total of four blocks were covered under this study. Complete list of credit linked SHGs of these four blocks were collected from the office of concerned Block Development Officer. From each selected block, 5 credits linked Self-Help Groups were selected randomly. Hence, a total 20 credit linked Self-Help Groups were covered under this study. From each credit linked SHG, 10 members were selected randomly. Thus, a total 200 SHG members were studied under this research project.

Measurement of group dynamics effectiveness among the SHG members: Group dynamics effectiveness is operationalized for this study as the interaction forces among group members in the group, how the group were formed, their structure, process, and how do they function and effect of individual members, other groups and the organization. In the present study, 'Group Dynamics' of members of Self Help Groups was quantified with an index called as "Group Dynamics

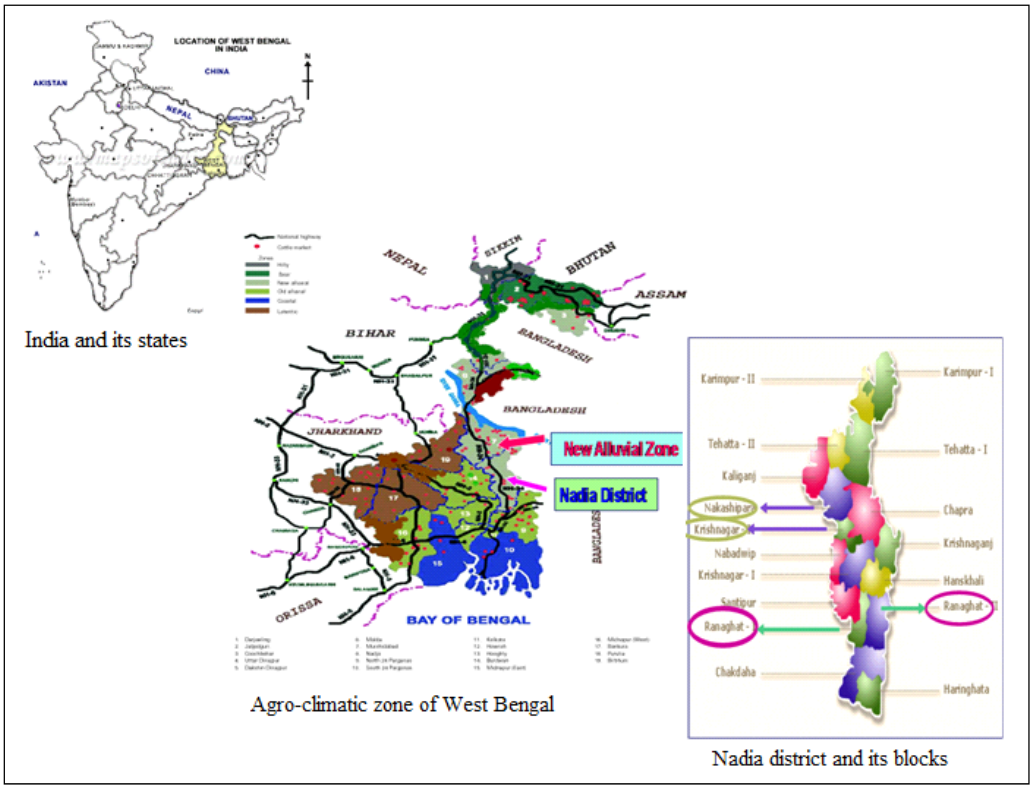


Figure 1: Locale of the study

Effectiveness Index (hereinafter GDEI)" developed by Purnima (2004). Indicators of the index, their measurement procedure and weightage are presented in Table 1.

For the computation of Group Dynamics Effectiveness Index (GDEI), the raw scores of each of the indicators were first normalized (by using the equitation no i) and then multiplied by the corresponding weightage of that indicator. These scores were then added up to get the GDE score of each respondent (by using the equation no ii). Average GDEI score of each group were considered as GDEI score of that SHG.

$$\text{Normalized score } (N_{ij}) = \frac{X_{ij}-X_{min}}{X_{max} - X_{min}}$$

Group Dynamics Effectiveness Index (GDEI) = "$W_j N_{ij}$

Where, X_{ij} = raw score of i^{th} respondent of j^{th} indicator

X_{min}/X_{max} = minimum/maximum score of the j^{th} indicator, respectively

N_{ij} = normalized score of the i^{th} respondent of j^{th} indicator

W_j = Weightage of the j^{th} indicator

Data collection: A structured interview schedule was prepared based on the 11 (eleven) independent variables and 14 indicators of GDEI. Developed interview schedule was pretested during pilot study of the project at non-sample area of the district and suitable modification was done for final study. Based on review of literature, eleven independent variables were considered for this study and these were; age of the SHG member, education, family size, number of training attended, total training duration, operational land holding, extension contact, mass media exposure, cosmopoliteness-localiteness, economic motivation and innovation proneness. Data were collected from the door step of the SHG members through personal interview method.

RESULTS AND DISCUSSION

Self Help Groups and their Group Dynamics Effectiveness Index (GDEI): Table 2 and Figure 2 represents a quick view of computed GDEI score of selected twenty SHGs. *Milan Samiti* had the highest GDEI score of 50.25 and *Teyas* SGSY had the lowest GDEI score of 23.75. Mean GDEI score of the twenty SHGs was 36.58 with the standard deviation and range was 8.85 and 26.50, respectively. This results indicated that a wide variation among the groups.

From Sadar Krishnanagar sub-division, two blocks *i.e.* Nakashipara and Krishnanagar-II were under study. In Nakashipara block, *Milan Samiti* had the highest GDEI score of 50.25 where as *Nari Kalian Swanirvar Dal* had the lowest GDEI score of 37.72. Average GDEI score among all the groups of this block was 46.74 with the standard deviation and range was 5.17 and 12.53. In

Table 1: Indicators of group dynamics effectiveness with their measurement procedure and weightage

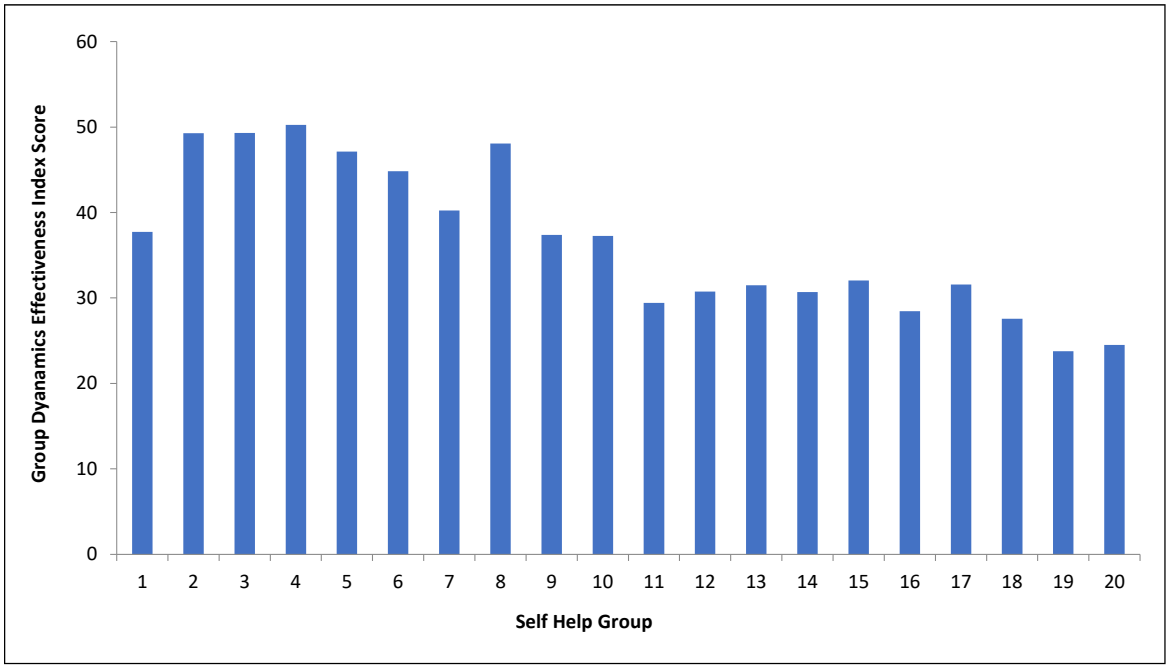
Name of the indicators	Measurement Procedure	Weightage
Participation	Procedure followed by Purnima (2004)	0.9
Team work	Procedure followed by Purnima (2004)	0.8
Group atmosphere	Procedure followed by Pfeiffer and Jones (1972)	0.8
Interest and motivation	Procedure followed by Ganguly (2005)	0.7
Decision making procedure	Procedure followed by Ganguly (2005)	0.7
Group cohesiveness	Scale developed by Mangasri (1999) with modifications	0.7
Group leadership	Procedure followed by Pfeiffer and Jones (1972)	0.6
Group communication	Scale developed by Mangasri (1999) with modifications	0.6
Interpersonal trust	Procedure followed by Ganguly (2005)	0.6
Empathy	Procedure followed by Ganguly (2005)	0.6
Task function	Procedure followed by Ganguly (2005)	0.6
Maintenance functions	Procedure followed by Purnima (2004)	0.6
Conformation to group norms	Scale developed by Mangasri (1999) with modifications	0.8
Achievement of the SHG	Procedure followed by Ganguly (2005)	1.0
	Total	**10**

Table 2: Self Help Groups and their Group Dynamics Effectiveness Index (GDEI)

Sub-Division	Block	Name of the SHG	GDEI Score	Remarks		
Krishnanagar Sadar	Nakashipara	*Nari Kalian Swanirvar Dal*	37.72	Mean - 46.74 SD - 5.17 Range - 12.53		
		Unnati Swarojkar Dal	49.29			
		Mahabharat Swarojkar Dal	49.31			
		Milan Samiti	50.25			
		Samaj Samiti	47.12		Mean - 41.15 SD - 5.43 Range - 12.99	
	Krishnanagar- II	*Maitri Mahila Samiti*	44.83	**'t' value 1.65**		
		Sonar Bangla	40.22	Mean – 41.55 SD – 4.77 Range – 10.81		
		Nibedita Swanirvar Dal	48.07			
		Maitri Swanirvar Dal	37.38			
		Sonar Tari Swanirvar Dal	37.26			Mean - 36.58 SD – 8.85 Range – 26.50
Ranaghat	Ranaghat- I	*Barasat Pritilata Swanirvar Samiti*	29.42		**'t' value 7.44****	
		Barasat Machandi Swanirvar Dal	30.76	Mean – 30.87 SD – 0.98 Range – 2.61		
		Jaiguru Swanirvar Dal	31.48			
		BarasatMabhavaniSwanirvar Dal	30.68		Mean – 29.02 SD – 2.95 Range – 8.28	
		Barasat Annadata Swanirvar Dal	32.03	**'t' value 1.65**		
	Ranaghat - II	*Silpi Dal*	28.46			
		Sonali Swanirvar Dal	31.57	Mean -27.17 SD – 3.16 Range – 7.82		
		Makali SGSY	27.56			
		Teyas SGSY	23.75			
		Krishi SGSY	24.49			

Significant at 5 % level of significance ** Significant at 1 % level of significance

Figure 2: SHGs and their GDEI Score



Legends: 1. *Nari Kalian Swanirvar Dal ;* **2.** *Unnati Swarojkar Dal ;* **3.** *Mahabharat Swarojkar Dal ;* **4.** *Milan Samiti;* **5.** *Samaj Samiti;* **6.** *Maitri Mahila Samiti;* **7.** *Sonar Bangla;* **8.** *Nibedita Swanirvar Dal;* **9.** *Maitri Swanirvar Dal;* **10.** *Sonar Tari Swanirvar Dal;* **11.** *Barasat Pritilata Swanirvar Samiti;* **12.** *Barasat Machandi Swanirvar Dal;* **13.** *Jaiguru Swanirvar Dal;* **14.** *Barasat Mabhavani Swanirvar Dal;* **15.** *Barasat Annadata Swanirvar Dal;* **16.** *Silpi Dal;* **17.** *Sonali Swanirvar Dal;* **18.** *Makali SGSY;* **19.** *Teyas SGSY;* **20.** *Krishi SGSY*

Krishnanagar-II block, *Nibedita Swanirvar Dal* had the highest GDEI score of 48.07 while *Sonar Tari Swanirvar Dal* had the lowest GDEI score of 37.26. Average GDEI score of this block was 41.55 with the standard deviation and range was 4.77 and 10.81, respectively. Calculated "t" value between the two blocks of Sadar Krishnanagar sub-division *i.e.* Nakashipara and Krishnanagar-II was 1.65 and it was found statistically non-significant. Then, it may be concluded that SHGs of these blocks had no difference in terms of their GDEI.

From Ranaghat sub-division, two blocks *i.e.* Ranaghat-I and Ranaghat-II were under study. In Ranaghat-I block, *Barasat Annadata Swanirvar Dal* had the highest GDEI score of 32.03 while *Barasat Pritilata Swanirvar Dal* had the lowest GDEI score of 29.42. Average GDEI score among all the groups of this block was 30.87 with standard deviation and range was 0.98 and 2.61, respectively. From this result, it may be concluded that there was a great homogeneity among the five SHGs of this block but they had lower GDEI score in comparison with the overall average and two blocks of Sadar Krishnanagar sub-division. In Ranaghat-II block, *Sonali Swanirvar Dal* had the highest GDEI score of 31.57 while *Teyas* SGSY had the lowest GDEI score of 23.75. Average GDEI score of this block was 27.17 with standard deviation and range was 3.16 and 7.82 respectively. Ranaghat-II has the worst scenario in terms of their GDEI score because this block's average score was far behind overall average score. Calculated "t" value between these blocks was 2.50 and it was found statistically significant. Then, it may be easily concluded that there was a significant difference among the groups of these two blocks. This difference was may be due to difference in attitude and commitment of among the members of SHG of these two blocks. Economic activities of the groups were more diversified and there were two male SHGs in each block. These factors *i.e.* diversified economic activities and presence of male SHG may be the cause of significant difference.

From the same table, it may be concluded that the average GDEI score among the SHGs of Sadar Krishnanagar sub-division (41.15) was higher than the average GDEI score among the SHGs of Ranaghat sub-division (29.02). Calculated "t" value between these two selected sub-division was 7.74 and it found statistically significant. One interesting result was found from this table that all the groups of Sadar Krishnanagar sub-division had the higher GDEI score than overall average while all the groups of Ranaghat sub-division had lower GDEI score than the overall average.

Distribution of SHG members based on their group dynamic effectiveness index (GDEI): Table 3 revealed that the majority (63.50%) of respondents were belonged to the medium category for group dynamic effectiveness followed by 21.50 per cent respondents in high category and rest 15 percent among the low category. Mean group dynamics effectiveness score was 36.58 with standard deviation and range as 9.78 and 39.97, respectively. It may be concluded that there was a wide variation among the respondents in term of their contribution in group dynamics effectiveness.

Table 3: Distribution of the SHG members based on their GDEI (n=200)

Category	Score	Frequency	Percentage	Remarks
Low	Less than 26.80	30	15.00	Mean – 36.58
Medium	26.80 to 46.36	127	63.50	SD – 9.78
High	More than 46.36	43	21.50	Range – 39.97

Relationship between personal characteristics and group dynamics effectiveness of SHG members: Table 4 indicated the correlation coefficient between the socio personal, socio-economic, communication, psychological variables with the group dynamics effectiveness of SHG members. It was observed that family size and operational land holding had shown significantly negative correlation with group dynamics effectiveness. Due to the large family size, the members were involved more in household activities and they didn't spent more time in group activity. SHG members having more operational land holding had less time and importance in group activity because of sufficient income.

Other variables like age, education, number of training attended, total training duration, extension contact, mass media exposure, cosmopoliteness– localiteness, economic motivation and innovation proneness had shown positively significantly correlation with GDE of SHG members at 1 percent level of significance. With the high level of economic motivation and education, members were more participative, task oriented, cohesive and obeyed to the group norms. Importance of training in success of any programme is a well establish fact. Hence, SHGs should approaches in past to formulate the training module which must not only take care of imparting knowledge but also

Table 4: Relationship between socio personal, socio-economic, communication, psychological traits of SHG members with their Group Dynamic Effectiveness Index (GDEI) (n=200)

Variable ID No.	Independent Variables	"r" Values
X_1	Age	0.573**
X_2	Education	0.408**
X_3	Family size	-0.331**
X_4	Number of training attended	0.491**
X_5	Total training duration	0.545**
X_6	Operational land holding	-0.413**
X_7	Extension contact	0.666**
X_8	Mass media exposure	0.596**
X_9	Cosmopoliteness - localiteness	0.642**
X_{10}	Economic motivation	0.438**
X_{11}	Innovation proneness	0.294**

** Significant at 1 % level of significance

to increase their managerial skill, and social acceptability in terms of gender equity and equality. Hence, all the variables had a significant relationship with group dynamics effectiveness, then, all the variables were considered for further analysis.

This result was in the line of Ganguly (2005). But, Vipinkumar (2000) found that characteristics like, education, farm size, socio-economic status, extension orientation, scientific orientation, cosmopoliteness, knowledge, attitude to other farmers and information source use pattern were positively related to group dynamics effectiveness of SHG members of Kerala state of India. Whereas Gopal *et al.* (2010) reported that personal characteristics like, economic motivation, social participation, training undergone, educational qualification and risk orientation were positively related with group dynamics effectiveness. Jyoti *et al.* (2019) also concluded that participation of the SHG members was the major determinant of the success of the entrepreneurial activity of the group.

Identification of most significant characteristics of SHG members for better group dynamics effectiveness: Stepwise regression mainly forward selection method was followed to identify the most significant characteristics of SHG members for better group dynamics effectiveness. In this analysis, F-value for inclusion was 0.005 and for deletion, it was 0.01. It was also found that 10 independent variables were included in the model. The variable education (X_2) was excluded in the model as its F value was too small (less than 0.005) to continue. The coefficient of multiple determination indicated that 10 variables included in the regression equation could predict 70.5 per cent of the dependent variable i.e. group dynamic effectiveness index of the SHG members. But, Vipinkumar (2000) expressed that personal and socio-psychological characteristics of SHG members can explain 83.99 percent of variation of group dynamics effectiveness.

Table 5 depicts that the first variable to enter the stepwise multiple regression equation of the SHG members was extension contact. This variable had highest contribution of 44.40 percent in predicting the dependent

Table 5: Stepwise multiple regression analysis of Group Dynamic Effectiveness Index (GDEI) on independent variables of SHG members (N =200)

Step no.	Variables entered	Multiple R^2	Increase in R^2	F to enter	No of independent variables included
1	X_7 Extension contact	0.444	0.444	158.19	1
2	X_1 Age	0.567	0.123	55.84	2
3	X_9Cosmopoliteness – localitenses	0.612	0.045	22.65	3
4	X_4 Number of training attended	0.650	0.038	21.22	4
5	X_3 Family size	0.666	0.016	9.60	5
6	X_6 Operational land holding	0.679	0.013	7.88	6
7	X_{10} Economic motivation	0.691	0.012	6.99	7
8	X_8 Mass media exposure	0.699	0.008	5.12	8
9	X_{11} Innovation proneness	0.704	0.005	3.538	9
10	X_5 Total training duration	0.705	0.001	0.66	10

F – value too small to continue

variable (GDEI). The second variable to enter was age, which contributed 12.30 percent in predicting the dependent variable (GDEI). Both the variables jointly contributed 56.7 percent in predicting dependent variable GDEI. In this way 10 variables jointly contributed 70.50 percent in predicting the GDEI. Whereas Vipinkumar (2000) reported that socio-economic status and extension contact were the two important characteristics of the SHG group members of Kerala. Hence, present study established the available research findings. If policy makers and researchers wish to accelerate the group dynamics effectiveness, then, they have to give more importance to extension contact of the SHG members.

CONCLUSION

Group cohesiveness and its internal metabolism is most important factor for success of that particular group. Self help groups, made with an aim of empowerment and poverty eradication among the millions of poor rural masses, is not exception of this. The present study highlighted the group dynamics scenario of most successful SHGs of Nadia district of West Bengal, India. It was found that overall group dynamics effectiveness scenario was encouraging. Resource poor rural masses are trying to transform their livelihood scenario by helping each other. Policy makers or development planners should look after some personal characteristics like extension contact, more younger members, capacity building of SHG members etc. Then, this empowerment and poverty alleviation programme will get another momentum.

REFERENCES

Anand, J.S. 2004. Self-Help Groups in Empowering Poor Women-Some Experience from Kerala, India. In: Alleviating Poverty: Case Studies of Local Level Linkages and Processing in Developing World. Eds: Menon, V.; P.G. Nair and K. N. Nair. Rainbow Publishers, Noida, pp. 285-309.

Aronson, E. 2008. The Social Animal. New York: Worth Publishers.

Ganguly S. 2005. Self Help Group Dynamics. MSc thesis (Unpublished), National Dairy Research Institute, Karnal, Haryana, India

Ghosh, S.; A. Kumar; P. Nanda and P.S.B. Anand. 2010, Group Dynamics Effectiveness of Water User Associations Under Different Irrigation Systems in an Eastern Indian State. *Irrigation and Drainage*, 59: 559–574. doi: 10.1002/ird.514

Gopal, N.; J.C. Jeeva; R. Parvathy and M. Nasser. 2010. Assessment of Group Dynamics among Fisherwomen Self Help Groups: A Participatory Monitoring Approach. *Journal of Global Communication,* 3(2): 23-28.

Hogg, M.A. and K.D. Williams. 2000. From I to We: Social Identity and the Collective Self. *Group Dynamics: Theory, Research, and Practice*, 4: 81. doi:10.1037/1089-2699.4.1.81

Jayaraman, R. 2008. Performance Analysis of Fisherwomen Self Help Groups. *Tamil Nadu Journal of Veterinary and Animal Sciences*, 4(2): 52-55.

Jyoti, M.D.; S. Borah and D.M. Dutta. 2019. Participation of the Members of Self Help Groups of Jorhat District of Assam in Different Entrepreneurial Activities. *Journal of Community Mobilization and Sustainable Development*, 14(3): 614-617.

Lina, J.; A. Prema and S. Krishnan. 2008. Determinants of Group Performance of Women-Led Agro-Processing Self-Help Groups in Kerala. *Agricultural Economics Research Review*, 21 (Conference Number): 355-362.

Mangasri, K. 1999. Empowerment of DWCRA Groups in Ranga Reddy District of Andhra Pradesh. Ph.D. Thesis (Unpublished), Acharya N G Ranga Agricultural University, Hyderabad, India

Pfeffer, J.W. and E.J. Jones. 1972. Annual Handbook for Group Facilitators. Vol. 3. Pfeiffer & Company, San Diego. California. p. 19–24.

Purnima, K.S. 2004. Women Self-Help Group Dynamics in the North Central Zone of Andhra Pradesh, Ph.D. thesis (Unpubl.). Acharya N.G. Ranga Agricultural University, Hyderabad, India

Rana, K. and M.A. Ansari. 2019. Women Empowerment through Self Help Groups: A Study in Northern Himalayan State of India. *Journal of Community Mobilization and Sustainable Development*, 14(3): 389-396.

Rao, M.K. 1999. Organizing and Implementing Income Generating Activities through Self-Help Groups in Fisheries and Agriculture, NABARD, Bangalore. pp. 350.

Shivamurthy, M.; O. Sarada; H. Shailaja and N.R. Gangadharappa. 2007. Functional Characteristics of Rural Women Self Help Groups. *Indian Journal of Extension Education*, 43(3&4): 78-82.

Sreedaya, G.S.; N.P.K. Sushama and S.M. Nehru. 2001. Perception of Officials about Self Help Groups Involved in Vegetable Cultivation. *Journal of Tropical Agriculture*, 39: 87-88.

Vashisht, S.; K. Khanna; R. Arora and N. Yadav. 2008. Dimensions of Group Dynamics Effectiveness of Self Help Groups of Rural Women in Haryana. *Indian Research Journal of Extension Education*, 8 (1): 42-45.

Vipinkumar, V.P. and B. Singh. 2000. Correlates of Effectiveness of Self Help Group Dynamics of Horticulture Farmers. *Journal of Extension Education,* 11(2): 2795-2801.

Wageman, R. 1995. Interdependence and Group Effectiveness. *Administrative Science Quarterly*, 40 (1): 145–180. doi:10.2307/2393703

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Bottlenecks of Potato Growers and Ways to Ameliorate Them: Micro Level Study from Kannauj District of Uttar Pradesh

Ashwani Kumar Verma[1]*, R.K. Doharey[2], Sachchidanand Upadhyay[3], S.K. Dubey[4] and Kaushik Prashad[5]

[1,3]Research Scholar, C.S.A. University of Agriculture and Technology, Kanpur, Uttar Pradesh

[2]Associate Dean, College of Agriculture, Azamgarh Campus, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

[4]Principle Scientist ICAR-ATARI, Zone III, Kanpur, Uttar Pradesh

[5]Assistant Professor, Department of Agricultural Extension, Rama University, Kanpur, Uttar Pradesh

ABSTRACT

Horticulture sector has become one of the major drivers of growth in the agriculture sector and it share about 30 per cent among total agriculture output. Potato (*Solanum tuberosum* L.) is considered to be one of the most epochal horticultural crops in the world because of its most affordable and most accessible food, which provide copious health benefits. In Uttar Pradesh, Kannauj district is an abundant producer of the potato crop. The study was conducted in Jalalabad block of Kannauj district of Uttar Pradesh. A simple random sampling method was used to select 125 respondents out of total 1338 potato growers from the selected five villages. The study reveals that according to degree of seriousness of constraints the maximum number of respondents faced constraints like, the constraint under socio-psychological was found most important constraints, *i.e.* 'skilled farm workers are hardly available'. Under economical constraints, the most important constraints *i.e.* 'costly diesel charges, and 'corruption of credit sanctions. Under technological constraints, the most important constraints were 'non-availability of quality HYV seeds. Under transportation constraints, the most important, was 'indigenous transport-means *viz.*, bullock cart, dunlop, tonga take much time and causes more inconvenience in transporting the products. Under post harvest technological constraints, the most improvement were 'lack of space in house of potato farmers for storing the products. The suggestive measures to overcome the constraints in potato production technology as perceived by the respondents were "suitable approach for the safeguard of the crop against the animal (blue calf)". Most frequently opined remedial measures expressed by the respondents and field observation made by the investigator was ensuring the fencing of the farmers' farm as appropriately as possible

Keyword: Personal interview constraint, Potato, Random sampling, Suggestive measures

INTRODUCTION

Potato (*Solanum tuberosum* L.) popularly known as 'The king of vegetables', has emerged as fourth most important food crop in India after rice, wheat and maize. Indian vegetable basket is incomplete without Potato. Because, the dry matter, edible energy and edible protein content of potato makes it nutritionally superior vegetable as well as staple food not only in our country but also throughout the world. Potato contributes about 1.23 per cent to the gross production from agricultural and allied activities in India (Prasad, 2006). Potato is a very important cash crop in India and the country produced 45.34 mt of potato from 1.99 mha land with average productivity of 22.80 tones/ha during 2012-13 (NHB, 2013).

Uttar Pradesh is the largest potato producing state in the country and accounts for 32 per cent of total production. The state produces 14.43 mt of potato from an area of 0.60 mha with productivity of 23.9 tones/ha during 2012-2013 (NHB, 2013). This rapid growth under production (10.63 mt in 2008-09 to 14.43 mt in 2012-2013) of potato in Uttar Pradesh was possible through dissemination of the latest technology under real farming conditions. Potato cultivation has become highly commercialized in Uttar Pradesh, still there is a wide gap between current production and potential productivity. So efforts have to be made by researchers, policy makers and extension workers together to overcome these constraints. With the view to achieve a high level of production it is not enough to develop farm

*Corresponding author email id: ashwanikumar761994@gmail.com

innovation but it is also necessary to transfer the latest technology from the research system to ultimate users *i.e.* farmers reported by Singh *et al.* (2015).

The Kannauj, district has been covered under "State Horticulture Mission" launched in 2005 which is a part of National Horticulture Mission (NHM) of GOI. The mission involves establishment of nurseries, potato seed. The major crop of the Kannauj, district is potato, which has been cultivated over the years without any rotation/ diversification. Due to mono cropping pattern, soils have developed deficiencies in micronutrients. Whenever there is bumper production of potato in the district, there is a glut in the market and the prices crash to abysmal low levels. The prices offered are not even sufficient to cover the storage costs contribute to environmental pollution. Hence, the present study was undertaken to analyze the constraints regarding the technological gap in potato production in Uttar Pradesh.

MATERIALS AND METHODS

The study was conducted in Uttar Pradesh state. Kannauj district of Uttar Pradesh was selected purposively for the study because it has extensive area under potato cultivation. It is considered to be the most climatically suitable area for potato in the state. From this district, Jalalabad block with maximum area under potato cultivation was selected purposively. Further five villages, namely, Paraspur, Gadnapur, Mirpur, Purva, and Bisundhua villages from Jalalabad block were selected randomly and from each village, 25 farmers were selected randomly, who were actively involved in cultivating potato, Thus, total sample size was 125 potato growers. In this investigation, constraints faced by the farmers in adoption of potato production technologies were studied. An interview schedule was used to collect the data and collected data were analysed by using simple percentage analysis.

RESULT AND DISCUSSION

Constraints faced by respondents of potato production technology

Economic Constraints: The Table 1 indicates, that the rank order of economic constraints *viz.*, 'costly diesel charges' was ranked I (0.82) followed by 'corruption of credit sanctions' ranked II (0.79), 'lack of money' ranked III (0.77), 'no subsidy for purchasing the input for potato e.g. seed, chemical etc.' ranked IV (0.75), 'more margin to middleman/commission agents' ranked V (0.64), 'inadequate availability of proper fertilizer' ranked VI (0.62), 'lack of credit facilities' ranked VII (0.54), 'inadequate availability of proper sufficient seed treatment chemicals' ranked VIII (0.51), 'inadequate availability of F.Y.M.' ranked IX (0.46), 'high Irrigation charges' ranked X (0.41) and 'tractor on hire hardly made available to the farmer' ranked XI (0.34). The score value for each constraint indicates that the seriousness of constraints caused by low adoption of technology. The similar finding was reported by Gogoi (2002); Rai and Singh (2010); Pandit *et al.* (2010).

Social Constraints: The Table 2 shows that the rank order of social constrains viz. 'skilled farm workers are hardly available' was ranked I (0.81), followed by 'co-operative societies do not help the potato growers for better production' ranked II (0.81), 'more incidence of pest &

Table 1: Distribution of respondents according to economic constraints (N=125)

S. No.	Constraints	Mean score value	Rank order
1.	Costly diesel charges	0.82	I
2.	Corruption of credit sanctions	0.79	II
3.	Lack of money	0.77	III
4.	No Subsidy for purchasing the input for potato e.g. Seed, chemical etc.	0.75	IV
5.	More margin to middleman/commission agents	0.64	V
6.	Inadequate availability of proper fertilizer.	0.62	VI
7.	Lack of credit facilities	0.54	VII
8.	Inadequate availability of proper sufficient seed treatment chemicals	0.51	VIII
9.	Inadequate availability of F.Y.M.	0.46	IX
10.	High Irrigation Charges	0.41	X
11.	Tractor on hire hardly made available to the farmer	0.34	XI

Table 2: Distribution of respondents according to social constraints (N=125)

S.No.	Constraints	Mean Score value	Rank order
1.	Skilled farm workers are hardly available	0.81	I
2.	Co-operative societies do not help the potato growers for better production	0.81	II
3.	More incidence of pest & diseases	0.73	III
4.	Lack of advice and guidance from change agents	0.71	IV
5.	Lack of scientific knowledge about potato cultivation	0.69	V
6.	Inadequate training facilities	0.63	VI
7.	Ineffectiveness of plant protection chemicals	0.51	VII

diseases' ranked III (0.73), 'lack of advice and guidance from change agents' ranked IV (0.71), 'lack of scientific knowledge about potato cultivation' ranked V (0.69), 'inadequate training facilities' ranked VI (0.63) and 'ineffectiveness of plant protection chemicals' ranked VII (0.51) respectively. The score value for each constraint indicates the seriousness that caused low adoption. Similar findings were also reported by Deka *et al.* (2014).

Technical and Resources Management Related Constraints: The Table 3 shows that the rank order of technical and resources management constraints *viz.* 'lack of availability of quality HYV seeds' was ranked I (0.73), followed by 'duplicate fertilizers are available in market' ranked II (0.55), 'lack of availability of plant protection chemicals' ranked III (0.45), 'diesel supply usually disappointed at a proper moment' ranked IV (0.43), 'scarcity of farm labour' ranked V (0.25), 'lack of irrigation facilities' ranked VI (0.17) and 'inadequate and erratic supply of electric for irrigation' ranked VII (0.15) respectively. The score value for each constraint indicates the seriousness that caused low adoption.

Transportation Related Constrains: The Table 4 shows that the rank order of Transportation constraints viz. 'indigenous transport-means *viz.*, bullock cart, dunlop, tonga take much time and causes more inconvenience in transporting the products' was ranked I(0.93), followed

Table 3: Distribution of respondents according to technical and resources management (N=125)

S.No.	Constraints	Mean Score value	Rank order
1.	Lack of availability of quality HYV seeds	0.73	I
2.	Duplicate fertilizers are available in market	0.55	II
3.	Lack of availability of plant protection chemicals	0.45	III
4.	Diesel supply usually disappointed at a proper moment	0.43	IV
5.	Scarcity of farm labour	0.25	V
6.	Lack of irrigation facilities	0.17	VI
7.	Inadequate and erratic supply of electric for irrigation	0.15	VII

Table 4: Distribution of respondents according to transportation constraints (N=125)

S.No.	Constraints	Mean Score value	Rank order
1.	Indigenous transport-means viz., Bullock cart, Dunlop, Tonga take much time and causes more inconveniences in transporting the products	0.93	I
2.	Transportation means viz., tractor/jeep/tempo, etc. rarely available	0.83	II
3.	Sometimes transporters bargain badly during odd periods and compel the producers to pay highly charges	0.68	III
4.	The condition of roads is not good which damage the vehicle as well as products/potato	0.26	IV
5.	Lack of roads to transport the products for disposal	0.19	V

by 'transportation means viz., tractor/jeep/tempo, etc. rarely available' ranked II (0.83), 'sometimes transporters bargain badly during odd periods and compel the producers to pay highly charges' ranked III (0.68), 'the condition of road are not good which damage the vehicle as well as products/potato' ranked IV (0.26) and 'lack of roads to transport the products for disposal' ranked V (0.19), respectively. The score value for each constraint indicates the seriousness that caused low adoption.

Post harvest Related Constraints: The Table 5 shows that the rank order of Post harvest technological constraints *viz.* 'lack of space in house of potato farmers for storing the products' was ranked I (0.92), followed by 'dumping off the products due to un-availability of space in cold storage' ranked II (0.84), 'lack of knowledge about the proper market of value products' ranked III (0.64), 'no strict provision of sureing return of damage potato by the cold storage owners' ranked IV (0.62), 'lack of knowledge of value added products productions' ranked V (0.59), 'the monopoly knowledge of cold storage owners' ranked VI (0.46) and 'lack of cold storage in the area' ranked VII (0.23), respectively. The score value for each constraint indicates the seriousness that caused low adoption. The findings were in accordance with Singh *et al.* (2013).

Suggestive measures to overcome the constraints faced by the potato growers

Table 6 envisages on suggestive measures for better potato production, the majority of the respondents suggested the points viz., 'suitable approach for the safeguard of the crop against the animal (blue calf)' (73.33%) followed by 'a permanent source of information should be among the farmers related to crop production' (71.67%), 'the government should provide the well facilities of call centers to advice and guidance for the farmers and also other information sources be made available, (69.60), 'young

Table 5: Distribution of respondents according to Post harvest technological constraints (N=125)

S.No.	Constraints	Mean Score value	Rank order
1.	Lack of space in house of potato farmers for storing the products	0.92	I
2.	Dumping off the products due to un-availability of space in cold storage	0.84	II
3.	Lack of knowledge about the proper market of value products	0.64	III
4.	No strict provision of sureing returns of damage potato by the cold storage owners	0.62	IV
5.	Lack of knowledge of value added products productions	0.59	V
6.	The monopoly knowledge of cold storage owners	0.46	VI
7.	Lack of cold storage in the area	0.23	VII

Table 6: Measures to overcome the constraints (N=125)

S.No.	Suggestive measures	Percentage	Rank order
1.	Suitable approach for the safeguard of the crop against the animal (blue calf)	73.33	I
2.	A permanent source of information should be among the farmers related to crop production	71.67	II
3.	The government should provide the well facilities of call centers to advice and guidance for the farmers and also other information sources be made available	69.60	III
4.	Young generation does not like to work in farming.	65.80	IV
5.	Flexible sources of credit must be there	62.50	V
6.	Production procurement arrangement be made by government as in case of wheat and rice	57.50	VI
7.	Government irrigation facilities should be there	55.00	VII
8.	Reliable seed fertilizers and pesticide supply should be ensured	46.67	VIII
9.	Potato processing unit should be established	45.83	IX
10.	Demonstrations of different culture methods should be organized	40.00	X
11.	State department of agriculture should ensure the timely and adequate supply of inputs viz., fertilizer, seed and plant protection	36.00	XI

generation do not like to work in farming' (65.80), 'flexible source of credit must be there' (62.50%), 'production procurement arrangement be made by government as in case of wheat and rice' (57.50%).

'Governmental irrigation facilities should be there' (55.0%), 'reliable seed fertilizers and pesticide supply should be ensured' (46.67%), 'potato processing unit should be established' (45.83%), 'demonstrations of different cultural methods should be organized' (40.0%) and state department of agriculture should ensure the timely and adequate supply of inputs viz., fertilizer, seed and plant protection' ranked I, II, III, IV, V, VI, VII, VIII, IX, X and XI, respectively.

CONCLUSION

Potato is the main source of important nutrient but the productivity and processing has not been able to keep pace with the current trends because potato growers are facing constraints while performing farm field activities. As it was observed that majority of the potato growing farmers were faced constraints like, costly diesel charges, skilled farm workers are hardly available, non-availability of quality HYV seeds, indigenous transport-means viz., Bullock cart, Dunlop, Tonga take much time and causes more inconveniences in transporting the products and dumping off the products due to un-availability of space in cold storage. On the basis of the findings, following recommendations are made for increasing the yield and income of the potato growers. Extension workers should provide information to the concerned people regarding use of various inputs especially fertilizer. They should provide latest information relating to production techniques and technology. They should also provide information and motivate the farmers to use seed of high yielding and recommended varieties. Cold storage facilities should be provided for generating more income.

REFERENCES

Deka, C.K.; S.B. Mukhopadhyay and S. Kumar. 2014. Constraints in potato cultivation in Assam: Farmers' experiences. *International Journal of Agricultural Sciences,* 10(2): 488-492.

Gogoi, A. 2002. Production and marketing of potato in Jorhat district of Assam. M.Sc. (Ag.) Thesis, of A.E. F.M, Assam Agricultural University, Jorhat, Assam (India).

Ierna, A. and B. Parisi. 2014. Crop growth and tuber yield of "early" potato crop under organic and conventional farming. *Scientia Horticultural,* 165: 260-265.

NHB. 2013. Indian Horticulture Database, Ministry of Agriculture, Government of India.

Prasad, R. 2006. Field crop production. Indian council of agriculture research (ICAR) publication, New Delhi. pp. 719-769.

Pandit, A.; A. Kumar; R.K. Rana; N.K. Pandey and N.R. Kumar. 2010. A study on socio-economic profile of potato farmers: comparison of irrigated and rainfed conditions in Himachal Pradesh. *Potato J.,* 37(1-2): 56-63.

Rai, D.P. and B. Singh. 2010. Extent of knowledge and constraints in cotton production technology in Madhya Pradesh. *Indian Res. J. Extn. Edu.,* 10(2): 78-80.

Singh, M.; A.P. Dwivedi; A. Mishra; R.P. Singh; D. Singh; S.R.K. Singh and P. Chand. 2013. Adoption level and constraints of soybean production technology in Sagar District of Madhya Pradesh. *Journal of Community Mobilization and Sustainable Development*, 8(1): 94-99.

Singh, O.; R.P. Singh; R. Singh and D. Singh. 2015. Potato aid livelihoods security in Ghazipur district through front line demonstrations. *Journal of Community Mobilization and Sustainable Development,* 10(2): 168-170.

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Communication Pattern of Prime Source of Farm Information: Agro Input Dealers of Haryana

B.S. Ghanghas*, P.K. Chahal and A.K. Rohilla
Department of Extension Education, CCS Haryana Agricultural University, Hisar-125004, Haryana

ABSTRACT

Research findings clearly indicated that progressive farmers as well fellow input dealers were the regular used personal localite information sources by dealers for acquisition of technologies among personal cosmopolite sources viz. sales representatives of agro-input companies while, they regularly utilized impersonal cosmopolite sources such as krishimelas, brochures, news paper and mobiles for acquisition of effective as well efficient technologies. A vast majority of input dealers evaluated the acquired information in the light of past experience followed by discussion with farmers, firm representatives or executives and fellow input dealers while least used method were degree of complexity in understanding and explanation for application to customers i.e. more scientific/technical information, discussion with local leaders, friends and neighbours. Information was stored more in form of memories in comparison to notes, brochures and not at all in CDs and DVDs as answered for recall of information. The information transformation was done by adding personal experience, followed by paralanguage and answering the questions of customers. Answering questions of the customers directly was top ranked method of transfer of knowledge of technologies by input dealers followed by personal calls. Technical matters were attended by sales representative or field assistant of company i.e. effectiveness and efficiency of products while others like prices, expiries, damages etc. by themselves. Distribution of brochures, informal chat during social functions, group discussions, meeting, field days and demonstrations in collaboration with agro-input companies were the most used knowledge transfer methods while least used or not used methods/media was recent social media i.e. Whats App.

Keywords: Communication linkages, Communication media or methods, Information evaluation

INTRODUCTION

Agriculture is the main stay of India and its economy is agriculture based. So development of nation is largely dependent on growth in agricultural production, productivity and marketing. If anything in agriculture goes wrong nothing else will have chance to go right in our country. After natural resources, agro inputs play a major role in farm productivity. Most of the Indian farmers are small and marginal farmers having small land holdings and limited resource availability. Hence assured supply of quality seeds, fertilizers and chemicals is inevitable for raising productivity and income of farmers.

Farmers are often not aware of appropriate agro chemicals and proper dosage required for a particular chemical for different crops. There are numerous reports of inappropriate use of agro chemicals, especially insecticides and fungicides to crops and mixing up 2 or 3 kinds of pesticides for spraying. The excessive and indiscriminate use of agro chemicals not only resulted water and soil pollution but resistance in insect-pests also. Public extension agencies, including extension workers, KVKs and SAUs were a source of information for around 10 per cent of households (NSSO, 2014). The lack of sufficient field level staff and the apparent absence of systematic dissemination of important information regarding appropriate cropping pattern, seeds and other inputs, cultivation practices made input dealers most important and efficient source of such information to farmers. At present wide gap exists between technical knowhow and field level do how, particularly in the fields of small farmers, marginal farmers, share croppers, tenant farmers and farmers belonging to scheduled castes and scheduled tribe communities. Public Extension System alone is not sufficient to keep pace with changing scenario of agriculture due to globalization and liberalization.

*Corresponding author email id: ghanghasbs@gmail.com

Agro-input dealers play a signiûcant role of bringing the inputs close to the farmers (Chianu, 2008). Among all the agencies, input dealers are larger in number and spread even in interior areas of the country. Unlike other agencies they need not go to the farmers to spread the messages. Farmers themselves approach the input dealers for their requirements i.e. inputs even on credit basis. In India, there are about 2.82 lakh practicing agri-input dealers, who are the prime source of farm information to the farming community. While purchasing different inputs required for farming operations, the farmer naturally tries to find out from the input dealer about the usage of inputs, both in terms of quality and quantity. Many information source utilization studies indicated that input dealers are consulted by farmers more frequently than other sources because of their easy access, credit basis supply, less waiting time and experiential knowledge.

Though the input dealers are the prime source of information for farmers in villages, there were no concrete studies taken up about their communication behaviour, which helps in improving their efficiency in disseminating to farmers. So present study was conducted to understand the communication behaviour of extension personnel with the following objectives:

i) Communication linkages used by input dealers for acquisition of production and protection technologies

ii) Communication media or methods used by input dealers for transfer of production and protection technologies to farmers

MATERIAL AND METHODS

To collect the primary data on communication pattern of agriculture input dealers, ex post facto research design was followed whereby respondents were selected with multistage sampling. The zone-1 of the country comprising five states (Delhi, Himachal Pradesh, Haryana, Jammu & Kashmir and Punjab) was selected purposively having the food bowl of the nation and from selected zone Haryana was selected purposively being second largest contributor to the central pool in case of rice as well high contribution to textile industry being among major cotton growing states of the country. Hisar and Sirsa districts were selected purposively since cultivation of both paddy and cotton with sizeable share of pesticides consumption in the state leading to substantial number of input dealers. From the list provided by Deputy Director Agriculture office, 90 input dealers were selected randomly from each district. The data were collected with the help of well-structured and pretested schedule comprising the items to test the communication linkages used by input dealers for acquisition of production and protection technologies, information evaluation pattern, information storage pattern, information transformation pattern and communication media or methods used by input dealers for transfer of production and protection technologies to farmers**.** The descriptive statistical measures like frequency, percentage, weighted mean and rank order analysis were used to analyze the data to draw tangible inferences.

RESULTS AND DISCUSSION

It is clear from Table 1 that majority of input dealers belonged to 38-55 years age category and majority of them possessed higher secondary educational qualification while hardly 18.00 percent were graduates and post graduates out of which a few possessed B.Sc. Agriculture degree and diploma. Approximately 60.00 per cent of input dealers belonged to high experience in agribusiness category while vast majority (71.11%) belonged to low farming experience which is very critical for realistic farm advisory as well as effective input delivery service. Similarly, half of them did not possess farm land, one of the essential requirements for pragmatic experience of farming as well empathy for the community. Pertaining to language use, vast majority (73.33%) used Hindi as well local language for effective communication. Manufacturer was the major source of procurement of agrochemicals followed by retail purchase. Though 42.22 per cent of input dealers had attended short trainings conducted by agro-input companies in form of symposium, seminars, workshops etc. but more than 50.00 percent of them expressed their wish to attend trainings as well diploma like DAESI from agricultural university, an essential requirement by state department of agriculture in view of deadline of December 2019 for renewal of their licenses.

The data pertaining to communication linkages used by input dealers for acquisition of knowledge about technologies presented in Table 2 clearly indicate that progressive farmers as well fellow input dealers were the most used personal localite information sources with the weighted mean score of 3.11 and 2.95 followed by friends (1.64) while they least utilized the sources viz. Panchayats and Cooperatives. Among personal cosmopolite sources, sales representatives of agro-input companies were the highest used sources with WMS of 3.75 and ranking 1st followed by ADOs and demonstrations conducted by

Table 1: Socio-personal attributes profile of input dealers (n=180)

S. No.	Variable	Category	Frequency	Percentage
1	Age	Up to 37 years	28	15.56
		38-55 years	108	60.00
		Above 55 years	44	24.44
2.	Education	Up to primary	32	17.78
		Matriculation	16	8.89
		Higher secondary	100	55.55
		Graduation	12	6.67
		Post graduation	20	11.11
3	Occupation	Agro-input dealer	128	71.11
		Agro-input dealer + farmer	52	28.89
4.	Experience in agrobusiness	Low (< 13 years)	44	24.44
		Medium (13-24 years)	32	17.78
		High (25-42 years)	104	57.78
5.	Experience in farming	Low (< 13 years)	128	71.11
		Medium (13-24 years)	20	11.11
		High (25-42 years)	32	17.78
6.	Land holding	No land	92	51.11
		Land up to 2.5 acres	12	6.67
		Land between 3 to 5 acres	20	11.11
		Land between 6 -10 acres	12	6.67
		Land between 10-25 acres	20	11.11
		Land more than 25 acres	24	13.33
7.	Language used	Hindi	48	26.67
		Hindi + local language	132	73.33
8.	Agrochemicals procurement source	Manufacturer	124	68.89
		Bulk purchase	16	8.89
		Retail purchase	40	22.22
9.	Trainings attended		76	42.22
10.	Trainings requirement for updating the farm information		92	51.11

companies whereas the dealers had least utilized the sources such as office calls, group discussions and scientists with mean scores of 1.31, 1.66 and 1.80 respectively ranking 6th5th, 4th which are very much essential for acquisition of effective as well efficient technologies. Similarly among impersonal cosmopolite sources, krishimelas, brochures and agricultural exhibitions, news paper and mobiles were the most used sources with the scores of 3.31, 3.28, 3.13 and 3.02 respectively ranking 1st, 2nd, 3rd and 4th while, radio, farm journals, letters by input companies and television were least utilized sources ranking 11th, 10th, 9th and 8th with WMS of 1.02, 1.13, 1.26 and 1.86 respectively. The findings are in consonance with findings of Leelavani (2011) who observed that among personal localite sources fellow input dealers, farmers, friends, local leaders, neighbours, among personal cosmopolite sources sales representatives of agro input companies, trainings and among impersonal cosmopolite sources information material(brochures), and mobiles were the widely used sources to acquire the agricultural related information by the respondents.

The findings are in agreement with the findings of Etyang *et al.* (2013) who reported community based channels of communication were found to be the most

Table 2: Communication linkages used by input dealers for acquisition of knowledge about production and protection technologies (n=180)

S.No.	Information sources	Regularly (4)	Occasionally (3)	Rarely (2)	Never (1)	TWS	WMS	Rank
	Personal localite							
1	Friends	28	16	-	136	296	1.64	III
2	Neighbours	20	16	-	144	272	1.51	IV
3	Local leaders	24	4	-	152	260	1.44	V
4	Progressive farmers	92	52	-	36	560	3.11	I
5	Fellow input dealers	104	20	-	56	532	2.95	II
6	Panchayats	-	-	-	180	180	1.00	VI
7	Co-operatives	-	-	-	180	180	1.00	VI
	Personal cosmopolite							
1	ADO/HDO/SDO/DDA/DHO	28	48	24	80	384	2.13	II
2	Scientist (CCSHAU/MPU/ICAR)	24	28	16	112	324	1.80	IV
3	Sales representatives of Agro-input company	160	8	-	12	676	3.75	I
4	Demonstrations	44	32	08	96	384	2.13	II
5	Trainings	36	36	08	100	368	2.04	III
6	Group discussions	36	12	08	104	300	1.66	V
7	Office calls	-	24	08	148	236	1.31	VI
	Impersonal cosmopolite							
1	Radio	-	-	04	176	184	1.02	XI
2	Television	24	40	04	112	336	1.86	VIII
3	Newspapers (agri. page/especial local krishi newspapers)	112	24	-	44	564	3.13	III
4	Mobiles	108	16	-	64	544	3.02	IV
5	Internet	72	04	-	104	404	2.24	VII
6	Brochures	108	28	36	8	596	3.31	I
7	Package of practices for crops	40	40	28	72	408	2.26	VI
8	Farm magazines	84	20	12	64	484	2.68	V
9	Farm journals	08	-	-	172	204	1.13	X
10	Agricultural exhibitions	100	56	-	24	592	3.28	II
11	Krishimelas	96	64	-	20	596	3.31	I
12	Letters by input companies	08	08	08	156	228	1.26	IX

accessible by agro-input dealers being localize information sources as well easy in access by them.

It is obvious from the data presented in Table 3 that vast majority i.e. 91.11 per cent of input dealers evaluated information byjudging in the light of past experience followed by 86.66 per cent of them in form of discussion with farmers firm representatives or executives (82.22%) and fellow input dealers (62.22%) for information evaluation while they least used the sources such as degree of complexity (11.11%), discussion with local leaders (11.11%), friends, neighbours and agricultural officers and scientists 17.77 per cent, 22.22 percent and 24.44 percent respectively. These officers and scientists are more competent and credible sources of technology generation and transfer as well. The probable reason for less use of these might be not updated of latest molecules of pesticides of MNCs. The findings are in line with the findings of Leelavani (2011) who reported that majority of the input dealers depend on discussing with sales representatives, farmers and past experience for information evaluation. Apart from this the respondents may be oriented on

Table 3: Information Evaluation pattern of input dealers (n-180)

S.No.	Statements	Frequency	Percentage
1	Discussion with the firm representatives or executives	148	82.22
2	Discussion with agricultural officers and scientists	44	24.44
3	Discussion with farmers	156	86.66
4	Discussion with fellow input dealers	112	62.22
5	Discussion with friends	32	17.77
6	Discussion with neighbours	40	22.22
7	Discussion with local leaders	20	11.11
8	Judgment in the light of past experience	164	91.11
9	Degree of complexity in understanding and explanation to clients i.e. more scientific/technical	20	11.11

alternate methods of information processing toanalyze information on various parameters for effective comparison and processing it for future use. Data pertaining to information storage pattern presented in Table 4 clearly indicate that vast majority (88.88%) stored the information by memorizing followed by brochures (73.33%) and taking hints in note book while they had not used at all the audio-video cassettes and CDs and DVDs which are the permanent as well most efficient information storage devices in digital era of information. Pertaining to information transformation pattern of input dealers it is clear from the data presented in Table 5 that a vast majority (82.22%) added their personal experience, followed by paralanguage (80.00%), and answering the questions of customers for transformation of information while least used techniques such as preparation of leaflets or handouts, conducting actual demonstrations and casual talks. It is obvious that they gave top priority to sales promotion activities. Similar findings have been reported by Leelavani (2011). Data presented in Table 6 clearly indicate that answering questions of the customers directly was top ranked method for transfer of knowledge of production

Table 4: Information storage pattern of input dealers (n-180)

S.No.	Statements	Frequency	Percentage
1	Preserving information material (brochures)	132	73.33
2	Taking hints in a note book	72	40.00
3	Memorizing	160	88.88
4	Conveying to family members to remember for future use	08	4.44
5	Recording the information in audio and video cassettes	-	0.00
6	Recording the information in CDs and DVDs	-	0.00

Table 5: Information transformation pattern of input dealers during its processing (n-180)

S.No.	Statements	Frequency	Percentage
1	Answering the questions of the customers	124	68.88
2	Adding personal experience to the information	148	82.22
3	Casual talks at shops	76	42.22
4	Providing hints notebook for references	36	20.00
5	Preparation of leaflets or handouts	08	4.44
6	Paralanguage the message i.e. in local dialect (for pests and diagnosis of problems)	144	80.00
7	Actual demonstrations	28	15.55
8.	Chats at villages during attending social functions	84	46.66

Table 6: Communication media or methods used by input dealers for transfer of knowledge of production and protection technologies to farmers (n=180)

S.No.	Media or methods	Regularly (4)	Occasionally (3)	Rarely (2)	Never (1)	TWS	WMS	Rank
1	Distribution of informationmaterials (Brochures)	108	08	-	64	520	2.88	III
2	Group discussions	64	68	-	48	508	2.82	IV
3	Meetings	56	72	-	52	492	2.73	V
4	Informal chat during socialfunctions	64	68	-	48	508	2.82	IV
5	Field days	60	24	08	88	416	2.31	VI
6	Demonstrations	60	32	04	44	388	2.15	VII
7	Personal calls	120	12	-	48	564	3.13	II
8	Answering questions of thecustomers directly.	152	-	-	28	636	3.53	I
9	Organizing film shows/songs/skits	-	-	-	180	180	1.00	VIII
10	Whats App	1	-	-	179	183	1.01	IX

and protection technologies with weighted mean score of 3.53 followed by personal calls (mean score 3.13) technical matters were attended by sales representative or field assistant of company while others by themselves, informal chat during social functions(score 2.88), distribution of Brochures (mean score 2.88), group discussions were held in collaboration with companies(mean score 2.82), and meeting conducted by companies (mean score 2.73),field days (mean score 2.31) and demonstrations (mean score 2.15) in collaboration with agro-input companies while least used methods/media were Whats App social media (mean score 1.01) and organization of film shows/songs/ skits(mean 1.00) for transfer of technologies to farmers. Similar findings have been reported by Leelavani (2011) who inferred that distribution of information material, answering the questions of the customers directly and personal calls were the most widely used information output channels and meetings, demonstrations and group discussions were used occasionally by the input dealer.

CONCLUSION

Findings highlight that agro input dealers most utilized the communication channels for acquisition, evaluation as well transfer of knowledge about production and protection technologies viz. sales representatives and activities of companies which were oriented to sales promotion rather than coordination and cooperation with scientists and extension functionaries i.e. most competent and credible sources of farm information generation and transfer. To enable them to adequately respond the changing farming situations, their professional knowledge as para extension workers should be enhanced through sincere efforts in form of especial diploma courses like DAESI should be conducted by agriculture university which has been made mandatory by state department for renewal of licences of agro-input dealers as started by UAS, Dharwad. Highlights of frontier as well latest technologies should be displayed at prime locations of krishimela and agro-exhibition site on every occasion for updating technical knowledge of input dealers as demanded by input dealers for up gradation of their professional knowledge and skill. Similarly, regular especial trainings by SAUs on the pattern of field functionaries to enhance the extension out reach were demanded by them.

REFERENCES

Chianu, J.N.; F. Mairura; I. Ekise and J.N. Chianu. 2008. Farm Input Marketing in Western Kenya: Challenges and Opportunities. *African Journal of Agricultural Research,* 3(3): 167–173.

Etyang, T.B.; J.J. Okello; S. Zingore; P.F. Okoth; F.S. Mairura; A. Mureithi and B.S. Waswa. 2013. Exploring Relevance of Agro Input Dealers in Disseminating and Communicating of Soil Fertility Management Knowledge: The Case of Siaya and Trans Nzoia Counties, Kenya T.B. *Agricultural Information Worldwide,* 6: 82-85.

Leelavani, M. 2011. A Study on Communication Behaviour of Input Dealers in Guntur District of Andhra Pradesh. *M.Sc. Thesis* Acharya N.G. Ranga Agricultural University, Rajendra Nagar, Hyderabad.

Managuli, G.; J.P. Sharma; R. Gill; R.R. Burman; B. Gurung and S. Sahu. 2019. Analysis of the Constraints from Farmer's Perspective in Agricultural Knowledge Creation,

Information Management and Technology Delivery Systems (AgriKITS) in Bundelkhand Region of U.P. *Journal of Community Mobilization and Sustainable Development,* 14(1): 93-96.

Nain, M.S.; R. Singh; J.R. Mishra and J.P. Sharma. 2015. Utilization and Linkage with Agricultural Information Sources: A Study of Palwal District of Haryana State. *Journal of Community Mobilization and Sustainable Development*, 10(2): 152-156.

National Sample Survey Organisation (NSSO) 2014. Key Indicators of Situation of Agricultural Households in India. 70th round (January-December 2013). Ministry of Statistics and Programme Implementation, New Delhi.

Sanchez, P.A. and B.A. Jama. 2002. Soil Fertility Replenishment Takes Oû in East and Southern Africa. In: Vanlauwe, B.; J. Diels; N. Sanginga and R. Merckx, (Eds) Integrated Plant Nutrient Management in Sub-Saharan Africa: From Concept to Africa. CABI Publishing, New York, pp. 23–45.

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Use of Personal Protection Equipment's for the Workers

Iti Dubey[1]* and Sudha Babel[2]

[1]Ph.D. Research Scholar, [2]Professor, Department of Textile and Apparel Designing, College of Community and Applied Sciences, Maharana Pratap University of Agriculture and Technology, Udaipur-313001, Rajasthan

ABSTRACT

Personal Protective Equipment plays an important role to take care of the health problems faced by the workers. Different surveys reported that the workers are affected more exposure of chemical and other harmful elements which they continuously in contact during work. In this paper researcher analyses the problems faced by workers and exposure area of the chemicals and how to protect themselves to the exposure of harmful chemicals which are hazardous to their health. There are various kinds of physical, chemical, and biological hazards in the workplace face by the workers. To protect workers from these hazards, it is not controversial that environmental management measures to remove or reduce these harmful factors and to improve the quality of workplace. Any type of accidents brings several consequences such as loss of time, costs for medical treatment, injuries, disabilities and potential fatalities to the workers. Personal protective equipment can be used to reduce illness and injuries. This study aimed to assess the use of personal protection equipment and how it protect the workers from getting injured.

Keywords: Health problems, Industrial workers, Personal Protective Equipment (PPE), Protective equipment, Safety

INTRODUCTION

Workplace injuries are the main cause of sustainable disability among the workers (Leary *et al.,* 2012). According to the International Labor Organization, 270 lakh workers injured annually due to workplace problems. Construction employees have 1 in 300 chances of getting injured while dying process in the workplace and work environment also effected to the workers' health (Abdelhamid and Everett, 2000). In particular, falls top the list of building construction sites most of the workers getting injured through the personal harm through their body part getting injured through some mishappening with the building so that must be a cause of worker getting injured (Chi *et al.,* 2005). In general, construction site accidents result in getting injured and facing substantial pain, suffering headache, less productivity, decrease happiness in life, and less time spend with family. On regular, due to building construction accidents it caused everlasting disability decrease worker capacity by 37 per cent (Alinaitwe *et al.,* 2007). Unexpectedly, in most developing countries, health and safety reflections at is not the priority at the construction sites, and safety measures also used as a burden. In Uganda, the Occupational Health and Safety (OHS) Act Number 9 of 2006 under this act all workers provide an environment friendly atmosphere and surroundings and every workers provide the health care. However, under this law casual worker will not be beneficiaries. The absence of contracts or formal appointments means they cannot charge employers for compensation in the event of injury, accident, or death. The stated Act also entails all enterprises to comply with OHS standards (Occupational Safety and Health Profile for Uganda 2004), (Okoth and Waiswa, 2015).

According to guidelines of personal protective equipment, they reported that the purpose of personal protective equipment is to reduce employee exposure to hazards when engineering controls and administrative controls are not possible or dynamic to reduce these risks to acceptable levels. when there are hazards present personal protective equipment is needed. PPE has the serious limitation that it does not eliminate the hazard at the source and may result in employees being exposed to the hazard if the equipment fails.

USE OF PROTECTIVE CLOTHING

Protective functionality can be sub classified into 3 categories depending on the nature of the threat from which protection is required. In each case the technical requirements are quite specific.

*Corresponding author email id: itidubey15@gmail.com

Environmental Hazard Protective: The nature of the hazard in this case is extreme environmental conditions (natural or man-made), such as extreme heat or cold, fire, rain, snow, dust, wind, or UV, against which protection is desired. The key design requirement here is to protect the body from exposure to extreme elements (such as temperature) in the environment, while at the same time facilitating the transport of metabolic heat and moisture from the body. The requirements required by the mobility requirement of the application will be low weight and good insulation with bulk and ergonomic design, for example scuba diving suits, mountaineering suits and fire fighting suits (Smith, 1999).

Biological, Chemical and Radiation (BCR) Hazard Protective: BCR hazards also exist in the environment, but the nature of the threat presented by them and consequently safety requirements are completely different from the first category. The critical design requirement in this case would be to create a barrier to prevent ingestion, penetration or skin contact with hazardous chemicals, toxic gases, body fluids, germs or radioactive particulate matter. Typical coating and laminate are the main materials used in these products. Often such clothing is completely sealed, and therefore cooling, breathing, or metabolic waste removal tasks may be required to manufacture them in the clothing system itself (Smith, 1999).

Injury Protective: The nature of the hazard in this case is from mild to fatal injuries due to ballistic, blunt and mechanical effects or cut and slash hazards from a variety of sources. In such cases the principle of conservation is mainly material based and impact resistant. Ballistic injuries are high impact injuries and anti-ballistic clothing is the oldest form of protective clothing known to humans. The field has been well studied and developed to keep pace with developments in weaponry. Several layers of high-strength fibers, ceramics, metal sheets and composites are used to achieve soft / semi-hard / hard armor with a favorable combination of light weight and high protection, depending on the perceived nature of the threat depends on (according to Smith, 1999).

INDUSTRIAL PROTECTIVE CLOTHING

Nomex® IIIA - flame resistant fabric protection: Fires are unpredictable. A situation can change in an instant. And when this happens, your workers need to be protected - against fire or molten metal spills. The Nomex® IIIA fabric is a blend of 93 per cent Nomex® fiber, with 5 per cent Kevlar® fiber added for break-open resistance and 2 percent P140 for improved antistatic performance. Workers wearing Nomex® IIIA benefit from light fabric weights that increase comfort and cool, breathable clothing that enables air flow to move away from the body, and to increase evaporation and cooling quickly spread moisture on the surface of the fabric.

Kevlar® for thermal, cut, and abrasion protection, with a comfortable fit: Kevlar® brand fiber provides power at high temperatures, making it suitable for gloves and soils used in high heat applications. Kevlar® is inherently flame resistant, and, unlike nylon, polyester and polyethylene, will not melt. Automotive, steel, glass, and metal workers as well as welders and foundry workers use gloves and apparel from around the world, made of kevlar fiber.

Tyvek® for general industrial protection: Tyvek® provides employees with an ideal balance of safety, durability and comfort in industrial environments including manufacturing, automotive and utilities. Tychem® for comprehensive chemical protection DuPont ™ Tychem® protective clothing has been tested against a wide range of hazardous chemicals to help users determine which fabrics are suitable for their applications. By developing clothes that pass these tests, DuPont helps protect emergency response personnel and workers in many industries.

Protera® for essential electric arc protection: Workers in the fields of construction and utilities face threats such as live wires and electric arcs every day. Hazardous job tasks may include work on energetic parts, including voltage testing, working on control circuits with energetic parts, and removing bolted covers to expose bare, energetic parts. Protera® is an excellent fabric for the flame resistance inherent to electric arcs. This helps minimize break-open and maintain a stable, passive barrier between the fire and the skin, protecting the wearer from direct exposure.

ProShield® garments for non-hazardous exposures: ProShield® garments are designed for workers in a range of industries for non-hazardous dry particle and light liquid splash applications. ProShield® garments have been optimized for comfort, softness, and breathability.

CONCLUSION

According to all studies Personal protective kit is useful to protect workers at work place. Also in the industries a supervisor who has the knowledge about the protective equipment should be there for the proper guidance to the workers to protect themselves from the hazardous chemicals and any other machineries. There should be different type of finish apply on their clothing for protect them to fire chemicals etc. proper guideline and protective clothing must be used in the industries so that workers feel comfort to the workplace.

REFERENCES

Abdelhamid, T.S. and J.G. Everett. 2000. Identifying root causes of construction accidents. *Journal of Construction Engineering and Management,* 126(1): 52–60.

Alinaitwe, H.; J. Mwakali and B. Hansson. 2007. Analysis of accidents on building construction sites reported in Uganda during 2001–2005, in CIB World Building Congress, pp. 1208–1221.

Chi, C.F.; T.C. Chang and H.I. Ting. 2005. Accident patterns and prevention measures for fatal occupational falls in the construction industry. *Applied Ergonomics,* 36(4): 391–400.

Dwicahyo, H.B., *et al.* 2019. Relationship of Total Suspended Particulate Dust Levels, Personal Protective Equipment, and Individual Characteristics with Breathing Respiratory Complaints at Benowo Landfill Surabaya. *Indian Journal of Public Health Research & Development,* 10(8): 2063-2066.

http://downloads.hindawi.com/journals/jeph/2017/7930589.pdf

International Labor Organization, "Occupational Safety and Health," http://www.ilo.org/safework/lang–en/index.htm.

Leary, P.O.; L.I. Boden and A.S. Seabury. 2012. Workplace injuries and the take-up of Social Security disability benefits. *Social Security Bulletin,* 72(3): 1-17.

Nargawe, L. and D.Y. Mishra. 2019. Association of socio-personal attributes of the beneficiaries with impact of KMA. *Journal of Community Mobilization and Sustainable Development*, 14(3): 467-472.

Okoth, C. and J. Waiswa. 2015. 12 enterprises closed over poor safety, health measures, Kampala, Saturday Vision.

Personal Protective Equipment *guide line Retrieved from 2019-11-15.*

Republic of Uganda, Occupational Safety and Health Profile for Uganda, Ministry of Health, Kampala-Uganda, 2004.

Smith, W.C. 1999. *An Overview of Protective Clothing-Markets, Materials, Needs* (Industrial Textile Associates), 1999. http://www.intexa.com/.

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Perception of farmers towards Custom Hiring Service Centres

Juhee Agrawal[1]*, J.P. Sharma[2], R.R. Burman[3], P. Venkatesh[4], Ankur Biswas[5] and Roaf Ahmad Parray[6]

[1]Ph.D. Scholar, [2]Joint Director (Extension), [3]Principal Scientist, Division of Agricultural Extension, ICAR-Indian Agricultural Research Institute, New Delhi-110012

[4]Scientist, Division of Agricultural Economics, ICAR-Indian Agricultural Research Institute, New Delhi-110012

[5]Scientist, Indian Agricultural Statistics Research Institute, New Delhi-110012

[6]Scientist, Division of Agricultural Engineering, ICAR- Indian Agricultural Research Institute, New Delhi-110012

ABSTRACT

Farmer's perception towards any policy or services is highly important for any policy makers and servicemen to analyse any current new project and to establish new service centres respectively. Current study was conducted in Punjab and Uttar Pradesh. In the present study, perception of farmers towards services of custom hiring is measured through perception scale and for this a scale was constructed in five-point continuum. The scale consists of 25 statements with dimensions like availability, accessibility, economic factors, efficiency, social factor and environmental factor. After development of scale, perception of farmers towards CHSCs was measured. The result showed that farmers of Punjab and Uttar Pradesh have significantly favourable perception towards custom hiring service centre based on the above dimensions.

Keywords: Custom hiring service centre, Perception, Scale

INTRODUCTION

Agriculture is time-consuming occupation and most of the time cause health hazards. In India, women labour plays a significant role in agricultural production. Various tasks performed by women not only demand considerable time and energy but also a major source of drudgery for rural women (Srinath *et al.,* 2010). Hazards caused due to faulty works and methods, unsupported postures and positions may lead to muscles-skeletal pains of tendons, muscles, related nerves and bones (Joshi *et al*., 2018). Agricultural mechanization is the way of using machines and equipment to increase the productivity and reduce drudgery. Mechanization plays a crucial role in saving time which allows farmers including women to dedicate more time to other more profitable occupations than growing a crop, such as raising livestock, adding value with post-harvest processing or seeking off-farm employment. In a labour scarce country, mechanization may be aimed at competing with human labour but in a relatively labour abundant country like India, mechanization may be of a complementary nature (Pawar *et al.,* 2010). Due to need of very high fixed cost and of huge operation and maintenance cost, small and marginal farmers can't own farm machineries. For reducing cost of cultivation of small and marginal farmers, the best way is to hire machineries on rental basis from a common platform like Custom Hiring Service Centres. Through custom hiring of agricultural machinery, even small farmers have been able to get the benefit of agricultural mechanization (Singh *et al.,* 2013). Custom hiring is a developing concept in India and holds an extreme power to change the farm mechanization landscape of India (Nissa *et al*., 2017).

The success or failure of any agricultural service centres to a great extent depends on the perception of its clientele towards the service centres. In this type of situation, it is essential to develop a new scale which serves the purpose of study. In present study, an attempt has been made to develop a scale which measures the perception of farmers towards Custom Hiring Service Centres.

MATERIAL AND METHODS

The study was conducted in four purposively selected districts namely, Muzaffarnagar, Baghpat, Faridkot, and Bhatinda from Uttar Pradesh (UP) and Punjab respectively and the year of study was 2018-2019. These states were chosen purposively because mechanization level is high in

*Corresponding author email id: juhee.agrawal123@gmail.com

these states as against the national average (projection) 1.502 kW/ha (Nissa *et al.*, 2017). The mechanization is 3.5 kW/ha (Nissa *et. al.*, 2017) and. 4.82 kW/ha (Kumar and Tripathi, 2018) in Punjab and Uttar Pradesh respectively. From each district, thirty farmers were selected by simple random sampling technique; so, the total sample size was one hundred and twenty.

Measurement of perception

According to (Morgan *et al.*, 1993), perception can be defined as what is experienced by a person. It is the term that refers to awareness of objects, qualities or event stimulating the sense organs. Perception can be operationalised in terms of how farmers experience and comprehend the availability and accessibility of services by CHSCs and efficiency, economic, social and environmental factors related to custom hiring service centres. In the present study, perception of farmers towards CHSCs were studied through perception scale. For measuring perception, a Likert type perception scale with a set of statement on 5-point continuum i.e. strongly agree, agree, undecided, disagree and strongly disagree was developed for the study. The major steps followed to develop the perception scale were as below-

a) Defining the construct: a construct is a concept with added meaning, deliberately and consciously invented or adopted for a special scientific purpose (Kerlinger, 1973). In the present study construct was perception of farmers towards CHSCs.

b) Identification and operationalization of dimensions under construct: major dimensions identified under this construct were availability, accessibility, efficiency, economic factor, social factor and environmental factor etc.

c) Item collection: Exhaustive lists of items were collected on concept of CHSCs. Total 50 items were collected from different sources like published research paper, own thoughts, books, consultation with experts. Then the items were edited on a three-point continuum viz., Most relevant, Relevant and Least relevant with the score of 3, 2 and 1 respectively were administered to the experts. The Relevancy Weightage (RW) and Mean Relevancy Score (MRS) were worked out for all the selected indicators individually by using the following formula;

$$\text{Relevancy Weightage (RW)} = \frac{(MR\times3)+(R\times2)+(LR\times1)}{\text{Maximum Possible Score}}$$

$$\text{Mean Relevancy Score (MRS)} = \frac{(MR\times3)+(R\times2)+(LR\times1)}{\text{No of Judges}}$$

d) Item analysis: The purpose of an item analysis is to find those items that form an internally consistent scale and to eliminate those items that do not (Spector, 1992). The earlier decided item statements were administered to 30 farmers and their responses were recorded on a five-point continuum ranging from 'strongly agree' to 'strongly disagree'. Then, every responded item was scored with different weights ranging from 5 to 1. For positive statements a weight of 5 was given to 'strongly agree', 4 to 'agree', 3 to 'undecided', 2 to 'disagree', and 1 to 'strongly disagree'. After assigning weightage to each statement based on individual responses, scores for each individual was calculated by summing up scores of all the statements for each individual.

Based on expert judgements and criteria given by Edwards (1957) appropriate items were selected for item analysis and respondents were ordered as per their total obtained score. After that, two criteria groups were formed by including 25 percent respondents with highest score and 25 percent respondents with lowest score.

Finally, the responses of the two groups namely high group and low group were evaluated by using the following formula:

$$t = \frac{\overline{x}_H - \overline{x}_L}{\sqrt{\frac{S_H^2}{n_H} + \frac{S_L^2}{n_L}}}$$

Where, $\overline{X}_H$= the mean score on a given statement for the high group,

$\overline{X}_L$ = the mean score on a given statement for the low group,

S^2_H = the variance of the distribution of responses of high group to the statement,

S^2_L = the variance of the distribution of responses of low group to the statement,

n_H = the number of subjects in the high group, and

n_L = the number of subjects in the low group

From the calculated t value, all the statements were ranked and the statements having t value more than 1.75 were only retained in the final perception scale. Total number of statements kept in the final scale was 25.

e) Reliability and validity measurement: 'Cronbach's Coefficient alpha' (α) was used to calculate the internal consistency reliability of the scale and the formula used for this purpose is:

$$r_{tt} = \alpha = (\frac{n}{n-1})\frac{\sigma_t^2 - \sum(\sigma_i^2)}{\sigma_t^2}$$

Where, $r_{tt} = \alpha$ = Reliability coefficient by Cronbach alpha,

n = Number of items in the scale,

σ^2_t = Variance of scores on the scale, and

$\Sigma(\sigma^2_t)$ = The sum of variances of item scores

The 'Cronbach's Coefficient alpha' (α) scale for measuring perception was found to be 0.73

RESULTS AND DISCUSSION

Perception in terms of availability can be operationalised as degree to which it is perceived as timely and sufficient availability of machineries to farmers by CHSCs. After proper analysis of data, the results are summarised in Table 1. Table displayed that 84.16 per cent of the farmers were strongly agreeing that machineries were available at the time of requirement, 65 per cent farmers were agreeing in terms of modern/updated farm machineries were also available in the CHSCs apart from traditional ones, and 46.67 per cent farmers were strongly disagreeing towards the fact that CHSCs helped in providing expert drivers along with operators.

Perception in terms of accessibility can be operationalised as degree to which it is perceived as CHSCs enables the access of costly farm machinery to small and marginal farmers (affordability/hiring charges). The findings of the table suggest that, majority of the respondents strongly perceived as CHSCs enables the access of costly farm machinery to small and marginal farmers due to affordable hiring charges and 65.83 per cent beneficiaries are agreeing related to the matter like easy procedure to get services in CHSCs.

Perception in terms of economic factor can be operationalised as degree to which it is perceived to bring change in income and reduction in cost of cultivation after hiring of machineries. The data in Table 3 shows that 80.83 per cent were agreeing towards there was reduction in the cost of cultivation after they started hiring machineries from CHSCs. Approximately half (48.33%) of the beneficiaries were disagreeing related to the issue like there was no significant change in yield of crops after hiring of machineries.

Perception in terms of efficiency can be operationalised as the degree to which it is perceived as useful work performed by a machine, quality of being able to do a task successfully without wasting time or

Table 1: Perception of farmers towards availability of services from CHSCs (N=120)

Perception in terms of Availability	SA f (%)	A f (%)	U f (%)	D f (%)	SD f (%)
Machines are available in CHSCs at the time of requirement	101(84.16)	19(15.83)	0(0)	0(0)	0(0)
CHSCs helps in providing expert drivers along with operators	0 (0)	28(23.33)	0(0)	36(30)	56(46.6)
Modern/Updated farm machineries are also available in the CHSCs apart from traditional ones	32(26.67)	78(65)	0(0)	10(8.33)	0(0)
Repair and maintenance facilities of damaged machineries are available in CHSCs	33(27.5)	87(72.5)	0(0)	0(0)	0(0)

f=frequency, %=percentage

Table 2: Perception of farmers towards accessibility of services from CHSCs (N=120)

Perception in terms of Accessibility	SA f (%)	A f (%)	U f (%)	D f (%)	SD f (%)
CHSCs enables the access of costly farm machinery to small and marginal farmers due to affordable hiring charges	97(80.3)	23(19.17)	0(0)	0(0)	0(0)
The location of CHSCs is near to my farm	56(46.67)	64(53.33)	0(0)	0(0)	0(0)
Easy procedure to get services in CHSCs	41(34.17)	79(65.83)	0(0)	0(0)	0(0)

f=frequency, %=percentage

Table 3: Perception in terms of Economic factor related to CHSCs (N=120)

Perception in terms of Economic factor	SA f(%)	A f(%)	U f(%)	D f(%)	SD f(%)
There has been increase in my income after hiring of machineries	39(32.5)	81(67.5)	0(0)	0(0)	0(0)
There has been reduction in my cost of cultivation after I started hiring from CHSCs	23(19.17)	97(80.83)	0(0)	0(0)	0(0)
There has been no significant change in yield of crops after hiring of machineries	0(0)	28(23.33)	20(16.67)	58(48.33)	14(11.67)
CHSCs reduce the credit burdens of farmers	26(21.67)	94(78.33)	0(0)	0(0)	0(0)
CHSCs decreases the burden of maintenance charges of draught animals	6(5)	90(751	24(20)	0(0)	0(0)

f=frequency, %=percentage

energy. From Table 4, it can be concluded that, as much as 92.50 per cent of the respondents strongly perceived as CHSCs helped in maintaining timeliness in operation. Similarly, 87.50 per cent of the respondents agreed that there was precision in efficiency of utilization of various crop inputs due to CHSCs. Likewise, nearly half of the respondents either 'agreed' or 'strongly agreed' that they considered CHSCs reduced the problems of labour shortage.

Perception in terms of social factor can be operationalised as the degree to which it is perceived to have effect on health and employment due to CHSCs. The data in Table 5 shows that as much as 86.67 per cent of the respondents thought that, farm machineries were easily accessible to all sections of the society (unbiasedness) after establishment of CHSCs. More than half of the respondents (64.17%) agreed that there was reduction in health hazards by using machineries for various agricultural operations. More than half i.e., 52.50 per cent of the farmers disagreed to issues like CHSCs employees were not helpful and 35.83 per cent were strongly disagreeing towards this statement.

Perception in terms of environmental factor can be operationalised as degree to which it is perceived to have effect on environment due to enhanced mechanization facilitated by CHSCs.

Table 4. Perception in terms of efficiency related to CHSCs (N=120)

Perception in terms of Efficiency	SA f(%)	A f(%)	U f(%)	D f(%)	SD f(%)
CHSCs helps in maintaining timeliness in operation	111(92.5)	9(7.5)	0(0)	0(0)	0(0)
CHSCs reduce the problems of labour shortage	65(54.17)	55(45.83)	0(0)	0(0)	0(0)
CHSCs helps in reduction of harvest and post-harvest losses	17(14.17)	80(66.67)	16(13.33)	0(0)	7(5.83)
Precision in efficiency of utilization of various crop inputs is brought by CHSCs	15(12.5)	105(87.5)	0(0)	0(0)	0(0)

f=frequency, %=percentage

Table 5: Perception in terms of social factor related to CHSCs (N=120)

Perception in terms of Social factor	SA f(%)	A f(%)	U f(%)	D f(%)	SD f(%)
Farm machineries are easily accessible to all sections of the society (unbiasedness) after establishment of CHSCs	104(86.67)	16(13.33)	0(0)	0(0)	0(0)
CHSCs assist in employment generation among villagers	3(2.5)	22(18.33)	9(7.5)	32(26.67)	54(45)
There is reduction in health hazards by using machineries for various agricultural operations	43(35.83)	77(64.17)	0(0)	0(0)	0(0)
Mechanization facilitated by CHSCs helps in drudgery reduction	74(61.67)	42(35)	0(0)	4(3.33)	0(0)
CHSCs employees are not helpful	0(0)	14(11.66)	0(0)	63(52.5)	43(35.83)

f=frequency, %=percentage

Table 6: Perception in terms of environmental factor related to CHSCs (N=120)

Perception about Environmental factor	SA f(%)	A f(%)	U f(%)	D f(%)	SD f(%)
There has been reduction in pollution due to pooling of machineries	16(13.33)	48(40)	27(22.5)	23(19.67)	6(5)
Proper management of stubbles and crop residue has been brought about after advanced machineries are being hired from CHSCs	12(10)	94(78.83)	8(6.67)	6(5)	0(0)
There will be spread of disease due to use of contaminated machines from CHSCs	0(0)	11(9.167)	30(25)	31(25.83)	48(40)
Heavy agricultural machinery results in more permanent damage to the soil than before	11(9.17)	33(27.5)	15(12.5)	30(25)	31(25.83)

f=frequency, %=percentage

Table 6 shows that, 40 per cent farmers are agreeing toward the fact like, there has been reduction in pollution due to pooling of machineries, while 22.50 per cent farmers were undecided and further 19.67 per cent respondents 'disagreed' to this statement. Majority of the respondents (78.83%) agreed that proper management of stubbles and crop residue has been brought after advanced machineries are being hired from CHSCs. And 25 per cent farmers are undecided regarding the factors like there will be spread of disease due to use of contaminated machines from CHSCs whereas 40 per cent of the respondents strongly disagreed with the statement.

CONCLUSION

From the findings of the study it can be concluded that CHSCs managed to imprint its positive and favorable results on various dimensions on farmers and its surroundings. The majority of farmers considered that mechanization is important, and as machineries are costly, more custom hiring service centres should be set up. The possible reason for having good perception of farmers towards CHSCs can be attributed to factors like availability, accessibility of machineries and it also played an important role in economic, social and environmental factors. The Custom Hiring Service Centres were able to make beneficiary farmers stand a step ahead towards accessing modern and new machineries.

REFERENCES

Edwards, A.L. 1957. *Techniques of attitude scale construction*. Vakils, Feffer and Simons Pvt. Ltd, Bombay.

Joshi, P.; N. Sharma; A. Kumar; J.P.S. Dabas; N. Ahmad; S. Sahu and P.P. Maurya. 2018. Assessment of Drudgery in Paddy Cultivation among Women Workers and Technological Gaps in the National Capital Region of Delhi. *Journal of Community Mobilization and Sustainable Development*, 13(2): 227-232.

Kerlinger, F.N. 1964. *Foundation of Behavioural Research, Educational and Psychological Inquiry*. Holt. Rinehort and Winston. *Inc., New York*.

Kerlinger, F.N. 1973. *Foundations of Behavioral Research*. 2nd edition. Holt, Rinehart and Winston.

Kumar, R. and A. Tripathi. 2018. Status of Farm Mechanization of Different Agro-Climatic Zones in Uttar Pradesh. *Internat. J. Agric. Engg.,* 11(1): 180-83.

Likert, R.A. 1932. A technique for the measurement of attitude. *Archives of Psychology,* 22(140): 1-55.

Morgan, C.T.; R.A. King; J.R. Weisz and J. Schpler. 1993. *Introduction to Psychology*. The McGraw-Hill Companies, New York.

Nissa, R.; M. Zubair; I. Ghani and N. Jahan. 2017. Custom Hiring Centre: An Emerging Trend-Benefits, Constraints and Way Forward with Reference to Nicra Village in Wakharwan, District Pulwama. *Int. J. Res. Applied Natural and Soc. Sci.*, 5: 111-24

Pawar, D.B.; B.R. Pawar; A.A. Ansari and M.O.H.D. Asmatoddin. 2010. Economics of custom hired tractor service business in Maharashtra. *International Journal of Commerce and Business Managaement*, 2(2): 136-138.

Singh, M.; B.K. Singh; P. Singh and R.R. Burman. 2018. Development of Scale to Measure Attitude of farmers towards IARI-Voluntary Organizations Partnership Extension Model: A Methodological Approach. *Journal of Community Mobilization and Sustainable Development*, 13(2): 221-226.

Singh, S.; S. Kingra and Sangeet. 2013. Custom Hiring the Services of Farm Machinery in Punjab: Impact and Policies. *Indian Res. J. Ext. Edu*., 13(2): 45-50.

Spector, Paul E. 1992. Summated Rating Scale Construction: An Introduction Sage University Papers Series. Quantitative Applications in the Social Sciences; No. 07-082.

Srinath, K.; H.K. Dash; S. Agarwal; A. Tripathy; P. Lopamudra and S. Pattanaik. 2010. Drudgery reduction and women friendly farm tools and equipment. *Technical bulletin 16*. Directorate of Research on Women in Agriculture (ICAR) Bhubaneswar. pp 2.

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Content of Three Indian Newspapers on '*Beti Bachao Beti Padhao*': A Comparative Analysis

Shakshi Bisht[1] and Vandana Verma Trar[2]
Department Extension Education and Communication Management, CCS Haryana Agricultural University, Hisar, Haryana

ABSTRACT

Alarming decline in Child Sex Ratio led a challenge for society. The government addressed the issue by launching '*Beti Bachao Beti Padhao*' scheme. Print media also participated as a vehicle for change in the issues relating to girl. As a result, the study focused on the content analysis of three newspapers regarding '*Beti Bachao Beti Padhao*' (BBBP) issue. The newspapers were analyzed quantitatively as well as qualitatively. Space covered regarding BBBP issues was 451.85 col.cm, 509.21col.cm and 219.65col.cm in the Times of India, the Tribune and *Nabh-chor,* respectively. All the three newspapers gave first priority to news, second priority was given to editorial by The Times of India, feature in The Tribune and photographs in *Nabh-chor*.

Keywords: *Beti Bachao Beti Padhao*, Content analysis, Newspaper, Print media, Media

INTRODUCTION

Child Sex Ratio (CSR) is defined as number of girls per 1000 boys in the age group 0-6 years; it is an indicator of social attitude and response towards girl child in society. Child Sex Ratio (CSR) has been on decline since 1961 in India from 945 in 1991 to 927 in 2001 and further down to 919 in 2011. Haryana has the worst sex ratio among all 29 states having 819 females per 1000 males and Child Sex Ratio (CSR) is 834 (Census 2011). The sharp decline in Child Sex Ratio (CSR) alarmed the government and called for immediate action to protect the girl child in country. Concerned about the skewed figure, '*Beti Bachao Beti Padhao*' scheme was launched by Prime Minister Shri Narendra Modi on 22 January 2015 at Panipat in Haryana. The 'Beti Bachao Beti Padhao' campaign was massively projected by mass media campaigns. Along with digital media, print media also participated as a vehicle for change in the issues relating to girl. Increasing literacy, political inclination and better purchasing power are the reasons which provide base for golden days to print media industry. Hence, print media of both developed as well as developing countries has major share in development communication in the world, which can be of great importance in shaping the society as print media will act as medium of developmental change in society (Patil, 2011).

Bala (2001) pinpointed that English newspapers devoted less space to development issues as compared to Hindi newspapers, in proportion to total printed area of newspaper. Singh (2011) did the investigation of the coverage of progress programmes in Indian newspapers. The reporting of news related to them is very less. The editorial page of the newspapers also lacks in giving information about developmental programmes. The major lacking remains on the front page of newspaper which does not showcase any type of developmental programme. Upon investigating print news discourses on an act of violence perpetrated on women in India, Das (2012) suggested that it is very important for the media breaking free from the patriarchal control and start captivating feminist perspectives into serious considerations, so that it can impart healthy attitudes towards feminity in the society. Sahu and Shah (2015) conducted a study on Agenda Setting Role of Hindi Dailies (Amar Ujala and Dainik Jagran) on Women's Issues found that most of the time negative issues like violence against women are covered by newspapers. Content analysis is a research method that uses a set of procedure to make valid inferences from text as defined by Robert Phillip Weber in 1990. Berelson (1952) defined content analysis as a systematic, replicable technique for compressing many words of text into fewer content categories based on explicit rules of coding. Kaur and

*Corresponding author email id: 2112shakshi@gmail.com

Kaur (2013) studied the content of Changi Kheti magazine qualitatively with the aid of reading difficulty index and reader's reactions towards it. Results revealed that contents of selected magazine were termed as easy to understand and all the respondents were satisfied with periodicity and volume. Majority stated that the content was practicable, useful, always relevant, timely and highly motivational. Similarly, a study was conducted to measure the perception of farming community on a magazine 'Haryana Kheti' (Yadav *et al.,* 2018). In order to analyze the content of Indian newspapers about "*Beti Bachao Beti Padhao (BBBP)*" scheme present research was conducted.

MATERIAL AND METHODS

Three newspapers were selected, one national English, one regional English and one local Hindi. National and regional newspapers were selected according to readership chart released by Indian Readership Survey IRS-2015. In the case of local newspaper, readership chart was not available then; newspaper was randomly selected out of the total local newspapers of Hisar city. '*Beti Bachao Beti Padhao (BBBP)*' issues were analyzed for the period of January-February in the year 2015, 2016 and 2017. The data was collected in terms of column.cm. Content quantitative analysis was done by assessing the space and ratio of total space devoted to *BBBP* issues. Qualitative analysis was done by evaluating source, format, context and placement of *BBBP* issues.

RESULT AND DISCUSSION

Profile of the newspapers: The Times of India is an English language daily newspaper. It is the oldest English language newspaper in India still in circulation with its first edition published in 1838. The Tribune is an Indian English language daily newspaper published from Chandigarh, New Delhi, Jalandhar, Dehradun and Bhatinda. It was founded on 2 February 1881. It is major Indian newspaper with a worldwide circulation. *Nabh-chor* is leading service provider of newspaper in Hisar city of Haryana. *Nabh-chor* was established in the year 1986 (Table 1).

The Times of India had maximum number of pages (20-22+ supplements) followed by The Tribune (16-22+ supplements) and *Nabh-chor* had least number of pages (4-8). Cost of The Times of India and The Tribune is Rupees 5 each whereas cost of *Nabh-chor* is Rupees 2. According to Audit Bureau of Circulation, per day average circulation of The Times of India was maximum i.e. 27, 31,334 followed by The Tribune with average circulation 3, 11,936 per day. According to information given by editor of *Nabh-chor* the average circulation of *Nabh-chor* is 30,000 approx per day. According to the survey of MURC, The Times of India were having maximum number of readers i.e. approximately 75,90,000 followed by The Tribune with approximate 5,07,000 number of readers. As per the information given by *Nabh-chor* the local newspaper was having 90,000 readers.

Edition that was used for The Times of India was New-Delhi edition, for The Tribune it was Chandigarh edition and for *Nabh-chor,* Hisar edition was used.

Space devoted to 'Beti Bachao Beti Padhao' issues in selected dailies: Total average printed area of newspaper was found maximum in The Times of India (9152col.cm) followed by The Tribune (7904col.cm) and least in *Nabh-chor* (3052col.cm) (Table 2). Total space covered by BBBP issues is maximum in The Tribune (509.21col.cm) followed by The Times of India (451.85col.cm.) and least in *Nabh-chor* (219.65col.cm). Percentage space covered by BBBP issues was calculated by dividing the total space covered by BBBP issues by total average printed area of newspaper into 100, it was

Table 1: Profile of the newspapers

Particulars	The Times of India	The Tribune	*Nabh-chor*
Year of establishment	1838	1881	1986
Number of printed pages	20-22+ supplements	16-22+supplements	4-8
Cost of the paper	Rs. 5	Rs. 5	Rs. 2
Average circulation per day	27,31,334 (Audit Bureau of circulation)	3,11,936 (Audit Bureau of circulation)	30,000 approx (newspapers agency)
Approximate No. of readers	75,90,000 (Indian readership survey-MRUC)	5,07,000 (Indian readership survey-MRUC)	90,000 approx (newspapers agency)
Edition used in study	New Delhi	Chandigarh	Hisar

Table 2: Space devoted to *'Beti Bachao Beti Padhao'* issues

Information	The Times of India	The Tribune	*Nabh-chor*
Total average printed area of newspaper	9152col.cm	7904col.cm	3052col.cm
Total space covered by BBBP issues	451.85col.cm.	509.21col.cm	219.65col.cm
Percentage space covered by BBBP issues	4.93	6.44	7.19
Total number of items related to BBBP issues	163	195	75

maximum in *Nabh-chor* (7.19%) followed by The Tribune (6.44%) and least in The Times of India (4.93%). Total number of items related to BBBP issues were maximum in The Tribune (195) followed by The Times of India (163) and then in *Nabh-chor* (75).

Source of coverage used for reporting *'Beti Bachao Beti Padhao'* issues: Most of the items related to BBBP issues were covered by newspapers own correspondents (54) in The Times of India followed by national wire services (47), freelance journalist (39). Very less information is provided by no source mentioned (16), letter to editor (4) and international wire services (3). In the Tribune, Freelance journalist (58) are major source of information followed by newspapers own correspondents (53) and national wire services (45). Less information is provided by no source (25), international wire services (8) and letter to editor (6). In *Nabh-chor,* most information was by newspapers own correspondents (51). Least information is offered by national wire service (10), freelance journalist (5), no source (5) and letter to editor (2) (Table 3).

***Format of coverage regarding 'Beti Bachao Beti Padhao' issues*:** Format of coverage is another key pointer of the significance attached to any news item. News pinpoints timely reporting, feature is based on feelings while article is an intricate portion of composition written on a broad subject. News items were most used format for publishing BBBP issues in all the three dailies (Table 4).

Table 3: Source of information used

Source of information	The Times of India		The Tribune		*Nabh-chor*	
	No. of items	Rank	No. of items	Rank	No. of items	Rank
Newspapers own correspondents	54	I	53	II	51	I
National wire service	47	II	45	III	10	II
International wire service	3	VI	8	V	0	-
Freelance journalist	39	III	58	I	5	VI
Letter to editor	4	V	6	VI	2	V
No source	16	IV	25	IV	8	III
Total	163		195		75	

Table 4: Format of coverage

Format of coverage	The Times of India		The Tribune		*Nabh-chor*	
	No. of items	Rank	No. of items	Rank	No. of items	Rank
Article	28	III	26	IV	3	V
Feature	16	V	33	II	1	VII
News	55	I	72	I	54	I
Advertisements	22	IV	17	V	4	IV
Editorial	32	II	31	III	5	III
Letter to editor	4	VII	6	VII	2	VI
Photographs	6	VI	10	VI	6	II
Total	163		195		75	

Most preferred format of coverage of BBBP issues by editors was news items (55) followed by editorial (32), article (28), advertisements (22) and feature (16). Least used formats were photographs (6) and letter to editor (4) in The Times of India. In the Tribune, news items (72) were important format to cover BBBP issues followed by feature (33). Other main formats were editorial (31) and article (26). Least used formats were advertisement (17), photographs (10) and letter to editor (6). High importance was given to news items (54) by *Nabh-chor*. Least used formats were photographs (6) and editorial (5). Negligible items were published as advertisements (4), article (3), letter to editor (2) and feature (1).

Context of coverage regarding 'Beti Bachao Beti Padhao' issues: Context of coverage refers to reporting of *'Beti Bachao Beti Padhao'* issues at various levels. Most information was provided in form of photographs, editorial, feature, article and letter to editor (86) by The Times of India followed by information at national level context (55). Fewer items were in state level context (10). International level context (6) and district level context (5) was low and least information was in village level (1) context. In the Tribune, most information was in form of photographs, editorial, feature, article and letter to editor (106). Fewer items were in state level context (24), district level context (21), national level context (19) and village level context (15). Least number of items was in international level context (10). In *Nabh-chor,* most information was published in village level context (22) closely followed by state level (19). Photographs, editorial, feature, article and letter to editor context (17) were another important source. Less information is provided in district level (13) and national level (4) context. No information was published at international level context (Table 5).

Placement of coverage regarding 'Beti Bachao Beti Padhao' issues: Placement of coverage in various pages of newspaper highlights the relative importance of the item. A news item placed at front page will have more importance than the item which is placed at local/city page. Table 6 reveals data on placement of news items in the three dailies. Most number of the items were placed in national page (42) by national newspaper- The Times of India followed by editorial page (39), local/city page (38) and special supplements (24). Fewer items were in front

Table 5: Context of coverage

Context of coverage	The Times of India		The Tribune		*Nabh-chor*	
	No. of items	Rank	No. of items	Rank	No. of items	Rank
National level	55	II	19	IV	4	V
International level	6	IV	10	VI	0	-
State level	10	III	24	II	19	II
District level	5	V	21	III	13	IV
Village level	1	VI	15	V	22	I
Others*	86	I	106	I	17	III
Total	163		195		75	

*****(Photographs, Feature, Article, editorial, Letter to editor)

Table 6: Placement of coverage

Placement of coverage	The Times of India		The Tribune		*Nabh-chor*	
	No. of items	Rank	No. of items	Rank	No. of items	Rank
Front page	15	V	12	V	6	IV
International page	5	VI	8	VI	0	-
National page	42	I	28	IV	7	III
Local/city page	38	III	51	I	54	I
Editorial	39	II	47	III	8	II
Special supplement (feature page)	24	IV	49	II	0	-
Total	163		195		75	

page (15) and in international page (5). In the regional newspaper The Tribune, majority of the items were placed in local/city page (51) followed by special supplements (49), editorial page (47) and national page (28). Smaller number items were in front page (12) and in international page (8). *Nabh-chor* does not have international page and supplements; therefore, no items were recorded in this category of placement of coverage. Most of the items were placed in local/city page (54) following the pattern of regional newspaper. Fewer items were placed in editorial page (8), national page (7) and front page (6).

CONCLUSION

All the three selected newspapers The Times of India, The Tribune and *Nabh-chor* provided a total average of 5.87 per cent of the space to published BBBP issues. The Times of India gave 451.85col.cm., The Tribune gave 509.21col.cm and *Nabh-chor* gave 219.65col.cm of space, respectively, to publish BBBP issues. Space devoted to *'Beti Bachao Beti Padhao'* in the year 2015 was 547.15 col.cm by all the three dailies, which decreased to 378.87 col.cm. in 2016 and further decreased to 254.69 col.cm. in 2017. Total number of items related to BBBP issues were maximum in The Tribune (195) followed by The Times of India (163) and *Nabh-chor* (75). First priority in format of coverage in all the three newspapers was news, second was editorial, feature and photographs, respectively. Most preferred source of coverage was newspapers own correspondents in The Times of India and *Nabh-Chor*. The Tribune gathers most information from freelance journalist. Context of coverage in national and local newspaper BBBP issues were mainly in form of photographs, feature, article, editorial and letter to editor. In *Nabh-chor,* village level context was most used. Placement of coverage in The Times of India was at national page while in The Tribune and *Nabh-chor,* news items are mainly placed at local/city page.

REFERENCE

Bala. 2001. Role of newspapers in development communication. M.Sc. Thesis. CCS Haryana Agricultural University, Hisar, India.

Berelson, B. 1952. Content Analysis in Communication Research. Free Press, New York.

Census Data. 2011. Govt. of India, Ministry of Home Affairs. Office of Registrar General and Census Commissioner. India. Website: http://www.censusindia.gov.in/2011-common/census_2011.html

Das, R. 2012. Representation of violence against women in Indian print media: A comparative analysis. *Global Media Journal*, 3: 1-124.

Kaur, M. and S. Kaur. 2013. Qualitative analysis of contents of changi kheti magazine. *Journal of Community Mobilization and sustainable Development,* 8(1): 100-104.

Patil, M. 2011. Recent trends of print media in development communication. *Global Media Journal –Indian Edition,* 2(2): 1-20.

Sahu, G.K. and A. Shah. 2015. Agenda setting roles of Hindi Dailies on women issue: Comparative analysis. *International Journal of Scientific Research,* 4(4): 259-261.

Singh, A.K. 2011. Coverage of Development News in Print Media (A content analysis). *Shodh Sanchayan*, 2(1&2): 1-7.

Weber, R.P. 1990. *Basic Content Analysis*. 2nd ed. Newbury Park, CA.

Yadav, K.; R. Kumar; P.K. Chahal and B.S. Ghanghas. 2018. Perception of the farming community regarding quality of articles published in Haryana Kheti. *Journal of Community Mobilization and Sustainable Development*, 13(1): 75-78.

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Farmers' Perception on Use of Mobile phones for Agricultural Information

Usha Das[1]*, Pragya Goswamy[2] and V.L.V. Kameswari[3]

[1,2]Ph.D. Scholar and [3]Professor, Department of Agricultural Communication, G.B. Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar-263145, Uttarakhand

ABSTRACT

Extension reforms are underway and integration of new Information and Communication Technologies (ICTs) are rapidly transforming agricultural extension. The ICT-enabled extension systems are acting as a key agent for changing the agrarian situation and farmers' lives by improving access to information and sharing knowledge. Thus, present study analysed the perceived ease of use of ICTs as perceived by a sample of farmers of Udham Singh Nagar district of Uttarakhand. About 35 per cent farmers felt that it was easy to use ICTs while 38 and 27 per cent perceived them as medium and highly difficult, respectively. Perceived ease in use index was found to be around 44 per cent, which indicates that ICTs as a system is not that easy to use. Capacity building of farmers in use of ICTs is the need of the hour to tap their benefits.

Keywords: Farmers' perceptions, ICT, m-agriculture, Social media

INTRODUCTION

Technology adoption among farming community is widely acknowledged as one of the critical factors for efficient and effective agricultural decision-making (Cash, 2001; Galloway & Mochrie, 2005; Rao, 2006; Opara, 2008; Taragola and Van Lierde, 2010). Even after continuous efforts of extension organisations, 60 per cent of the farmers in India do not have access to any source of information on advanced agricultural technological information, resulting in a huge adoption gap (NSSO, 2005). In India, there are about 120 million farm holdings and the number has been showing an increasing trend. The present requirement of field level extension personnel is estimated to be about 1.3 to 1.5 lakh, against which the current availability is only about 1 lakh personnel (Planning Commission, GOI, 2017). In this existing scenario, it is expected that integration of ICTs in agricultural extension will provide needed impetus to agricultural sector (Saravanan, 2013). The high cost of delivering information through face to face interaction and crumbling extension services has paved the way for use of modern Information and Communication Technologies (ICTs) including mobile phones in disseminating agricultural information. The ICT-enabled extension systems are acting as a key agent for changing the agrarian situation and farmer's lives by improving access to information and sharing knowledge. It is believed that ICT-based agricultural extension brings opportunities and has the potential for enabling the empowerment of farming communities.

Over the last decade, India has emerged as a testing ground for innovations in ICTs with more than 45 per cent of the World's ICT projects have been implemented in India (Saravanan, 2010). During the last decade, a large number of ICT innovations were deployed for facilitating agro-advisory services in India for overall development of agriculture and allied sectors. However, only few projects were scaled-up and sustained. It is expected that the ICT led extension systems are going to act as a key agent for changing agrarian situation and farmers' lives by improving access to information and sharing knowledge. Hence, there is a renewed enthusiasm to use new ICTs like mobile apps and social media for agricultural advisory services.

Agricultural information needs of farmers in India have changed over the years. They often require advice and interpretation of information rather than information itself, emphasizing the importance of information

(*Corresponding author) email id: *usha24.das@gmail.com, [2]pragya24goswamy@gmail.com, [3]vlvkameswari@yahoo.co.in

management for farmers (Prashanth, 2012). In recent years, the spread of ICTs with more focus on mobile advisories and use of social media has raised the expectation that these technologies would deliver fast, reliable and accurate information in a user-friendly manner (Shalendra *et al.*, 2011).

Information and Communication Technology (ICT) though revolutionised the communication system yet it had its own bottlenecks in terms of affordability, logistics issues, social penetration, acceptability etc. that thus led to evolution of another form of ICT through mobile phones which had better acceptance and larger penetration with a personalised touch thus making it indispensable in the process of communication.

But the direct use of ICTs by farmers to access agricultural information is still quite low in India. This is due to several factors, one of them being technology apprehension. Many ICT based project, especially the earlier projects had an infomediary to overcome this bottleneck. But, with rapid change in technology and nature of ICT projects, it would be more effective if the farmers are able to use them directly. The Technology Acceptance Model (TAM) developed by Davis (1989), identifies perceived ease of use as an important contributing factor which influence the acceptance or adoption of technology including use of ICTs for accessing farm information. Against this backdrop, the present study was conducted "Farmers' Perception on Use of Mobile phones for Agricultural Information" in Uttarakhand.

MATERIALS AND METHODS

The study was conducted with the help of personal interview schedule developed by the authors (Das *et al.,* 2018). For the study, 99 farmers were selected following accidental sampling method. This random sample of farmers were selected during Agricultural Fair (Kisan Mela) organised by the Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, during the Rabi season (2018-19).

The interview schedule comprised of two parts. First part of the schedule pertained to items related to the socio-personal and economic characteristics of farmers, various types of mobiles owned by farmers and their use. The second part measured the perceived ease of use of mobile phones. This was done with the help of a tool comprising of nine statements. The tool used for evaluating the perceived ease of use of various mobile phones was on a three point continuum, where the class intervals were assigned after subtracting the minimum possible score from maximum possible score and dividing it by three. The perceived ease of use index was calculated using the formula:

$$\text{Ease in use index} = \frac{\text{Pooled mean}}{\text{Maximum possible score}} \times 100$$

The perceived ease of use index was calculated by dividing pooled mean with maximum possible score that can assign to each statement out of the 9 statements mentioned.

RESULTS AND DISCUSSION

Present study analysed the profile of the respondents, type of mobile phones being used by the farmers, purposes of using these tools, frequency of use and perceived ease of use. Most of the respondent farmers had preliminary contact with G.B. Pant University of Agriculture and Technology, Pantnagar as they visit and participate in different extension and communication programmes organised by the University around the year.

A perusal of Table 1 indicates that the majority of the famers were of middle age group (33-55 years). It was found that 31.1 per cent of the farmers had studied up to graduation and 29.29 percent up to intermediate level. Majority of the respondents had farming as their primary occupation (78.78%) followed by 11.11 per cent farmers with their secondary occupation as business along with farming. Out of the total respondents, 77.78 per cent used smart phones with internet connectivity and rest 22.22 per cent used feature phones. Maximum number of smart phone users owned Samsung (31.31%) phone followed by Nokia (16.16%) and Vivo (12.12%).

Table 2 represents the perceived ease of use of mobile phones based on nine statements in terms of agreement, disagreement or being undecided. Out of nine statements, 1st, 2nd, 3rd, 5th and 6th were negative statements while 4th, 7th, 8th and 9th were positive statements. Half of the respondents (50.64%) said that they often become confused when using mobile phones which indicated that majority of them perceived mobile phones to be difficult and confusing to use. However, it was also found that substantial number (33.76%) did not agree with this statement. This difference can perhaps be attributed to level of education of the respondents.

Table 1: General Profile of sampled farmers

Category	Frequency	Percentage
Age		
<33	11	11.11
33-55	67	67.67
>55	21	21.21
Education		
Illiterate	3	3.03
Primary School	4	4.04
Middle School	7	7.07
High School	14	14.14
Intermediate	29	29.29
Graduate	31	31.31
Post Graduate	11	11.11
Occupation		
Farming only	78	78.78
Farming + Service	10	10.1
Farming + Business	11	11.11
Mobile Type		
Smart	77	77.78
Feature	22	22.22
Internet Connectivity		
Yes	77	77.78
No	22	22.22
Brand		
Samsung	33	33.33
Nokia	16	16.16
Micromax	9	9.09
Oppo	6	6.06
Motorola	1	1.01
Lenovo	1	1.01
Vivo	12	12.12
Intex	4	4.04
i-Phone	5	5.05
Xiaomi	9	9.09
Spice	1	1.01
Videocon	1	1.01
Honor	1	1.01

The study also revealed that maximum (57.14%) number of respondents made errors while using mobile phones (statement 2). Majority (50.64%) of them also found it easy to recover from errors while using mobile phones (statement 4). Hence, with proper training, the farmers will be able to use mobile phones independently to access agricultural information. The study indicated that maximum number of farmers (37.66%) did not find using mobile phones stressful. However, more than a quarter of them found use of Mobile phones stressful (28.57%) or were undecided about this aspect (26%). Hence, this aspect of use of mobile phones needs further exploration and remedial action. It was seen that, maximum number of respondents (37.66%) found it easy to interact with mobile phones (statement 5) but were not able to do so independently (statement 6). About half of the farmers (51.94%) had to consult someone while using mobile phones, whereas 29.87 per cent were able to operate mobile phones independently. Further, more than a quarter of farmers (28.57%) found mobile phones difficult to use. Prashanth *et al.* (2012) found that 40.00 percent of the respondents consulted workers of voluntary organisation for their information acquisition regarding agricultural technologies and 36.66 per cent farmers consulted ANGRAU scientists for this purpose.

With reference to statement 7, maximum number of farmers (46.75%) found it easy to get the mobile phones to do what they want to do. Further, it was found that, majority (55.84%) of the respondents felt that mobile phones provide helpful guidance in performing tasks.

According to Shalendra *et al.* (2011), the spread of Mobile phones with more focus on mobile advisories and use of social media has raised the expectations that these technologies would deliver fast, reliable and accurate information in a user-friendly manner. This hope is well founded on the basis of farmers response to the last statement where it was seen that majority of them found it easy to use mobile phones.

Nargawe and Mishra (2019) suggested a clear lead towards use of mobile phones followed by television and newspapers by the respondents in terms of availability and exposure to modern mass media is concerned; with majority of the respondents having average or medium exposure to modern mass media use. This implies agricultural information needs can be best communicated through mobile phones or mobile telephonic services.

Table 3, depicts the overall perceived ease of use of mobile phones after calculating the cumulative scores and categorizing the respondents into three groups. It was found that maximum number of the respondents (38.96%)

Table 2: Statement wise perceived ease of use of mobile phones

Statement	Agree (%)	Neutral (F %)	Disagree (F %)
I often become confused when I use the Mobile phones	50.64	15.58	33.76
I make errors in using the Mobile phones	57.14	20.77	22.07
Interacting with Mobile phones puts a lot of mental strain on me	28.57	26	37.66
I find it easy to recover from errors while using Mobile phones	50.64	37.66	11.68
I find Mobile phones difficult to interact	28.57	33.76	37.66
I need to consult someone often using Mobile phones	51.94	18.18	29.87
I find it easy to get the Mobile phones to do what I want to do	46.75	38.96	14.28
The Mobile phones provide helpful guidance in performing task	55.84	41.55	2.59
I find the Mobile phones easy to use	55.84	36.36	7.79

Table 3: Overall perceived ease of use of mobile phones by the respondents

Perceived ease of Use	Frequency	Percentage
Difficult (less than 7)	24	31.17
Medium (7 to 12)	23	29.87
Easy (more than 12)	30	38.96

Table 4: Perceived Ease of use index of various mobile phones

Statement	Mean Score (SD)
1	0.65 (0.91)
2	0.51 (0.82)
3	0.85 (0.81)
4	1.08 (0.69)
5	0.85 (0.81)
6	0.61 (0.88)
7	1.03 (0.72)
8	1.19 (0.55)
9	1.15 (0.64)
Pooled mean	0.88
Ease in use index	44%

perceived mobile phones easy to use, while 31 per cent respondents found it difficult to use. So, it was found that both these perceptions were equally prevalent among the farmers. Also, more than a quarter of the respondents (29.87%) found them moderately difficult to use.

A study conducted by Sharma *et al.* (2019), suggested that promoting the usage and motivation for better use of ICTs involves four encouraging factors namely Economical, Facilitating, Social & Psychological and Technical along with provision of other supportive services. Of all these factors, among the social & psychological factors and technical factors, adequate familiarity and expertise in ICT and In-service training for using/producing ICTs, was on first rank respectively and perceived most important.

Table 4 describes the perceived ease of use index of mobile phones. It was observed that about 44 per cent of the respondents found that mobile phones were easy to use. The positive statements of the tool showed a mean of above one indicating that people found it easy to use Mobile phones and mean of negative statements showed lower mean score with quite high standard deviation. Statement 3 (Mobile phones puts a lot of mental strain) and statement 5 (Mobile phones are difficult to interact with) had a mean score of 0.85 and a high standard deviation (0.81). On the other hand, statement 8 (Mobile phones provide helpful guidance in performing task) had the highest mean score of 1.91 among all positive statements and low standard deviation of 0.55.

CONCLUSION

Present study reiterates the less than optimal use of mobile phones due to a variety of bottlenecks faced by farmers especially their perception about the ease of use requires addressing this issue through capacity building of farmers in use of Mobile phones. Over the last decade, India has emerged as a testing ground for mobile phones for development. As mobile phones-based interventions for delivering agricultural advisory services have increased significantly, understanding the profile of users and Mobile phones utilization pattern by farmers is essential for designing better information delivery systems. The present

study revealed that a significant number of farmers now have access to smart phones which makes information delivery through portals, apps and social media a distinct possibility. This approach would, however, require a positive perception about the use of mobile phones among farmers. The study revealed that a significant number of farmers feel that mobile phones were difficult or moderately difficult to use. This situation needs to be changed by organizing capacity building programmes on the use of mobile phones for agriculture. Training the farmers in use of mobile phones will go a long way in overcoming the technology apprehensions and use of mobile phones for accessing farming information.

REFERENCES

Cash, D.W. 2001. In order to aid in diffusing useful and practical information: Agricultural extension and boundary organizations. *Science Technology and Human Values*, 26: 431–453.

Davis, F.D. 1989. Perceived usefulness, perceived ease of use, and user acceptance of Information Technology. *MIS Quarterly*, 13(3): 319-340.

Galloway, L. and R. Mochrie. 2005. The use of ICT in rural firms: A policy-orientated literature review. *The Journal of Policy, Regulation and Strategy for Telecommunications*, 7: 33–46.

Nargawe, L. and Y.D. Sharma. 2019. Association of Socio-personal Attributes of the beneficiaries with the Impact of KMA. *Journal of Community Mobilization and Sustainable Development,* 14(3): 467-472.

National Sample Survey Organization (NSSO). 2005. *Situation assessment survey of farmers: Access to modern technology for farming* (Report No. 499 [59/33/2]), National Sample Survey Organization, Ministry of Statistics and Program Implementation, Government of India. New Delhi.

Opara, U.N. 2008. Agricultural information sources used by farmers in Imo State, Nigeria. *Information Development,* 24(4): 289–295.

Planning Commission, GOI, 2007. *Recommendations of working group on agricultural extension for formulation of eleventh five-year plan (2007-12)*, Planning Commission, Government of India, New Delhi. http://planningcommission.nic.in/plans/planrel/11thf.htm

Prashanth, P.; N.K. Kumar and M.J.M. Reddy. 2012. Usage of personal-localite channels for acquiring the agriculture information by the tribal farmers. *Indian Research Journal of Extension Education*, 2(Special issue): 107-110.

Rao, S.S. 2006. Role of ICTs in India's rural community information systems. *Info,* 6(4): 261–269.

Saravanan R. 2013. e-Agriculture Prototype for Knowledge Facilitation among Tribal Farmers of North-East India: Innovations, Impact and Lessons. *The Journal of Agricultural Education and Extension*, 19(2): 113-131.

Saravanan, R. 2010. ICTs for Agricultural Extension: Global Experiments, Innovations and Experiences. New India Publishing Agency, New Delhi.

Shalendra; K.C. Gummagolmath and P. Sharma. 2011. ICT initiatives in Indian agriculture – An overview. *Indian Journal of Agricultural Economics*, 66(3): 489-497.

Sharma, R.; S.R.K. Singh; K.N. Pathak; Y.D. Mishra and A. Sharma. 2019. Factors Encouraging Information and Communication Technologies (ICT) Usage to KVK Scientists of Madhya Pradesh and Chhattisgarh. *Journal of Community Mobilization and Sustainable Development,* 14(3): 497-500.

Sulaiman; V. Rasheed, A. Hall, N.J. Kalaivani; K. Dorai and T.S. Vamsidhar Reddy. 2012. Necessary, but not sufficient: Critiquing the role of information and communication technology in putting knowledge into use. *Journal of Agricultural Education and Extension*, 18(4): 331-346.

Taragola, N.M. and D.F. Van Lierde. 2010. Factors affecting the internet behaviour of horticultural growers in Flanders, Belgium. *Computers and Electronics in Agriculture*, 70: 369–379.

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Comparing Constraints of Rural Women Beneficiaries in CSR Initiatives

Nishu Kanwar Bhati[1]*, Rajshree Upadhyay[2] and Gopichand Singh[3]

[1]SMS, Jodhpur Agriculture University, [2]Professor and Head, Department of Extension Education and Communication Management, College of Community and Applied Sciences, MPUAT, Udaipur, Rajasthan

[3]Senior Scientist and Head, Jodhpur Agriculture University, Jodhpur, Rajasthan

ABSTRACT

Industrial houses are trying to augment rural women's income to sustain their livelihoods thereby focusing on creating, supporting and developing rural women-led enterprises, supporting women's role along value chains, enhancing their income opportunities and promoting their linkages to high value markets through CSR. They also strive to support women-led associations and small scale businesses in overcoming their supply side constraints so that they can take full advantage of opportunities offered by the market. But just like other developmental programmes constraints are experienced by rural women in these CSR initiatives. Thus, the present paper aims to compare and highlight the important constraints faced by the rural women beneficiaries of these private players face.

Keywords: Corporate social responsibility (CSR), Constraints, Rural women beneficiaries

INTRODUCTION

At present, a number of corporate houses under their Corporate Social Responsibility (CSR) initiatives are involved in the SHG formation. One of the proven ways to improve women empowerment in rural India has been the SHG approach and, credit and other support for microenterprise development. But despite the financial support received, studies have shown that many such enterprises have not sustained for long or provided sustainable or decent livelihoods. As Abraham and Kalamkar (2011) cites, this may be due to non-suitability of the enterprise activity to the area or incorrect choice, failure to market the product or service, lack of cohesion and co-operation among the members. Enterprises which received some type of formal support, particularly in marketing and credit requirements, on an average performed better in comparison to stand alone enterprises. To achieve the aim of community development, commitments of sustained efforts and investment of economic resources is very much required**.** Private business houses are from time to time delivering various training programmes for the upliftment of the rural women in particular. Through their planned CSR efforts by forming self-help groups and performing capacity building activities they have been able to instill a small change in their lives. Though planned efforts and need based activities are carried out but still the beneficiaries are unable to reap the full benefits of these initiatives. The paper thus aims to highlight the constraints these beneficiaries face in these CSR initiatives.

MATERIALS AND METHODS

The present study was conducted in Rajasthan state. Four companies comprising of Hindustan Zinc Limited (HZL), Chambal Fertilisers and Chemicals Limited (CFCL), JK Lakshmi Cement Limited (JKCL) and Shree Cement Limited (SCL) were purposively selected on the basis of their activities focusing on empowerment of rural women. From each company 60 rural women beneficiaries of CSR initiatives were selected to make the total sample of 240. To study the constrains the items under infrastructural, operational and personal constraints were content validated by various subject matter specialists and extension experts and pre testing was done on 10 rural women. After final correction and modification, the schedule was introduced for data collection. Data was collected using interview schedule and frequency, percentage and mean percent score was used to interpret the results. Mean per cent scores were obtained by dividing the total scores of the

*Corresponding author email id: nishubhati9@gmail.com

respondents by the maximum obtainable score and multiplying by 100 under each constraint.

RESULTS AND DISCUSSION

Constraints imply the problems or difficulties experienced by the rural women in the CSR activities. The constraints were categorized into personal and family, operational and infrastructural constraints. The response was recorded on the scale of three continuum that is, to great extent, to some extent and not at all assigning scores as 2, 1 and 0 respectively. The results are presented under the following sub heads.

Infrastructural Constraints: Table 1 highlight that beneficiaries of HZL's CSR initiatives faced constraints such as lack of transportation (MPS 80) and communication facilities (MPS 76.67). The trainings were carried out outside the village near the HZL factories, and respondents commuted mainly by walking. Also, the training centers were quite spacious to accommodate group of 12 to 15 women at a time (Least faced constraint MPS 39.1). In contrary, distance of training centre from home (MPS 26.67) and lack of transportation facilities (MPS 26.67) were least faced constraint by CFCL and JKCL beneficiaries due to the fact that most of the gatherings for the activities were carried out at the place which was convenient to all the group members and was not that far from their homes. The results are in conformity with Bhati *et al.* (2019).

Overall ranking of infrastructural constraints showed that lack of communication facilities as first followed by lack of basic amenities like bank, post offices (Rank II), lack of transportation facilities (Rank III), lack of adequate space to carry out suggested activities (Rank IV), and distance to training centre from the home (Rank V) were the major constraints. Results are in line with the findings of other studies that highlight lack of transportation, lack of adequate space, and distance from training centre as bottlenecks in infrastructural aspects (Meenakshi and Mahapatra, 2015; Kandeeban and Velusamy, 2016; Ranjan *et al.,* 2019). Though these studies are not carried out on CSR initiatives but jointly the beneficiaries in these studies (government and non government training programmes) broadly describes the above mentioned constraints while performing their trainings.

Operational Constraints: The beneficiaries of HZL's CSR initiatives were reported to face the least pooled operational constraint (MPS 29.87) as compared to the other three companies. Perusal of Table 2 highlighting the operational constraints depicts that none of the respondents faced problems of language in trainings, lack of technical guidance and support after the trainings and difficulty in carrying out suggested work due to lack of knowledge / skill with MPS 0. At HZL, the respondents were trained in stitching and embroidery. After the training, they were absorbed at the centre itself, by assigning them stitching projects thereby establishing market linkups. Thus, the beneficiaries earned a regular income through proper institutional support. High cost of initial investment (MPS 93.33) was the highest faced constraint reported by most of the respondents because of the cost of electricity operated sewing machines used in trainings which was quite difficult for the respondents to own, if in case they plan to start their own enterprise.

The beneficiaries of CFCL's CSR initiatives reported target oriented attitude of personnels as the major constraint (MPS 93.33) faced to great extent by majority (86.67%) of the respondents. The reason being that CFCL's approach was mainly towards building up of self-help groups, which were involved in loaning and inter-loaning thus less emphasis was laid on providing need based income generating trainings. Similar was the case of JKCL as it worked for both tribal and rural women with low

Table 1: Infrastructural constraint faced by rural women in CSR activities

Constraints	HZL (n=60) MPS	CFCL (n=60) MPS	JKCL (n=60) MPS	SCL (n=60) MPS	Overall MPS/ Rank
Distance of training centre from home	67.5	26.67	81.67	33.33	52.29(V)
Lack of basic amenities like bank, post offices	69.17	47.5	74.17	73.33	66.04(II)
Lack of adequate space to carry out suggested activities	39.17	71.67	33.33	70.83	53.75(IV)
Lack of communication facilities	76.67	60	81.67	79.17	74.37(I)
Lack of transportation facilities	80	26.67	81.67	39.17	56.88(III)

Table 2: Operational constraints faced by rural women in CSR activities

Constraints	HZL (n=60) MPS	CFCL (n=60) MPS	JKCL (n=60) MPS	SCL (n=60) MPS	Overall MPS/ Rank
Untimely supply of input	25.83	54.17	32.5	42.5	38.75 (XI)
High cost of initial investment	93.33	90	82.5	73.33	84.79(I)
Language barrier in training	0	8.33	63.33	49.17	30.20(XIII)
Activities not according to the needs	20	84.17	74.17	77.5	63.95 (V)
Lack of technical guidance and support after the training	0	92.5	55.83	89.17	59.38(VII)
Lack of institutional support	19.17	85	50.83	89.17	61.04 (VI)
Lack of faith in beneficiaries	23.33	46.67	48.33	81.67	49.99(IX)
Difficulty in carrying out suggested work due to lack of knowledge/skill	0	17.5	64.17	63.33	36.25(XII)
Follow up activities are poor	55	88.33	60	95	74.58 (III)
Personnels consider it a target oriented work	34.17	93.33	78.33	80	71.46 (IV)
Asympathatic behaviour of training perssonels	20.83	70	65.83	77.5	58.54 (VIII)
Unfulfilled promises	86.67	83.33	80	71.67	80.41 (II)
Discrimination at the training centre due to caste or class	10	44.17	41.67	64.17	40(X)

SES socio economic status. The respondents were of the view that they should be provided with financial support after the trainings to start an *enterprise* rather than just skill trainings. Inability of the perssonels to do the same yielded lesser interest on the part of the respondents in the CSR initiatives.

At SCL, SHG approach was followed for building up training groups, though it was seen that inputs were regularly provided during the trainings (MPS 42.5, least faced constraint) but support after the trainings was poor as the perssonels considered it just target oriented (MPS 80) and not need based (MPS 77.5). Thus, it lacked sustainability.

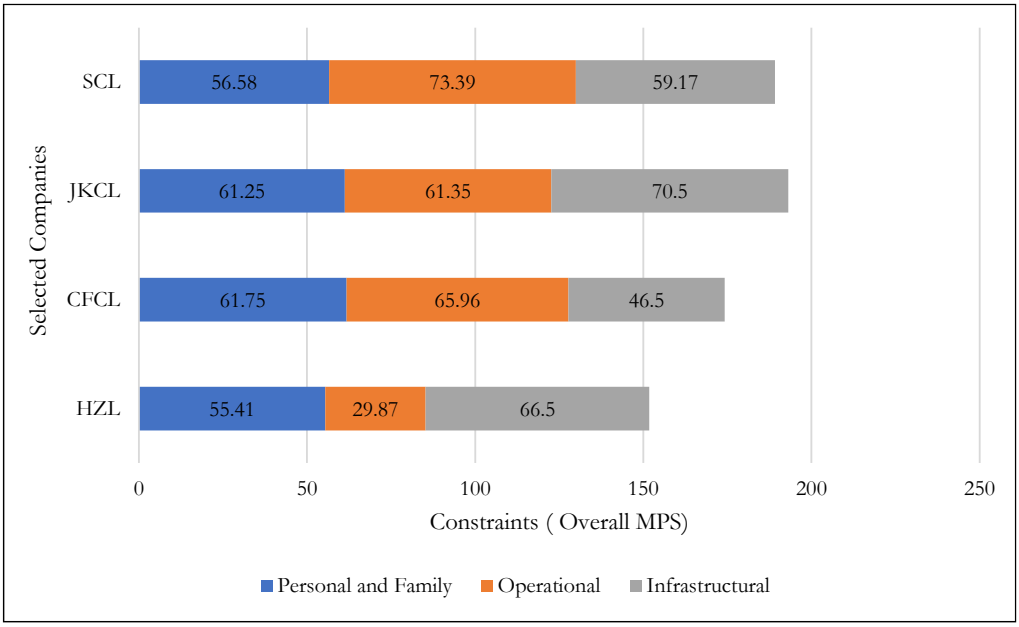
Insight into the operational constraints faced by all the beneficiaries of selected companies reveals high cost of initial investment, unfulfilled promises, poor follow up activities and target oriented work of the training personnels as a few important constraints with rank I, II, III and IV respectively. Similar findings were reported by Ahuja (2016); Collett and Gale (2009) who observed high cost of initial investment, trainings not relevant to the needs, inadequate follow up activities as major barriers that prevent the beneficiaries from accessing training.

Personal and family constraints: It is clearly evident from the Table 3 that workload constraints were the prominent constraints (Rank I, II, II) that restricted the beneficiaries of all the four companies to pursue the CSR activities. The respondents reported that though engaging in these activities may give economic benefits but they had to work for a long stretch of time from around 4-6 hours a day, thereby resulting in the above constraints. The respondents from HZL, CFCL and JKCL also expressed that children are often left uncared (Rank IV), if they participate in these activities. It is believed to be a women's duty to look after the children and other members of the family. Most of the respondents faced problem from the family side as they were not very supportive (Rank V). In the absence of husband, in laws and other family members support, entering into any economic activity could be a dream, and an unimaginable, for a woman. Her involvement in family leaves little energy and time and thus hardly any work can be taken up due to fatigue and debility (Rank VIII). They often prefer to go by the flow and thus at times their own personal hindrances like lack of enthusiasm to adopt something new (Rank VI) and lack of initiative (Rank VII) turns out to be bottlenecks for their growth. Likewise, the beneficiaries from CFCL, JKCL and SCL were farm labourers (Table 3), thus had time constraints to both participate and practice these activities (Rank IX). This does hinder their working and they often have to compromise at the work front. The findings are in line with the research by Sharma and Varma (2008) that highlights that increased work burden and

Table 3: Personal and family constraints faced by rural women in CSR activities

Constraints	HZL (n=60) MPS	CFCL (n=60) MPS	JKCL (n=60) MPS	SCL (n=60) MPS	Overall MPS/ Rank
Too much workload in family	79.17	86.67	79.17	60	76.25(III)
Increased workload due to participation in the activities	84.17	82.5	82.5	69.17	79.58(II)
Non-cooperation from family members	21.67	85	54.17	71.67	58.12(V)
Domestic work neglected	90.83	74.17	85	81.67	82.92(I)
No extra work can be taken up due to fatigue and debility	80.83	25.83	35	60	50.42(VIII)
Children left uncared	71.67	77.5	79.17	29.17	64.37(IV)
Elderly left uncared	6.67	25.83	38.33	27.5	24.58(X)
Farm and cattle care activities not attended properly	5	71.67	64.17	41.67	45.62(IX)
Lack of initiative	62.5	36.67	51.67	55	51.45 (VII)
Lack of enthusiasm to adopt something new	51.67	51.67	43.33	70	54.17(VI)

Figure 1: Pooled constraints of rural women beneficiaries of different companies



responsibility, and small children or dependent in-laws as major personal constraints faced by women beneficiaries.

It can be seen from Figure 1 that in the overall ranking of constraints, infrastructural constraints ranks I, followed by personal and family (Rank II) and operational (Rank III) constraints. Likewise, highest difficulties were faced by the beneficiaries of JKCLs (MPS 64.37) CSR initiatives followed by SCL (MPS 63.04), CFCL (MPS 58.07) and least by HZL (MPS 50.59).

CONCLUSION

The results from the study show clear evidence that the beneficiaries of HZL faced fewer constraints compared to the ones from other companies. The company took into account the hardships the beneficiaries might face and what it can do to mitigate such situation; this resulted in fewer constraints on the beneficiary's side. Though need based selection of activities was carried out by all the companies but setting of a proper linkage with the market has fostered sustainability of the selected trainings. Companies have tried to address the issues of transportation, communication, input supply, proper technical follow up and marketing guidance which has enabled the beneficiaries to effectively use these trainings into income earning ventures.

REFERENCES

Ahuja, A. 2016. Women Entrepreneurship in Tertiary Sector in Indore District. School of Economics Devi, Ahilya Vishwavidyalaya, Indore.

Bhati, N.K.; R. Upadhyay and G. Singh. 2019. Comparative analysis of economic empowerment of rural women non beneficiaries and beneficiaries of CSR initiatives. *Journal of Community Mobilization and Sustainable Development,* 14(1): 76-78.

Collett, K. and G. Gale. 2009. Training for rural development: Agricultural and enterprise skills for women smallholders. City guilds centre for skills development, London cited from http://citeseerx.ist.psu.edu/viewdoc/download? doi=10.1.1.404.4825&rep=rep1&type =pdf retrieved on April 20th 2018.

Kandeeban, M. and R. Velusamy. 2016. Training needs of rural women in hilly areas for their empowerment. *Social Science Revien;* 2(2): 59-71.

Meenakshi, M. and S.N. Mahapatra. 2015. Constraints faced by women entrepreneurs. *International Journal of Management,* 6(5): 8-17.

Ranjan, R.; M.A. Ansari; S. Shekhar; C.V. Singh and R.K. Singh. 2019. Constraints experienced by the KVKs Scientists and beneficiaries for improvement of KVKs performance: A Study in Uttarakhand, India. *Journal of Community Mobilization and Sustainable Development,* 14(2): 229-236.

Sharma, P. and S.K. Varma. 2008. Women empowerment through entrepreneurial activities of self-help Groups. *Indian Research Journal of Extension Education,* 8(1): 46-51.

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Socio-economic Reasons for Non-adoption of Crop Diversification

Jobanjit Singh[1]* and Lavleesh Garg[2]

[1]M.Sc. Student, [2]Assistant Professor, Department of Extension Education, Punjab Agricultural University, Ludhiana-141004, Punjab

ABSTRACT

In Punjab State rice- wheat cropping system created serious issues related to agriculture, such as decline in water table, deterioration of soil health, loss of biodiversity, emergence and outbreak of new insect pest etc. Keeping these facts in mind, the present study was conducted with the objective to study the opinion of farmers about socio-economic reasons for non-adoption of crop diversification. The study comprises of farmer as respondent who were adopting or not adopting crop diversification. Total 252 respondents, out of which 72 were adopter and 180 were non- adopter comprised the sample of the study from 12 villagers of 3 randomly selected district from each regions of Punjab. The data were collected through personal interview method with the help of structured interview schedule. The findings highlighted that major socio- economic reasons faced by non-adopters were lack of marketing facility (92.77%), lack of minimum sport price in case of other crop (96.11%), youth is getting away from agriculture (74.74%) etc. which hinder the adoption of crop diversification.

Keywords: Adopters, Crop diversification, Mono-cropping, Non-adopters, Opinion, Rice-wheat, Socio-economic

INTRODUCTION

Crop diversification is one of the most important mechanism for economic development, especially in rural areas, alternatives for farmers that can lead to enhancement in the income of farmers, improve health of soils and prevents deterioration of ground water. Traditionally, agricultural diversification is said to be a subsistence kind of farming where the farmers were cultivating more than one crops on their land and undertaking several enterprises on farm. During the recent period cultivation of high value crops is one of the parameter in agricultural diversification. Agricultural diversification has gained large attention from recent years in Punjab due to monoculture of crops and following of fixed crop rotations year after year. Paddy-Wheat rotation is most common in Punjab because of its assured market price. The Green Revolution helped the Punjab to move into one of the most highly productive and mechanized agricultural states of India. However, it can be viewed as a mixed blessing for Punjab because it leads to the establishment of Wheat-Rice-Cropping-Pattern as a main cropping pattern in many parts of Punjab by eliminating all the other available cropping patterns. The Wheat-Rice-Cropping-Pattern has been, and remains, the most preferred cropping pattern across Punjab due to its comparative economic advantages, assured marketing and stable productivity levels. As a result, Wheat-Rice-Cropping-Pattern continues to occupy more than 77 per cent of net cropped area of Punjab, which has further dropped the crop diversification index (Sidhu *et al.,* 2010). It results in more dependency on wheat-rice cereals, whereas other cereals and milts are drastically decreased from our diet. Continues dependency on cereal based diet and unsatisfactory consumption of the protective food result in malnutrition in people particularly women and children because most of the cereal are deficient in micro nutrients such as vitamins and minerals (Islam *et al.,* 2008). The intensive monoculture of wheat and paddy had harmful impact on the natural resource base of the state. Excessive use of chemical fertilizers and pesticides, has added to environmental degradation, decline in water table and increase in water logging, soil salinity and pollution became the major problems in the state. The results were felt in the form of slow increase in output, increase the cost of cultivation which ultimately decrease the income of farmers. Realizing the significance of these problems, it was felt necessary to find out the major reasons for adoption/non-adoption of crop diversification in the study area. Therefore, present study was undertaken to study the opinion of farmers on socioeconomic reasons for non-adoption of crop diversification in Punjab.

*Corresponding author email id: khehrajoban07@gmail.com

MATERIALS AND METHODS

The study was conducted in the three regions of Punjab i.e. *Majha, Malwa, Doaba* and three districts were randomly selected from each region i.e. Gurdaspur, Bathinda and Jalandhar. Further Six blocks (two from each district) were randomly selected. From these blocks further twelve villages (two from each block) were randomly selected. From each selected village 15 respondents from non-adopter category and 6 adopters i.e. (2 from each small, medium and large land holding categories) were selected. In this way 21 farmers were selected from each village and total 252 respondents comprised the sample of the study. Out of these 252 respondents, 72 respondents were adopter and 180 respondents were non-adopter. In the present study socio-economic reasons was operationalized as a source to find out obstacles which hinder the adoption of crop diversification. A list of socio economic reason was finalized with the help of experts and primary data were collected from the respondents with the help of personal interview schedule. The socioeconomic reasons perceived by respondents were scored on the basis of percentage calculated from individual statement.

RESULTS AND DISCUSSION

It can be noted from data given in Table 1 that out of various inputs related economic reasons for non-adoption of crop diversification lesser availability of package of practice holds the first rank (77.22%) followed by lesser availability of labour in case of alternative crops (73.33%), lesser availability of bio pesticide and bio herbicide in case of alternative crops (57.78%), more labour is required for harvesting of vegetables crops (57.22%), lesser availability of High Yielding Varieties in case of alternative crops, lesser availability of seed in case of alternative crops holds the same rank (i.e. 56.11%), lesser availability of fertilisers in case of alternative crops and lesser availability of seed in case of alternative crops (54.44%).

The data in Table 2 depicted that high cost of production in case of alternative crops hold the first rank (61.67%), were the main reason of non- adoption that hinder the process of crop diversification followed by high cost of vegetable seeds, pesticides and fertilizers (56.11%) and lesser availability of specialized expertise (55.00%) least cost related economic reason hinder the process of crop diversification

Table 1: Distribution of non-adopters according to different inputs related socio-economic reasons for non-adoption of crop diversification (N=180)

S.No.	Statements	Frequency* (%)	Rank
1.	Lesser availability of inputs in case of alternative crops		
a)	Seed	101(56.11)	5.5
b)	Fertiliser	98 (54.44)	7.5
c)	Labour	132 (73.33)	2
d)	Bio pesticide and bio fertilisers	104 (57.78)	3
e)	Irrigation facility	98 (54.44)	7.5
2.	Lesser availability of package of practices	139(77.22)	1
3.	Lesser availability of HYV in case of alternative crops	101(56.11)	5.5
4	More labour is required for harvesting of vegetables crops	103(57.22)	4

*multiple response; Figure in percentage indicate percentages

It is cleared from the findings in Table 3 that the most important production related socio- economic reason for non-adoption of crop diversification was difficulty in cultivation of crops other than rice and wheat (67.77%), followed by yield of other crops is not sure as of wheat and paddy (67.77%), while (56.11%) of the respondent felt that more risk involved in case of alternative crops.

The data in Table 4 depicted that lack of minimum support price (MSP) in case of other crops (96.11%) hold the first rank as major market and income related economic reason which hinder the process of crop diversification, followed by lack of marketing infrastructure (92.77%), marketing is not sure in case of vegetable, pulses and oiled as of rice and wheat (91.77%), price fluctuation and net

Table 2: Distribution of non-adopters according to different cost related socio-economic reasons for non-adoption of crop diversification (N=180)

S.No.	Statements	Frequency* (%)	Rank
1.	High cost of production in case of alternative crops	111(61.67)	1
2.	High cost of vegetable seeds, pesticides and fertilizers	101 (56.11)	2
3.	Lesser availability of specialized expertise	99 (55.00)	3

*multiple response; Figure in percentage indicate percentages

Table 3: Distribution of non-adopters according to different production related socio-economic reasons for non-adoption of crop diversification (N=180)

S.No.	Statements	Frequency* (%)	Rank
1.	Production of crops other than rice and wheat is not easy	122 (67.77)	1
2.	Yield of other crops is not sure as of wheat and paddy	117(65.00)	2
3.	More risk involved in case of alternative crops as compare to rice- wheat	101 (56.11)	3

*multiple response; Figure in percentage indicate percentages

Table 4: Distribution of non-adopters according to different market and income related socio-economic reasons for non-adoption of crop diversification (N=180)

S.No.	Statements	Frequency* (%)	Rank
1.	Lack of marketing infrastructure	167 (92.77)	2
2.	Lack of minimum support price (MSP) in case of other crops	173 (96.11)	1
3	Shattering of pulses, oilseed and net return is low	109(60.56)	5
4	Marketing is not sure in case of vegetables, pulses and oilseeds as of rice and wheat	165(91.67)	3
5.	Diversify agriculture has low income as compare to rice-wheat rotation	83(46.11)	8
6.	Demand of other crops is low as compare to rice and wheat	72 (40.00)	9
7	Price fluctuation and net return in very low in case of vegetables and fruit crops	138(76.67)	4
8	More money required for diversifying farming	104 (57.78)	6
9	Lack of government loan or subsidy for diversify agriculture	95(52.78)	7

*multiple response; Figure in percentage indicate percentages

return is very low in case of vegetables and fruit crops (76.67%), shattering of pulses, oilseed and net return is low (60.56%), more money required for diversifying farming (57.78%), lack of government loan or subsidy for diversifying agriculture (52.78%), diversify agriculture has low income as compare to rice-wheat rotation (46.11%) and demand of other crops is low as compare to rice and wheat (40%) holds the ninth rank among all market and income related economic reason for non-adaptation crop diversification.

Singh *et al.* (2009) in their study revealed that respondents rated low prospects of diversification followed by medium (26.07%) and high (23.93%). The serious problem faced by the respondents in diversification were, 'lack of support price and high credit requirement.' Kumar *et al.* (2016) also revealed in their study that the major problem in diversification perceived and expressed by the farmers were supporting price, technical guidance, transportation of produce, non-availability and adulteration in inputs and lack of developed marketing infrastructure.

It is clear from the finding in Table 5 that 74.74 per cent of the respondent reported that youth was getting away from agriculture and perceived as the major social factors for non-adoption of crop diversification. More than half (61.67%) of the respondents felt that more hard work was required for the successful establishment of other enterprises in agriculture. Almost one-third respondents (28.33%) reported fragmentation of land holding forced the farmers to stick into rice-wheat monoculture while another 6.11 per cent farmers felt that crops other than

Table 5: Distribution of non-adopters according to different social reasons for non-adoption of crop diversification (N=180)

S.No.	Statements	Frequency* (%)	Rank
1.	Due to fragmentation of land holding farmers are stuck into rice-wheat monoculture	51(28.33)	3
2.	Other crops rather than rice and wheat are not suitable to environment	11(6.11)	4
3.	Youth is getting away from agriculture	134(74.74)	1
4.	More hard work is required for the successful establishment of other enterprises in agriculture	111(61.67)	2

*multiple response; Figure in percentage indicate percentages

Table 6: Distribution of non- adopters according to different miscellaneous reasons for non-adoption of crop diversification (N=180)

S. No.	Statements	Frequency* (%)	Rank
1	Lack of technical know-how and training	104(57.78)	1
2	Lesser availability of equipment and other inputs	82 (45.56)	3
3.	Priority to rice-wheat crops	86 (47.78)	2

*multiple response; Figure in percentage indicate percentages

rice and wheat were not suitable to their environment for crop diversification.

The data in Table 6 depicted that lack of technical know-how and training (57.78%) holds the first rank for non-adoption of crop diversification, followed by priority to rice-wheat crops (47.78%) and lesser availability of equipment among the different miscellaneous reasons.

CONCLUSION

The various economic reasons for non-adoption of crop diversification were lack of marketing facilities, lack of minimum support price (MSP) in case of other crops then marketing was not sure in case of pulses and oilseeds as of rice and wheat. Whereas, social reasons that hinder the adoption of crop diversification were demand of more hard work for the successful establishment of other enterprises in agriculture and thus, youth was getting away from agriculture because they want more money in less time. Other reason that took away adoption of crop diversification were lack of technical know-how and training followed by more skill was required for diversify farming and non-availability of equipment and inputs.

REFERENCES

Islam, M.D.A.; M.B. Ahmed and M.M. Islam. 2018. Participation of Rural Women in Activities related to Homestead Vegetable Cultivation at Monirampur upazila under Jessore District. *Journal of Bangladesh Agricultural University,* 16(1): 17–22.

Kumar, S.; G. Pal and S. Joshi. 2016. Extent and Scope of Agriculture Diversification in Baghpat District of Uttar Pradesh. *Journal of Community Mobilization and Sustainable Development,* 11(1): 48-52.

Sidhu, R.S.; K. Vatta and H.S. Dhaliwal. 2010. Conservation Agriculture in Punjab: Economic Implication of Technologies and Practices. *Indian Journal of Agriculture Economics,* 53(3): 1413-1427.

Singh, J., U.G. Sharma; V.P. Chahal and S.P. Singh. 2009. Farm Diversification: Problems and Prospects. *Journal of Community Mobilization and Sustainable Development,* 4(2): 76-79.

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An Empirical Study on Intention to Use Online Utility Services

Preeti Sharma* and Anupriya Nayal
Department of Extension Education and Communication Management, Punjab Agricultural University, Ludhiana-141004, Punjab

ABSTRACT

The study was conducted to analyse the intention of respondents towards usage of online utility services. Data was collected randomly from sixty online utility service users each from rural, peri-urban and urban areas of Ludhiana district using pre-tested structured interview schedule. Thus, in total 180 respondents were selected. Findings revealed that majority of them perceived online utility services useful due to its qualities of trialability, compatibility and relative advantage and perceived self-efficacy, trust and attitude towards online utility services made these services easier to use. Majority of the respondents had moderate to high level of intention to use these services.

Keywords: Empirical, Intention, Online, Services

INTRODUCTION

Over the past century, the Information Technology (IT) has brought a paradigm shift in technological, economic and social transformations. Today the world has transformed from knowledge savvy to techno knowledge savvy (Mohanta *et al.,* 2017). Increased globalization has regarded ICT tools as the decisive technology of the information age (Castells, 2014). As a result, people all over the globe have recognized the internet as their latest developmental tool (Sethi, 2004). Smart phones are becoming ubiquitous providing the continuous internet access. ICTs are also being used to increase effectiveness and efficiency of extension system (Sharma *et al.,* 2019). The rate of acceptance of ICT is continuously accelerating which has brought about significant advances in relatively all aspects of human existence (Anusha and Gupta, 2019). It even includes 'digitisation' of utility services which facilitate routine operations of the public. Online utility services are services that are provided by different organisations with the use of the internet for public use in day to day life such as paying bills, e-ticket booking, money transfer, applying for various identification cards (Passport, Aadhar Card, PAN Card) etc. It has enabled e-banking or internet banking or mobile banking in the banking industry (Reddy and Reddy, 2015) and perception of the customer is altering with the ease of internet availability (Choi, 2010).

The behaviour intention of individuals is jointly influenced by their perceived behavioural control, subjective norms and attitude. Further, this behaviour intention expresses an individual's usage behaviour (Ajzen and Madden, 1986). Technology acceptability, availability, accessibility, safety and user-friendliness highly depend on the demographic profile of the population size (Khanna and Gupta, 2015). Convenience, fast speed, cost-effective, all-time accessibility, flexibility, influence of perceived risk, perceived ease of use and perceived usefulness on use of online utility services are making these services more usable (Tavishi and Kumar, 2013). The Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), Technology Acceptance Model (TAM, TAM2) and Unified Theory of Acceptance and Use of Technology (UTAUT) are the most dominant theories to investigate perception, intention, attitude and behaviour of online utility service users' towards adoption of latest technologies. To analyse user behaviour in an information system, researchers have been extensively using TAM as it has evolved as a well-established model for predicting IT acceptance, usage intentions and behaviour via the mediating variables perceived ease of use and perceived usefulness (Davis, 1989). It presupposes users' behavioural intention to use as an important construct to determine actual system use. It postulates that user acceptance of a new system is ascertained by the users' intention to use it. In addition, the behavioural intention to use, is, in turn, affected by users' attitude towards usage. The expeditious growth in utilization of online utility services and internet penetration is making it imperative to analyse the intention of users of

*Corresponding author email id: preetisharmahsee@pau.edu

online utility services so as to effectively harness the potential of these services to provide the maximum benefits to the society. Thus, the present study was conceptualised with the objective to analyse the intention of respondents towards usage of online utility services.

MATERIALS AND METHODS

The study was conducted in the state of Punjab and Ludhiana district was selected purposively as it is one of the most developed districts of Punjab state. Purposive and random sampling techniques were used for the current study. From each of urban, peri-urban and rural area, sixty households who use online utility services were selected randomly. Thus, in total 180 households were selected. The family members of the selected households were asked to designate a family member who was responsible most of the times for using online utility services. That designated member acted as respondent for the study. Thus, the sample size for the study was 180 respondents. An interview schedule was prepared to collect the data from the respondents. It was pretested on 27 non-sampled respondents of urban, peri-urban and rural areas. The reliability of the interview schedule was recorded as 0.737 i.e. 74.00 per cent. On the basis of experience gained in pre-testing, necessary modifications were incorporated and the schedule was finalized. Survey research design was used for the present study and it is based on primary data.

For data collection, the researcher personally visited the respondents to collect the required information. The tabulated data was analysed using Statistical Package for Social Sciences (SPSS) software to yield information relevant and consistent with the objective of the study. The important statistical tools such as frequency distribution, percentage, arithmetic mean, category interval method, Kruskal Wallis H-test for k independent samples and cumulative cube root frequency method were used for analysis of the data.

RESULTS AND DISCUSSION

Intention to use refers to the user's beliefs about perceived ease of use and perceived usefulness of online utility services. It was measured as the sum total of respondents' scores for perceived ease of use and usefulness. The importance of considering both perceived ease of use and perceived usefulness in predicting behaviour was studied by Bandura (1982). The basic Technology Acceptance Model (TAM) proposed by Davis (1989) and its extended models were used to study these variables.

Mean perceived ease of use (PEOU) for online utility services

The data in Table 1 discusses the mean perceived ease of use (PEOU) for online utility services. Perceived ease of use is defined as the degree to which a person believes that using an online utility service would be free from effort. To calculate a respondent's PEOU, seven constructs (attitude, subjective norm, context, perceived self-efficacy, trust, perceived hedonism, and innovativeness) were studied with the help of statements and a score range of 1 to 5 from strongly disagree to strongly agree were assigned based on their responses.

Attitude: Analysis of the results revealed that there was significant ($H=33.48$, $p<0.01$) difference in attitude of respondents across different areas i.e. urban respondents ($\bar{x}=3.98$) showed more favorable attitude towards online utility services (OUS) as compared to rural ($\bar{x}=3.38$) and peri-urban ($\bar{x}=3.59$) area. The overall mean ($\bar{x}=3.65$) of attitude indicates that respondents had a favorable attitude towards online utility services usage. Eriksson *et al.* (2005) and Hernandez and Mazzon (2007) also considered attitude as having a strong, direct and positive effect on consumers' intentions to actually use any new technology.

Subjective norm: The tabulated data states that respondents from the selected three areas significantly ($H=8.67$, $p<0.05$) differed in their opinion towards subjective norms though the results suggested that none of the respondents were in much agreement towards the fact that subjective norms controlled their usage of online utility services. Majority were usually driven by their own will and choice towards selection and usage of these services. Urban respondents ($\bar{x}=2.47$) mentioned a bit higher concern for effect of subjective norms on their usage followed by rural ($\bar{x}=2.42$) and peri-urban respondents ($\bar{x}=2.21$) and its overall mean score reflected disagreement towards subjective norms and that it had less significance on respondents' perceived ease of use. Thus, it can be interpreted that social influence plays a secondary role for the adoption of digital services as also supported by Schepers and Wetzels (2007).

Context: The context for using online utility services had overall mean 3.58 indicating significant ($H=8.50$, $p<0.05$) difference which was again highest in urban area ($\bar{x}=3.76$) followed by rural ($\bar{x}=3.56$) and peri-urban area ($\bar{x}=3.42$). The agreement with statements showed that the online utility services were in accordance with users' needs in their

Table 1: Mean perceived ease of use (PEOU) for online utility services (n=180)

Constructs of PEOU	Mean Score (1 to 5)			Overall Mean	Kruskal Wallis χ^2 (H)
	Rural (n_1=60)	Peri-urban (n_2=60)	Urban (n_3=60)		
Attitude	3.38	3.59	3.98	3.65	33.48**
Subjective Norm	2.42	2.21	2.47	2.37	8.67*
Context	3.56	3.42	3.76	3.58	8.50*
Perceived Self-efficacy	3.88	3.61	4.30	3.93	35.29**
Trust	3.53	3.53	4.23	3.76	36.21**
Perceived Hedonism	2.95	3.31	3.79	3.35	40.50**
Innovativeness	2.24	1.95	2.48	2.23	12.07**
Overall PEOU Mean	3.14	3.09	3.57	3.27	
Kruskal Wallis χ^2 (H)	384.81**	384.05**	396.6**		

**Significant at 0.01 level of significance; *Significant at 0.05 level of significance

specific environment with available resources. Therefore, the respondents even perceived online utility services easy to use in terms of their daily routine works.

Perceived self-efficacy: It had the highest overall mean ($\bar{x}$=3.93) among all the constructs with mean score as follows; urban ($\bar{x}$=4.30), rural ($\bar{x}$=3.88) and peri-urban ($\bar{x}$=3.61) with a significant (H=35.29, p<0.01) difference. It can be concluded that respondents considered themselves skilled enough to use online utility services. There are studies that have confirmed the causal links between perceived self-efficacy, perceived usefulness (Compeau and Higgins, 1995) and ease of use (Agarwal and Karahanna, 2000; Hu *et al.,* 2003; Galan *et al.,* 2014).

Trust: Trust ranked after perceived self-efficacy with overall mean score of 3.76. Its mean score was same in rural and peri-urban area ($\bar{x}$=3.53) but low as compared to urban area ($\bar{x}$=4.23). It shows that users perceived online utility services reliable and secure and they had faith in the integrity of the application. Galan *et al.* (2014) confirmed that trust plays a key role in the adoption process and has stronger influence on intention to use.

Perceived hedonism: Urban respondents ($\bar{x}$=3.79) followed by peri-urban respondents ($\bar{x}$=3.31) agreed that they enjoyed using OUS whereas rural respondents ($\bar{x}$=2.95) did not seem to enjoy online utility services to that extent as urban and peri-urban respondents did. A significant (H=40.50, p<0.01) difference was observed in respondents' perceived hedonism. Overall ($\bar{x}$=3.35) the respondents were in agreement that online utility services provided them enjoyment. Van der Heijden (2004) and Galan *et al.* (2014) also revealed that hedonic motivation influenced technology acceptance and use very significantly.

Innovativeness: Respondents' overall mean score ($\bar{x}$=2.23) states that they tend to be less innovative in using different OUS and the same trend was observed all through the selected areas (rural 2.24, peri-urban 1.95, urban 2.48) with a significant (H=12.07, p<0.01) difference. It may be due to the fact that respondents preferred to use tested and experienced services only. Urban and rural respondents were found to be more innovative in comparison to peri-urban respondents.

Thus, overall for perceived ease of use, area wise significant difference was found in all the constructs of perceived ease of use (rural 384.81, peri-urban 384.05 and urban 396.6; p<0.01), where the majority of the respondents of urban area (overall PEOU 3.57) perceived online utility services easier to use as compared to rural (overall PEOU 3.14) and peri-urban area (overall PEOU 3.09). Thus from Table 1, it can be concluded that perceived self-efficacy, trust, and attitude towards online utility services were the major constructs which affected the overall perception of respondents in terms of easier use of online utility services.

Mean perceived usefulness (PU) for online utility services

Table 2 discusses the mean perceived usefulness for online utility services wherein perceived usefulness is the degree to which a person believes that using an online utility service would be beneficial in terms of relatively advantageous,

compatible etc. It is also known as performance expectancy (Venkatesh *et al.,* 2003). In order to analyse respondent's perceived usefulness, eight constructs (compatibility, relatively advantageous, complexity, perceived social image, job relevance, result demonstrability, perceived risk, and trialability) were studied with the help of statements for each construct. Score range from 1 to 5 was assigned indicating strongly disagree to strongly agree. Sum of mean scores of these constructs was calculated to give mean perceived usefulness score.

Compatibility: As per the results, urban respondents ($\bar{x}$=4.37) stated online utility services more compatible with their lifestyle followed by rural ($\bar{x}$=3.97) and peri-urban ($\bar{x}$=3.87) respondents. With a significant (H=29.80, p<0.01) difference across the three areas, total mean score reveals that respondents were in agreement with online utility services being compatible with their lifestyle and needs.

Relatively advantageous: Urban users ($\bar{x}$=4.28) in comparison to peri-urban ($\bar{x}$=3.78) and rural users ($\bar{x}$=3.64) felt that online utility services are relatively more advantageous to them than traditional services. The overall mean score ($\bar{x}$=3.90) states that majority of the users were in agreement with this construct with a significant (H=38.36, p<0.01) difference across the area. The findings of the study were consistent with Chitungo and Munongo (2013) i.e. relative advantage was found to influence respondents' intention to use online utility services. Therefore, the more relative advantage perceived by users, the higher the possibility that they will be intended towards usage of online utility services.

Complexity: According to the responses, peri-urban users ($\bar{x}$=3.48) felt online utility services more complex followed by rural ($\bar{x}$=3.56) and urban users ($\bar{x}$=3.89). Significant (H=22.58, p<0.01) difference was noted across the three areas and overall mean score ($\bar{x}$=3.64) indicated that respondents felt online utility services simpler to use.

Perceived social image: Similarly, urban respondents ($\bar{x}$=2.66) responses indicated disagreement that online utility services helped to improve one's perceived social image which was followed by rural ($\bar{x}$=2.48) and peri-urban ($\bar{x}$=2.10) respondents and a significant (H=15.69, p<0.01) difference was found across the three areas. Overall mean score ($\bar{x}$=2.41) reveals that respondents did not feel that using online utility services affect their image in the society.

Job relevance: Majority ($\bar{x}$=4.21) of the urban respondents followed by peri-urban ($\bar{x}$=3.72) and rural respondents ($\bar{x}$=3.67) were in agreement with online utility services being relevant with their needs and job/ tasks they have to perform. A significant (H=29.68, p<0.01) difference was found across the selected three areas and the overall mean score ($\bar{x}$=3.86) indicated that respondents perceived online utility services as relevant with their tasks and even make their work easier.

Result demonstrability: Similarly, more urban respondents ($\bar{x}$=4.24) agreed that online utility services have the quality of result demonstrability than peri-urban ($\bar{x}$=3.76) and rural ($\bar{x}$=3.39) respondents and a significant

Table 2: Mean perceived usefulness (PU) for online utility services (n=180)

Constructs of PU	Mean Score (1 to 5)			Overall Mean	Kruskal Wallis χ^2 (H)
	Rural (n_1=60)	Peri-urban (n_2=60)	Urban (n_3=60)		
Compatibility	3.97	3.87	4.37	4.07	29.80**
Relatively Advantageous	3.64	3.78	4.28	3.90	38.36**
Complexity	3.56	3.48	3.89	3.64	22.58**
Perceived Social Image	2.48	2.10	2.66	2.41	15.69**
Job Relevance	3.67	3.72	4.21	3.86	29.68**
Result Demonstrability	3.39	3.76	4.24	3.80	26.05**
Perceived Risk	3.31	2.90	3.46	3.23	12.69**
Trialability	4.58	4.15	4.63	4.45	23.21**
Overall PU Mean	3.58	3.47	3.97	3.67	
Kruskal Wallis χ^2 (H)	398.10**	370.17**	380.15**		

**Significant at 0.01 level of significance

Table 3: Intention to use online utility services (n=180)

Level (Score range)	Rural (n_1=60)		Peri-urban (n_2=60)		Urban (n_3=60)		Total		χ^2
	f	%	f	%	f	%	f	%	
Less (<217.48)	25	41.67	23	38.33	4	6.67	52	28.89	46.66**
Moderate (217.48-240.26)	11	18.33	28	46.67	14	23.33	53	29.44	
High (>240.26)	24	40.00	9	15.00	42	70.00	75	41.67	

**Significant at 0.01 level of significance

(H=26.05, p<0.01) difference was observed across the three areas. The overall mean score indicates that (=3.80) respondents were able to see the results immediately after use which makes online utility services useful for them.

Perceived risk: Peri-urban ($\bar{x}$=2.90) respondents perceived online utility services as more risky than rural ($\bar{x}$=3.31) and urban respondents ($\bar{x}$=3.46). A significant (H=12.69, p<0.01) difference was observed in respondent's perception of risk related to these services across area. The overall mean score ($\bar{x}$=3.23) reveals that respondents were cautious about sharing their credentials while using online utility services. It can be interpreted that if respondents perceived higher risks and uncertainty such as issues of loss and theft of financial information, this would discourage them from using online utility services. These results were found to be consistent with Luo (2010) and Chitungo and Munongo (2013).

Trialability: Majority of the urban respondents ($\bar{x}$=4.63) followed by rural ($\bar{x}$=4.58) and peri-urban ($\bar{x}$=4.15) respondents considered online utility services as trialable with a significant (H=23.21, p<0.01) difference across the three areas. The overall mean score ($\bar{x}$=4.45) also indicated respondents' agreement in this regard.

Thus, overall significant difference was found within these constructs of perceived usefulness in each of the selected areas [H (rural)=398.10, H (peri-urban)=370.17, H (urban)=380.15, p<0.01]. Overall mean perceived usefulness of respondents ($\bar{x}$=3.67) indicated that respondents considered online utility services useful due to its qualities of trialability, compatibility and relative advantage. More urban respondents ($\bar{x}$=3.97) perceived online utility services useful as compared to rural ($\bar{x}$=3.58) and peri-urban respondents ($\bar{x}$=3.47).

Intention to use online utility services

Data in Table 3 pertains to the respondents' intention to use online utility services wherein the intention was calculated as the sum of scores of respondents' response to perceived ease of use and perceived usefulness statements. The scores were further categorized as low, medium and high. Davis *et al.* (1989) in their study concluded that both perceived ease of use and perceived usefulness had a direct influence on behavioral intention. The findings of Chitungo and Munongo (2013); Luarn and Lin (2005) also revealed the same. The data revealed that majority of the urban respondents (70.00%) and two-fifth of the rural respondents (40.00%) had high intention to use online utility services whereas nearly half of the peri-urban respondents (46.67%) had medium level of intention.

The chi square value also indicated that users' intention to use online utility services was significantly (χ^2= 46.66, p<0.01) associated with the area in which they reside. From the Table 3 it can be concluded that large proportion of the respondents (41.67%) reported high intention towards usage of online utility services.

CONCLUSION

The perusal of the data revealed that large proportion of the respondents had high intention towards usage of online utility services which interprets that people were interested in using online utility services. Perceived self-efficacy, trust and attitude towards online utility services as well as attributes like trialability, compatibility and relative advantage affected the overall perception of respondents in terms of easier use and usefulness of online utility services. Therefore, it is suggested that provisions should be made to increase the availability of online utility services and above-mentioned factors should be kept in mind to make online utility services user friendly.

REFERENCES

Agarwal, R. and E. Karahanna. 2000. Time flies when you are having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly,* 24: 665-694.

Ajzen, I. and T.J. Madden. 1986. Prediction of goal-directed behaviour: Attitudes, intentions and perceived behavioural control. *Journal of Experimental Social Psychology,* 22: 453–474.

Anusha and R.M. Gupta. 2019. Perception of University Students Towards e-learning in Punjab. *Journal of Community Mobilization and Sustainable Development,* 14: 602-608.

Bandura, A. 1982. Self-efficacy mechanism in human agency. *American Psychologist,* 37: 122-47.

Castells, M. 2014. The impact of the internet on society: A global perspective. Retrieved from: https://www.technology review.com/s/530566/the-impact-of-the-internet-on-society-a-global-perspective/ on 2 February, 2018.

Chitungo, S.K. and S. Munongo. 2013. Extending the technology acceptance model to mobile banking adoption in rural Zimbabwe. *Journal of Business Administration and Education,* 3: 51-79.

Choi, C. 2010. The effect of internet on service trade. *Economics Letters,* 109: 102-104.

Compeau, D.R. and C.A. Higgins. 1995. Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly,* 19: 189-211.

Davis, F.D. 1989. Perceived usefulness, perceived ease of use and user acceptance of information technology. *MIS Quarterly,* 13: 319-340.

Davis, F.D.; R.P. Bagozzi and P.R. Warshaw. 1989. User acceptance of computer technology: A comparison of two theoretical models. *Management Science,* 35: 982-1003.

Eriksson, K.; K. Kerem and D. Nilsson. 2005. Customer acceptance of internet banking in Estonia. *International Journal of Bank Marketing,* 23: 200-216.

Galan, J.P.; M. Giraud and L.M. Waarden. 2014. A theoretical extension of the technology acceptance model to explain the adoption and the usage of new digital devices. Retrieved from: https://www.afm-marketing.org/fr/system/files/publications/ 20160429234015_S05_P3_GALAN_GIRAUD_et_MEYER_WAARDEN.pdf on 25 February, 2019.

Hernandez, J.M.C. and J.A. Mazzon. 2007. Adoption of internet banking: Proposition and implementation of an integrated methodology approach. *International Journal of Bank Marketing,* 25: 72-88.

Hu, P.J.; T.H. Clark and W.W. Ma. 2003. Examining technology acceptance by school teachers: A longitudinal study. *Information and Management,* 41: 227-241.

Khanna, V.T. and N. Gupta. 2015. Customer's perception about banks technology for innovative delivery channels of public sector banks of India. *International Journal of Business and Management,* 10: 215-225.

Luarn, P. and H.H. Lin. 2005. Toward an understanding of the behavioural intention to use mobile banking. *Computers in Human Behavior,* 21: 873-891.

Luo, X. 2010. Examining multi-dimensional trust and multi-faceted risk in initial acceptance of emerging technologies: An empirical study of mobile banking services. *Decision Support Systems,* 49: 222-234.

Mohanta, G.; S.S. Debasish and S.K. Nanda. 2017. A study on growth and prospect of Digital India campaign. *Saudi Journal of Business and Management Studies,* 2: 727-731.

Reddy, K. and M.S. Reddy. 2015. A study on customer's perception and satisfaction towards electronic banking in Khamman district. *Journal of Business and Management,* 17: 20-27.

Schepers, J. and M. Wetzels. 2007. A meta-analysis of the technology acceptance model: Investigating subjective norm and moderation effects. *Information and Management,* 44: 90-103.

Sethi, N. 2004. Internet' Grover I, Sethi N and Grover D *Handbook of Communication and Media,* pp 321-324 Udaipur, India, Agrotech Publishing Academy.

Sharma, R.; S.R.K. Singh; K.N. Pathak; Y.D. Mishra and A. Sharma. 2019. Factors Encouraging Information and Communication Technologies (ICTs) Usage to KVKs Scientists of Madhya Pradesh and Chhattisgarh. *Journal of Community Mobilization and Sustainable Development,* 14: 497-500.

Tavishi and S. Kumar. 2013. An empirical study on technology adoption by Indian banks. *Global Journal of Management and Business Studies,* 3: 1169-1172.

Van der Heijden, H. 2004. User acceptance of hedonic information systems. *MIS Quarterly,* 24: 695-704.

Venkatesh, V.; M.G. Morris; G.B. Davis and F.D. Davis. 2003. User acceptance of information technology: Toward a unified view. *MIS Quarterly,* 27: 425–478.

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Reducing Nutritional Anemia by Iron Supplementation in Adolescent Girls in Rural Area of Delhi

Ritu Singh
Subject Matter Specialist (Home Science), Krishi Vigyan Kendra, Ujwa, New Delhi

ABSTRACT

The NFHS-3 data suggests that anemia among adolescent Indian girls (15–19 years) is fifty six percent. The control of anemia in adolescent girls can be more easily achieved if satisfactory iron status can be ensured in this important phase of life. The present study aimed at assessing the effect of supplementation of iron folic acid with and without ascorbic acid on hemoglobin level of adolescent girls. This case-control study was conducted at Govt. Girls School, Ujwa, New Delhi. One hundred sixty-eight adolescent girls between the of 12-15 years age group were screened for hemoglobin level and among them 90 moderate anemic (7-10 g/dl) were selected for the study and divided into three equal groups randomly *viz.* A, B & C (30 each). Adolescent in A group were supplemented with Iron Folic Acid (IFA); B group were supplemented with Iron Folic Acid (IFA) + Vitamin C 500 mg (Ceilen tablet) and group C (without supplementation) for the period of 3 months. Hemoglobin level and anthropometric examination was done at baseline and after the supplementation period of three months. General profile of the subjects was elicited using a pre coded pre tested questionnaire. Prevalence of anemia in the adolescent girls was found to be 70.79 per cent. Majority of girls were having moderate anemia. The two intervention groups (A & B) had shown an improvement in the hemoglobin level of the subjects due to the impact of IFA supplementation (10.6±1.06 and 11.2±1.10). When compared, Group B (supplementation of IFA and Vitamin C Biweekly) was found to be the best intervention. The declining trend was observed in grades of anemia, there was conversion of moderate anemia to mild anemia and non-anemia which was significant. The mean hemoglobin levels were increased after supplementation of IFA with vitamin C in respondents.

Keywords: Adolescent girls, Anemia, IFA supplementation and ascorbic acid

INTRODUCTION

Adolescence proves to be the most vulnerable phase in the path of human life cycle after infancy, characterized by rapid growth and development with a transition from childhood to adulthood. During this period, they gain 50 per cent of their adult weight and skeletal mass and more than 20 per cent of their adult height, where, nutrition plays a vital role in determining the growth, development and survival of an individual. Adolescents, especially adolescent girls, at this stage needs protein, iron and other micronutrients to support the adolescent growth spurt to meet the body's increased demand for iron during menstruation. The main nutritional problems identified in adolescents are micronutrient deficiencies in general and iron deficiency anemia in particular.

Anemia is defined as having hemoglobin below a specific level *i.e.* less than 12 grams of hemoglobin per deciliter of blood (g/dl) in non-pregnant women and less than 10 g/dl in pregnant women. The body uses iron to produce hemoglobin, a protein that transports oxygen from the lungs to other tissues in the body via blood stream. When the hemoglobin levels in the blood fall, it leads to weakness, exhaustion, breathlessness and low immunity, making person more susceptible to infections.

The pre-pregnancy anemic status of adolescent girls is crucial and has long-term inter-generational consequences as the anemic adolescent mother is at high risk of miscarriages, maternal mortality and giving birth to still born and low birth weight babies with low iron reserves. Evidence also supports that bodies of the still growing adolescent mother and her baby may compete for nutrients, raising the infant's risk of low birth weight. This iron deficiency anemia is also associated with impaired cognitive functioning, lower school achievement**,** and more susceptible to infections and lowers physical work capacity.

Email id: singhritu0705@gmail.com

Thus, adolescence is a unique intervention point in the life cycle, which decides the health status of future generations. Presently, the basic approaches to the prevention of iron deficiency anemia are deworming along with iron-folic acid supplementation and nutrition and health education (including sanitation and personal hygiene).

The National Family Health 4 Survey data suggests that anemia among adolescent girls (15-19 years) is 56 per cent. A multi-centric study by the Indian Council of Medical Research showed that over 90 per cent of adolescent girls throughout the country had some kind of anemia. These findings were corroborated by a district level household survey in 2002-2004 showing that only 5 per cent of adolescent girls did not have any kind of anemia and a large proportion were suffering from severe anemia (Agarwal *et al.,* 2006). In adolescent girls, there is expansion of the lean body mass, total blood volume and onset of menstruation that creates a greater risk of iron deficiency. Iron deficiency not only reduces work productivity but also accentuates the problem further during pregnancy because, they are just on threshold of marriage and motherhood. Thus, nutritional pattern in these years has special significance (Chaudhary *et al.,* 2019). Study conducted by Jethi *et al.* (2018) found that the negative effects of malnutrition among women are compounded by heavy work demands, poverty, child bearing and rearing and special nutritional needs of women, resulting in increased susceptibility to illness and consequently higher morbidity.

A study done by Deshmukh *et al.* (2006) found better compliance to Iron folic acid (IFA) tablet consumption in rural areas as compared to urban areas and another study from rural Wardha reported perceived benefits to adolescent girls such as an increase in appetite and reduction in scanty menses, tiredness, and weakness, acted as positive factors for better compliance with weekly iron supplementation (Dongre *et al.,* 2011).

Therefore, the present study was designed to improve the Hb level of adolescents thereby reducing the iron deficiency anemia through weekly iron supplementation (with and without vitamin C), to improve the efficacy of iron absorption and subsequently.

MATERIALS AND METHODS

Study Area: The study was conducted for two consecutive years (2013-14 & 2014-15) at the Government Girls Senior Secondary School in village Ujwa of South West District of Delhi.

Study Population: The population in this study was all female students who were in class VIII to XI in School, with the total number of 168 female students in the age group of 12-15 years who said to have attended menarche. Further, subjects with case history of any severe illness during the last two weeks for which they required hospitalization and those who are suffering from chronic illnesses or receiving any long-term allopathic or indigenous treatment were excluded from the study.

Initial screening for anemic (Hemoglobin <12 g/dl) was carried out with a B-Hemoglobin Analyze (Hemo Cue, Angelholm, Sweden) on a finger-capillary blood sample. The hemoglobin estimation was assessed with the technical support of State Govt. Hospital, Rao Tula Ram Hospital, Jaffarpur, New Delhi (Picture 1).

Stages of intervention

Stage 1 pre-intervention: Out of the 90 moderate anemic adolescents, three study groups were constituted randomly having 30 subjects in each group. Two group as experimental A & B and another group C as control (Table 1). The group A was supplemented with Iron Folic Acid tablets (100 mg elemental iron and 0.5 mg folic acid), experimental group B was supplemented with Iron Folic Acid tablets (100 mg elemental iron and 0.5 mg folic acid) plus 500 mg Vitamin-C tablets (Ceilen tablet) and group

Table 1: Iron and Folic Acid (with and without Vitamin C) Supplementation

Groups	Supplementation	Periodicity
A Moderate anemeic (7-10g/dl)	Iron Folic Acid Tablet*	Bi-Weekly
B Moderate anemeic (7-10g/dl)	Iron Folic Acid Tablet + Vitamin C**	Bi-Weekly
C Moderate anemeic (7-10g/dl)	No supplementation	-

Chemical Composition:
***IFA Tablet :** Dried Ferrous Sulphate IP 335 mg equivalent to 100 mg Ferrous Iron and 0.5 mg Folic Acid
****Vitamin C Tablet :** I.P. 50 mg of Ascorbic acid

Picture 1: Hemoglobin testing of school girls for iron deficiency anemia

C was without supplementation. The period of the intervention was for three months. Bi-weekly iron supplementation with and without vitamin C was given to all adolescents every Tuesday and Friday in the school after lunch. The supplementation was done with the support of the para medical staff of Rao Tula Ram Hospital, Jaffarpurr, New Delhi (Picture 2).

Picture 2: Bi-weekly intake IFA and Vitamin C by Anemic Girls

De worming

Deworming tablets was given to all the groups initially, before proceeding for the hemoglobin investigation to ensure the efficacy of iron and folic acid (with and without vitamin C) absorption. Deworming was done one week prior to supplementation.

Stage 2 Intervention: A pretested and pre-designed proforma was used for data collection of enrolled 90 subjects in the study. Information on socio-demographic characteristics like age, educational status, family size, monthly family income was collected. Adolescents were interviewed, anthropometric measurements were recorded by standard procedures and hemoglobin estimation was done before and after intervention.

RESULTS AND DISCUSSION

A total of 168 adolescent girls were screened for hemoglobin in the study area and the prevalence of anemia in adolescent girls was found to be 70.79 per cent. Only about 29.21 per cent girls were having normal range of hemoglobin (Table 2 and Figure 1). Pattnaik *et.al.* (2013) reported a prevalence of 78.8 per cent anemia among adolescent girls in a rural area of Khordha District, Odisha, which is similar to findings. WHO/UNICEF has suggested that the problem of anemia is of high magnitude in a community when prevalence rate exceeds 40 per cent. Among the anemic girls, mild and moderate degree of anemia was 20.8 per cent and 53.6 per cent respectively. While some authors have reported low prevalence of anemia among adolescent girls.

The data for general information of adolescent girls indicates that most of the girls belonged to OBC category

Table 2: Prevalence and grades of anemia in adolescent girls

Anemic Condition (Hb %)	Number of Subjects	Percentage
Severe (<7 g/dl)	6	3.6
Moderate (7-10 g/dl)	90	53.6
Mild (10-12 g/dl)	35	20.8
Non anemic (>=12 g/dl)	49	29.21
Total	**168**	**100**

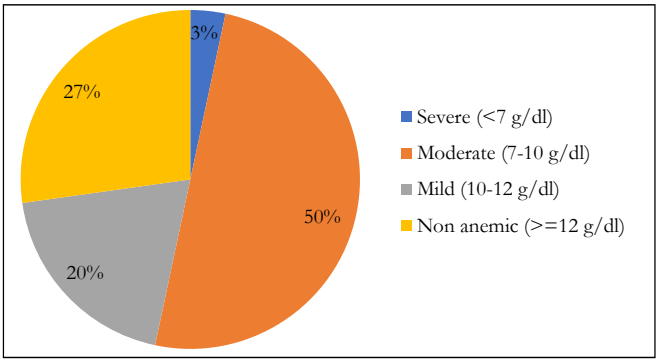

Figure 1: Prevalence of anemia among school girls

(55.6%), followed by general category (41.1%) and SC/ ST only 3.3 per cent. Table 3 depicts the family income; it explains that 76 per cent of respondents the family income ranged between Rs. 5000-10000/- per month while the family income for rest of the subjects was less than Rs. 5000/- per month. Kaur *et al.* (2006) observed similar findings that girls with lower socio-economic status were associated with increased likelihood of anemia compared to girls with higher socio-economic status.

Table 3 indicates the family type of the adolescent girls, in which majority (63.3%) of the sample subjects in all the groups hailed from nuclear families and the remaining 36.7 per cent of them were from joint families. Type of family had not shown any significant association with anemia in adolescent girls. The table shows that out of 90 anemic adolescent girls, 82.2 per cent were purely vegetarian as compared to 17.8 per cent anemic adolescents who were non-vegetarian.

Impact of IFA supplementation

Table 4 illustrates the changes in mean height, weight and hemoglobin percentage value among the three groups during the phase 0-3 months of the study. Group A (Bi-Weekly IFA supplementation) showed an increment in mean height by 0.4 cm at three months. The raise in weight was observed by 1.1 kg at three months. The hemoglobin per cent was also changed by 1.1 per cent on three months of supplementation. Group B (Bi-Weekly IFA + Vitamin C) showed an appreciable change in comparison to the group A. The mean height was gained by 1.9 cm at three

Table 3: General Information of adolescent girls in A B & C groups

	Group A	Group B	Group C	Total
Caste				
General	12(40)	11(36.7)	7(23.3)	**30(33.3)**
Scheduled Caste	9(30)	7(23.3)	8(26.7)	**24(26.7)**
Other Backward Class	9(30)	12(40)	15(50)	**36(40)**
Family Income (pm)				
<5000/-	4(13.3)	6(20)	3(10)	**13(14.4)**
5000-10000/-	26(86.7)	24(80)	27(90)	**77(85.6)**
Family Type				
Nuclear	17(56.7)	21(70)	19(63.3)	**57(63.3)**
Joint	13(43.3)	9(30)	11(33.3)	**33(36.7%)**
Eating Habits				
Vegetarian	26(86.7)	23(76.7)	25(83.3)	**74(82.2)**
Non-Vegetarian	4(13.3)	7(23.3)	5(16.7)	**16(17.8)**
Source of drinking water				
Bore well	5(16.7)	3(10)	6(20)	**14(15.6)**
Municipal supply	25(83.3)	27(90)	24(80)	**76(84.4)**

The values given in the parenthesis are in terms of percentage

Table 4: Anthropometric Measurement and Hemoglobin Status of the Adolescent Girls

Ist Phase (0 months)	**Mean Ht (cms)**	**Mean wt. (kg)**	**Mean Hb %**
Group A	138.7	37.8	9.6
Group B	137.3	38.1	8.9
Group C	137.9	37.7	9.2
IInd Phase (After 3 months)			
Group A	139.1 (+ 0.4)	38.9 (+ 1.1)	10.6 (+ 1.1)
Group B	138.4 (+ 1.1)	40.0 (+ 1.9)	11.2 (+ 2.3)
Group C	138.0 (+ 0.1)	37.7 (No change)	9.4 (+ 0.2)

months of supplementation. The mean weight was gained by 1.9 kg at three months and consequently, hemoglobin percent was accounted more by 2.3 per cent at three months. Whereas, group C (without supplementation) had showed slight increase in height with no change in weight and hemoglobin percent was increased by 0.2 per cent only at 3 months of study period. Similarly; (Dhikale *et al.,* 2015) also reported that about 287 (83.1%) participants found reduction in tiredness, and 13 (5.3%) of school students reported weight gain as the major benefits from IFA tablet consumption (Figure 2).

Agarwal (2006) reported that the initial baseline mean hemoglobin in daily treatment group was 11.7±1.3 and after interventions with iron and folic acid supplementation mean hemoglobin level was 12.3±1.1 g/dl. Joshi (2013) found that the mean pre intervention hemoglobin was 10.1±1.1 gm/dl and mean rise in hemoglobin after 3 months was 11.2±1.0 g/dl. The increase in Hb percentage was statistically significant. A daily treatment group showed the maximum rise. So, the present findings are consistent with these studies.

Sharma (2000) worked on adolescent girls of poor community and observed that even weekly supplementation of vitamin C along with iron/folate had a significant higher increase in hemoglobin concentration, as compared to weekly iron/folate supplementation alone. Joseph and Ramesh (2013) reported that the prevalence of anemia was high in women and a weekly supervised dose of iron; folic acid and vitamin C effectively tackle the problem and improves work efficiency. Therefore, there is need for an increase in ascorbic acid intake to enhance the absorption of iron supplements which is part of routine drug for antenatal women (Shu and Ogboda, 2005). It clears that IFA with supplementation of vitamin C plays an important role in increasing the Hb level of pregnant women (Mehnaz *et al.,* 2006).

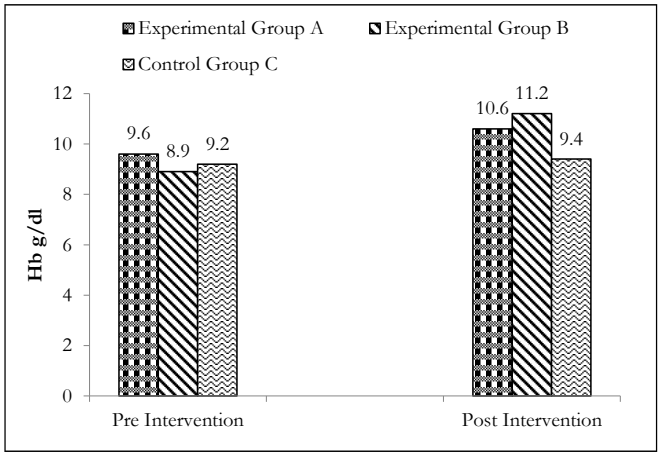

Figure 2: Changes in hemoglobin levels of subjects in control and experimental group

Clinical Manifestations due to IFA Supplementation

Though appropriate dosage of iron is determined for therapeutic intervention to control anemia, but one has to contend with its side effects such as constipation, black stool, nausea and diarrhea. The frequency of such side effects is directly related to the dosage of iron, which could be reduced to minimum on continued intake of supplement, which is clearly pictured in the Table 5, which depicts the clinical manifestations due to IFA supplementation. The effects of IFA supplementation appeared in few of the subjects when the observation of these subjects was made in respect of their groups for clinical manifestations, it was found that the groups A and C with weekly supplementation of IFA showed lesser side effects than those in Groups B and D with bi-weekly supplementation of IFA. However, with continued intake of supplements the intensity of side effects was reduced gradually and disappeared in the final stage of the study conducted by Dhikale *et al.* (2015) in their study on evaluation of weekly iron and folic acid supplementation program for adolescents in rural Pondicherry, India reported only 22.5 per cent of the students for side effects such as nausea and vomiting. The majority (70.4%) of the participants reported benefits such as an improved sense of well-being, reduction in breathlessness and tiredness. Significantly the girls had better knowledge about symptoms of anemia and iron-rich diet than boys.

The incidence of side effects due to IFA supplementation was found to be negligible during the study. It indicates that it may not be acting as barrier in promotion of consumption of IFA tablets which usually perceived as a fear by the adolescent girls and their parents in the community.

Table 5: Clinical Manifestations due to IFA Supplementation (n=30)

	Group A	Group B	Group C
Constipation	-	1 (1.03%)	-
Black stool	1 (1.10%)	-	1 (1.02%)
Nausea	1 (1.10%)	2 (2.10%)	-
Diarrhoea	-	1 (1.03%)	-

The values given in the parenthesis are in terms of percentage

CONCLUSION

Bi-weekly IFA supplementation with vitamin C for 12 weeks is more efficacious than is supplementation with iron and folic acid alone in improving the hemoglobin status of moderate anemic adolescent girls. So, the findings of the present study have considerable implications for reducing anemia among anemic adolescent girls and support to choose one of the supplement giving twice weekly containing 60 mg iron/dose. Thus, the program has ensured good compliance to IFA tablet consumption among school students. However, to strengthen the program further, awareness about IFA tablets consumption and health education component for students about iron-rich diet should be strengthened. The parents also should be educated about the importance of IFA consumption. Regarding the supply, the IFA tablets should be ensured of good quality.

REFERENCES

Agarwal, K.N.; D.K. Agarwal; A. Sharma; K. Sharma; K. Prasad and M.C. Kalita. 2006. Prevalence of anaemia in pregnant & lactating women in India. *Indian Journal of Medical Research,* 124(2): 173-184.

Basu, S.; R. Hazarika and V. Parmar. 2005. Prevalence of anaemia among school going adolescents of Chandigarh. *Indian Pediatrics*, 597(42): 17.

Chaudhary, P.; Radhna Gupta and Ranjana Verma. 2019. Impact of dietary and nutrition education intervention on nutritional knowledge of moderately Anemic Adolescent Girls of Kangra District, Himachal Pradesh. *Journal of Community Mobilization and Sustainable Development,* 14(3): 485-493.

Deshmukh, P.R.; B.S. Garg and M.S. Bharambe. 2008. Effectiveness of weekly supplementation of iron to control anaemia among adolescent girls of Nashik, Maharashtra. *Journal of Health, Population and Nutrition,* 26(1): 74–78.

Dongre, A.R.; P.R. Deshmukh and B.S. Garg. 2011. Community-led initiative for control of anemia among children 6 to 35 months of age and unmarried adolescent girls in rural Wardha, India. *Food and Nutrition Bulletin,* 32(4): 315–323.

Gupta; M.S. Anuradha; R. Kumar; V.S. Salhotra; A.D.S.R. Mohan. 2013. Guidelines for Control of Iron Deficiency Anemia. New Delhi. 54.

National Family Health Survey (NFHS- 4), India: Volume I. International Institute for Population Sciences (IIPS) and Macro International. 2015-16.

Jethi, R.; P. Joshi; N. Chandra; M.L. Roy and J. Kushagra. 2018. Investigation of nutritional and health status of Indian farm women. *Journal of Community Mobilization and Sustainable Development,* 13(1): 169-176.

Joseph, B. and N. Ramesh. 2013. Weekly dose of iron-folate supplementation with vitamin c in the work place can prevent anemia in women employees. *Pak. J. Med. Sci.*, 29(1): 47-52.

Joshi, M. and R. Gumashta. 2013. Weekly iron folate supplementation in adolescent girls-an effective nutritional measure for the management of iron deficiency Anemia. *National Library of Medicine,* 5(3): 188-194.

Kaur, S.; P.R. Deshmukh and B.S. Garg. 2006. Epidemiological correlates of nutritional Anemia in adolescent girls of rural Wardha. *Indian Journal of Community Medicine*, 31(4): 255-257.

Mehnaz, S.; S. Afzal; S. Khalil and Z. Khan. 2006. Impact of iron, folate and vitamin supplementation on the prevalence of iron deficiency Anemia in non pregnant females of peri urban Areas of Aligarh. *Indian Journal of Community Medicine*, 31(3): 201-203.

Pattnaik, S.; L. Patanaik; A. Kumar and T. Sahu. 2013. Prevalence of anemia among adolescent girls in a rural area of Odisha and its epidemiological correlates. *Indian Journal of Maternal and Child Health,* 15(1): 1-11.

Prasad Tukaram Dhikale, E. Suguna, A. Thamizharasi and Amol R. Dongre. 2015. Evaluation of Weekly Iron and Folic Acid Supplementation program for adolescents in rural Pondicherry, India. *International Journal of Medical Science and Public Health*, 4(10): 1-6.

Prasad Tukaram Dhikale, E.; Suguna, A. Thamizharasi, A.R. Dongre. 2015. Evaluation of weekly iron and folic acid supplementation program for adolescents in rural Pondicherry, India. *International Journal of Medical Science and Public Health,* 4(10).

Seshadri S. 1998. Oral iron supplementation to control anemia in adolescent girls: Community trials of effectiveness of daily vs weekly supplementation. UNICEF Project of Department of Foods and Nutrition/WHO Collaborating Centre for Anemia Control, Maharaja Sayajirao University of Baroda; pp. 26.

Sharma, A.; K. Prasad and V.K. Rao. 2000. Identification of an appropriate strategy of control anemia in adolescent girl of poor communities. *Indian Pediatrics*, 37: 261-267.

Shu, E.N. and S.O. Ogbodo. 2005. Role of ascorbic acid in the prevention of iron deficiency Anaemia in pregnancy. *Biochemical Research*, 16(1): 40-44.

World Health Organization/United Nations University/ UNICEF. 2001. Iron deficiency anemia, assessment, Prevention and Control: a guide for programme manager. Geneva: WHO.

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Micro Analysis of Yield Gain and Change in Technology Adoption in Western Uttar Pradesh

N.V. Kumbhare[1]*, Nishi Sharma[2], Nafees Ahmad[3], Pratibha Joshi[4], P. Punitha[5], J.P.S. Dabas[6] and J.P. Sharma[7]
[1]Senior Scientist & Incharge, ATIC; [2,3]Senior Scientist, CATAT; [4,5]Scientist, CATAT; [6]Incharge, CATAT and [7]Joint Director (Extension), ICAR-Indian Agricultural Research Institute, New Delhi-110012

ABSTRACT

The study on 'Out-scaling of Agricultural Innovations for Enhancing Farm Income' was carried out at 240 farmers' field from 2015-2018 in village Kutbi, district Muzaffarnagar in western Uttar Pradesh. The micro analysis of technological intervention for enhancing farm income revealed that per cent yield gain over check in wheat 16.88 to 36.36 per cent, in paddy 25.97 to 35.06 per cent and in mustard from 12.12 to 24.85 per cent. The change in cropping pattern and crop diversification after IARI interventions revealed that majority (76.66%) of the respondents shifted from using traditional varieties to improved HYVs, followed by shifted from using long duration varieties to short duration varieties (70%), shifted from sugarcane-wheat-sugarcane to rice-mustard-sugarcane (61.66%) and shifted from broadcasting to line sowing (30%). The change in technology adoption pattern of the respondents found that majority (63.33%) of the respondents observed change in mustard cultivation followed by use of high yielding varieties of crops especially wheat, paddy and mustard (60%), followed by IPM practices (56.66%), soil testing (58.34%), seed treatment in paddy and wheat (53.33%), higher yield of crops (50%), use of biofertilizers (48.33%) and pest management of fruit orchard (38.33%). The major problems faced by the farmers identified were problems of wild pig and blue bulls (81.66%) followed by crop damage by stray cattle (80%), labor shortage (75%), high cost of inputs especially fertilizers and pesticides (71.66%), crop damage by pest (65%) and low market price for agricultural produce (53.33%). The Friedman test statistic of farmers criteria for selection of wheat and paddy showed significant at 1 per cent level of significance.

Keywords: Cropping pattern, Diversification, Technology adoption, Yield gain

INTRODUCTION

Wheat, Paddy, and Mustard are the most important crops grown in the sugarcane-based cropping system of western Uttar Pradesh, India. Agricultural productivity and performance show wide variations across different regions of the country. It shows significant potential in raising agricultural production by addressing the factors related to differences in performance. The variation is mainly due to large differences in not only the level of adoption of the latest agricultural technologies but also the underlying determinants, which could be influenced through appropriate policies. In the changing agricultural scenario, farmers are facing a lot of problems due to an extensive technological gap, yield gap and productivity constraints in sugarcane-based cropping system of western Uttar Pradesh.

Initially, majority of the farmers were getting low return because of use of traditional and outdated varieties of crop, non-availability of seeds of high yielding varieties, and problems of pest and diseases and low awareness on recent improved production technologies. Hence, the need was recognized to undertake technological interventions on crop diversification for utilization of recent improved production technologies and assessment of wheat, paddy and mustard production technology in western Uttar Pradesh to reduce the yield gap at farmers field. Western Uttar Pradesh is an emerging and potential area for sugarcane, wheat, paddy, and mustard production because of good soil health conditions. Considering the good soil health and production condition, technological interventions on paddy, wheat, and mustard were undertaken at farmers' field to improve the production and productivity and to promote crop diversification in

*Corresponding author email id: n_kumbhare@yahoo.com

the sugarcane-based cropping system. Keeping in view, the farmers' constraints, technological and yield gap at farmers' field, an attempt was made to explore the 'micro analysis of yield gain and change in technology adoption in western Uttar Pradesh'.

MATERIALS AND METHODS

The study on 'Out-scaling of Agricultural Innovations for Enhancing Farm Income' was carried out at 240 farmers' field from 2015-2018 in village Kutbi, district Muzaffarnagar in western Uttar Pradesh. Twenty (20) farmers each were selected per year for the demonstration on a recently released variety of wheat, paddy, and mustard. Hence, there were 80 farmers for each crop selected for the purpose. Thus, a total of 240 respondents represent the sample of the study. The yield data collected from the selected farmers were analyzed in economic terms with the cost: benefit ratio of demonstrated varieties. For estimation of technology index, the following formula was used as per method of Samui *et al.* (2000) and Kumbhare *et al.* (2012).

$$\text{Technology index} = \frac{\text{Potential yield - Demonstrated yield}}{\text{Potential yield}} \text{ X } 100$$

RESULTS AND DISCUSSION

Socio-economic profile of the farmers: The data related to the socio-economic profile of the farmers (Figure 1) revealed that a majority of the respondents (68%) were belonged to the middle age group followed by old age group (18%) and young age groups (14%). The education status of the respondents showed that 30.20 per cent of farmers had schooling up to higher secondary level, followed by primary level (27.3%), middle class (21.8%) and graduate (20.5%). Also the landholding pattern of the respondents found that a majority (39.91 %) of the respondents were medium land holder, followed by large (21.77%) and marginal (13.70%) landholder.

A majority (95%) of the farmers were cultivating the sugarcane, paddy, wheat and mustard crop under sugarcane-based rice-wheat cropping system. A significant proportion of the farm households (73%) had major occupation as agriculture and majority (81.06%) of the respondents belongs to other backward class category, followed by scheduled caste (10.87%).

Status of varietal Performance in Wheat, Paddy and Mustard: The potential and field performance of the

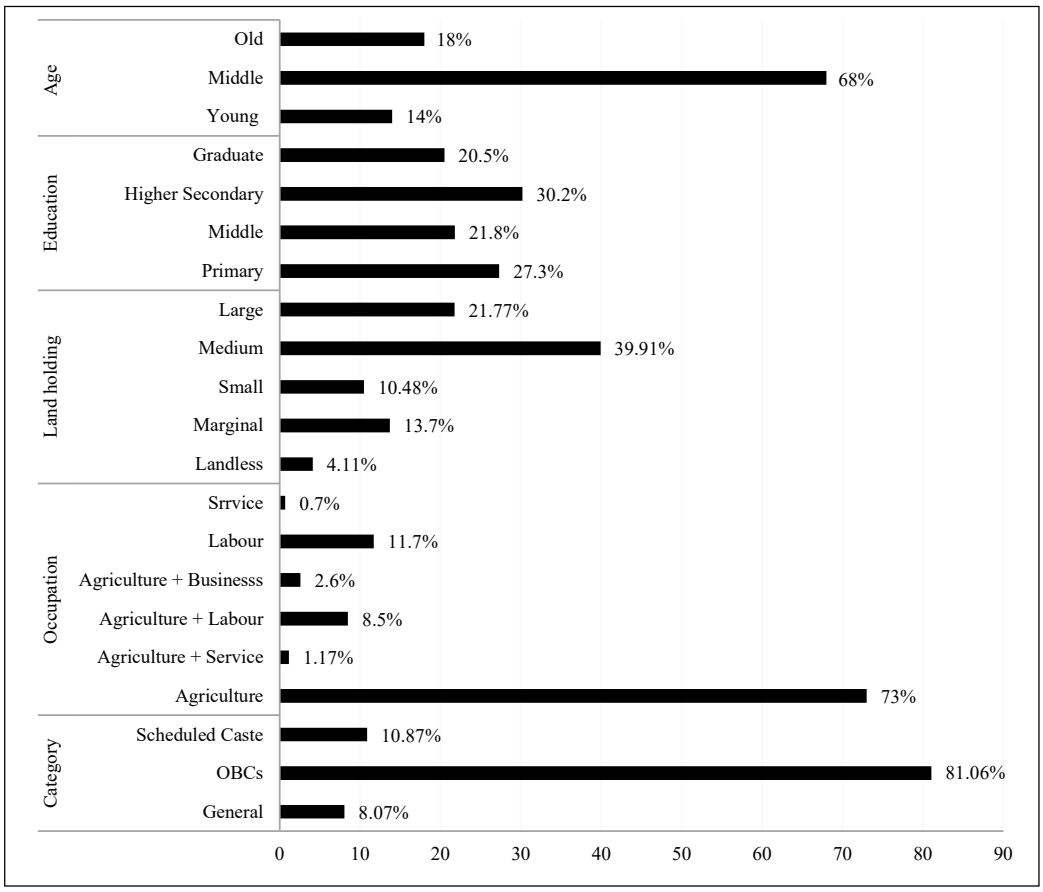

Figure 1: Socio-economic profile of the respondents

Table 1: Economic analysis of wheat, paddy and mustard crop varieties

Crops	Varieties	No. of FLDS	Yield (kg/ha)		Av. Cost of Cultivation (Rs/ha)	Av. Gross Return (Rs/ha)	Av. Net Return (Rs/ha)	B:C Ratio	% gain Over check	Technology Index (%)
			Demo yield	Local check						
Wheat	HD 2967	20	5080	3850	39,500	1,01,600	62,100	2.57:1	31.94	7.6
	HD 3086	20	5250	3850	39,500	1,05,000	65,500	2.65:1	36.36	4.5
	HD 3059	30	4500	3850	39,500	90,000	50,500	2.27:1	16.88	10.0
Rice	Pusa 1121	20	4850	3850	39,500	1,30,950	91,450	3.31:1	25.97	11.8
	Pusa 1509	20	5200	3850	39,500	1,30,000	90,500	3.29:1	35.06	5.4
	Pusa 1612	20	4950	3850	39,500	1,23,750	84,250	3.13:1	28.57	10.0
	PB-1	20	5100	3850	39,500	1,27,500	88,000	3.22:1	32.46	7.27
Mustard	Pusa Vijay	15	2060	1650	24,250	67,660	43,410	2.79:1	24.84	17.6
	Pusa Bold	15	1850	1650	24,250	57,350	33,100	2.36:1	12.12	7.5

improved paddy, wheat and mustard varieties under different condition were evaluated along with local check and data is presented in Table 1. An economic analysis of wheat, paddy and mustard varieties revealed that average net return of Rs. 65,500/- per hectare was recorded in HD 3086 variety of wheat with BC ratio of 2.65:1 followed by Rs. 62,100/- per hectare average net return in HD 2967 with BC ratio of 2.57:1. The yield gain of 36.36 per cent gain over local check was observed in HD 3086 followed by HD 2967 (31.94%). The analysis of paddy revealed that average net return of Rs. 91,450/- per hectare was recorded at farmers field in Pusa 1121 variety of paddy with BC ratio of 3.31:1 followed by Rs. 90,500/- per hectare average net return was recorded in Pusa 1509 with BC ratio of 3.29:1. The percent yield gain over local check i.e.35.06 per cent was observed in Pusa 1509 followed by Pusa 1121 (25.97%). The analysis of mustard variety revealed that average net return of Rs. 43,410/- per hectare was recorded at farmers' field in Pusa Vijay variety of mustard with BC ratio of 2.79:1. Above findings are in line with Singh and Singh (2019) and Singh *et al.* (2013).

The data of technology index (TI) observed that the higher technology index indicates the technology gap and lower technology index indicates the more feasibility/ suitability of that variety in the selected location. The technology index (TI) of wheat, paddy and mustard varieties revealed that wheat variety HD 3086 (TI 4.5) was found more feasible as compared to HD 2967 (TI 7.6). Among rice varieties PB 1509 (TI 5.4) was found more feasible followed by Pusa Basmati 1 (TI 7.27), Pusa 1612 (TI 10.0) and Pusa basmati 1121 (TI 11.8). In mustard varieties, Pusa Bold (TI 7.5) was found more feasible as compared to Pusa Vijay (TI 17.6). Similar findings were reported by Singh and Singh (2019) and Ray *et al.* (2019).

Farmers Criteria for Selection of Wheat and Paddy varieties: The farmers' criteria for the selection of wheat and paddy varieties (Table 2) revealed that cooking quality and taste (MS 1.12) was observed the first preference followed by more production (MS 1.88). In paddy, farmers' criteria for selection of rice varieties were good market price (MS 1.52) followed by more production (MS 2.22) and profitability of variety (MS 3.30). The Friedman

Table 2: Farmers Criteria for Selection of Wheat and Paddy varieties

Trait	Wheat (n=40)	Rice (n=40)
Good market price	7.98	1.52
Seed quality	5.00	5.93
More production	1.88	2.22
Cooking quality and taste	1.12	8.85
Output price	7.03	5.95
Profitability	9.20	3.30
Reduced market channel	6.07	7.18
Availability of technology	4.00	4.93
Awareness about the technology	10.10	10.20
Demonstration done by the IARI scientist	10.62	10.72
Fodder	3.00	5.20
Test Statistics (Friedman test)	χ^2=296.564 p=.000	χ^2=256.743 p=.000

test statistic of farmers criteria for selection of wheat and paddy showed significant at 1 % level of significance.

Change in Cropping Pattern and Crop diversification: The data on change in cropping pattern and crop diversification after IARI interventions depicted in Table 3 revealed that majority (76.66%) of the respondents shifted from using traditional varieties to improved HYVs, followed by shifted from using long duration varieties to short duration varieties (70%), shifted from sugarcane-wheat- sugarcane to rice-mustard-sugarcane (61.66%) and shifted from broadcasting to line sowing (30%). This change in cropping pattern and crop diversification among farmers is due to technological intervention, regular and timely availability of improved high yielding variety seeds to the farmers and awareness programme in the village for the farmers.

Change in Technology Adoption Pattern: The change in technology adoption pattern of the respondents (Table 4) revealed that a majority (63.33%) of the respondents observed change in mustard cultivation followed by use of high yielding varieties of crops especially wheat, paddy and mustard (60%), following IPM practices (56.66%), soil testing (58.34%), seed treatment in paddy and wheat (53.33%), higher yield of crops (50%), use of biofertilizers (48.33%) and pest management of fruit orchard (38.33%). This is positive sign that majority of the farmers (60%) shifted from using traditional varieties to use of high yielding varieties for enhancing their farm income. This change observed among farmers because of technological intervention and awareness programme organized during the project period.

Constraints faced by the farmers: The major problems faced by the farmers in western Uttar Pradesh (Table 5) were problems of wild pig and blue bulls (81.66%) followed by crop damage by stray cattle (80%), labor shortage (75%), high cost of inputs especially fertilizers and pesticides (71.66%), crop damage by pest (65%) and low market price for agricultural produce (53.33%). Related constraints reported by Kumbhare *et al.* (2014). It is also observed that wild pig and blue bulls are the major problems since last 10-15 years because in western Uttar Pradesh as majority of crop area is covered with sugarcane

Table 3: Change in Cropping Pattern and Diversification after IARI Interventions (n=60)

Cropping pattern and crop diversification	Respon-dents	Perce-ntage
No change	4	6.66
Shifted from using traditional varieties to improved HYVs	46	76.66
Shifted fro Sugarcane- wheat-sugarcane to rice- mustard- sugarcane	37	61.66
Shifted from using long duration varieties to short duration varieties	42	70.00
Shifted from broadcasting to line sowing	18	30.00

Table 5: Constraints faced by the farmers in Sugarcane based cropping system

Constraints	Respondents (n=60)	%age	Rank
Problems of wild pig and blue bulls	49	81.66	I
Crop damage by stray cattle	48	80.00	II
High cost of inputs	43	71.66	IV
Labour problem	45	75.00	III
Low market price for agricultural produce	32	53.33	VI
Crop damage by pest	38	63.33	V

Table 4: Change in technology Adoption Pattern (n=60)

Cropping pattern and diversification	% Farmers adopting before IARI	% Farmers adopting after IARI	Change (%)
Use of high yielding varieties of crops	16.66	76.66	60.00
Mustard cultivation	0.00	63.33	63.33
Seed treatment in paddy and wheat	8.33	61.66	53.33
Soil testing	11.66	70.00	58.34
Higher yield of crops	28.33	78.33	50.00
Following IPM practices	10.00	66.66	56.66
Pest management of fruit orchard	13.33	51.66	38.33
Use of biofertilizers	0.00	48.33	48.33

crop and these animals take shelter and hide in the standing sugarcane crop and damage the crop during night. However, the problem of stray cattle has occurred during last 3-4 years.

CONCLUSION

Technological intervention on crop diversification is crucial for enhancing crop yield, farm income, profitability and change in cropping pattern and technology adoption pattern at farmers' field. There is a need to promote recently released high yielding varieties of the crop at farmers field. In India, hundreds of high yielding varieties of different crops have been released for commercial cultivation in different states, but still, there is a wide yield gap at farmers' field. Thus, suitable extension interventions are needed to reduce the technological as well as extension gap at farmers' field for the benefit of farmers.

REFERENCES

Dubey, A.K. and J.P. Srivastava. 2007. Effect of training programme on knowledge and adoption behaviour of farmers on wheat production technologies. *Indian Research Journal of Extension Education,* 7(2&3): 41-43.

Kher, S.K. 1992. Adoption of improved wheat cultivation practices. *Indian Research Journal of Extension Education,* 8(1&2): 97-98.

Kumbhare, N.V.; Anil Kumar, K. Singh and S. Chowdhury. 2012. Micro analysis of yield gap and associated constraints in adoption of wheat production technologies in Bihar. *Indian Journal of Extension Education*, 48(3&4): 22-25.

Kumbhare, N.V.; S.K. Dubey, M.S. Nain and Ram Bahal. 2014. Micro analysis of yield gap and profitability in pulses and cereals. *Legume Research*, 37(5): 532-536.

Patel, M.M.; Amit Chatterjee and Mohmood Khan. 2003. Adoption of wheat production technology. *Indian Journal of Extension Education*, XXXIX (1&2): 58-62.

Ray, S.K.; K.K. Barman; S. Paul; R. Chuilo; D.J. Rajkhowa; S. Baishya and B.C. Deka. 2019. Utilization of rice fallow through cluster frontline demonstration programme: An adaptive research trial on mustard. *Journal of Community Mobilization and Sustainable Development,* 14(3): 439-446.

Samui, S.K.; S. Maitra; K. Roy; A.K. Mondal and D. Saha. 2000. Evaluation of frontline demonstration on ground nut (*Arachis hypogia* L.). *Journal of Indian Society of Costal Agriculture Research,* 8(2): 180-183.

Singh, K.K. and D.P. Singh. 2019. Evaluation of wheat varieties for timely sown condition in District Bijnor (Uttar Pradesh) with special reference to the yield gap and their adoption in District. *Journal of Community Mobilization and Sustainable Development,* 14(3): 435-438.

Singh, K.K.; P.K. Singh and Ashok. 2013. Analysis of timely sown wheat varieties for yield and yield gap at farmers field Saharanpur district. *New Agriculturist*, 24(2): 197-200.

Sriram and M.S. Chauhan. 2005. Constraints in the non-adoption of improved technology of wheat. development initiatives for farming community, extension strategy. seminar paper published by ISEE, pp. 413-417.

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Impact of Training Programme on Knowledge Level of the FCI Personnel

Ramandeep Kaur* and V.K. Rampal
M.Sc. Scholar and Deputy Director (Trg), Punjab Agricultural University, Ludhiana-141004, Punjab

ABSTRACT

The present study was conducted to assess the impact of training programme organized by Punjab Agricultural University for FCI personnel. The impact was measured in terms of gain in knowledge. All the trainees (180) of the training programme organized by Directorate of Extension Education, PAU, and Ludhiana during the period of 5 month (Oct, 2014 to Feb 2015) were the respondents of the study. A Knowledge test was prepared with the help of concerned resource persons and using the well-established. Knowledge index was calculated to access the cognitive domains of respondents in terms of knowledge about safe storage and quality. Data revealed that maximum knowledge index of 86.67 was in case of milling, procurement and marketing and minimum (68.20) was in insect/ pest and diseases. It is clear from the pre and post knowledge test that knowledge level of the respondents shifted from low to medium knowledge category and medium to high knowledge category. The tabulated t-value for all pre and post mean knowledge score is also significant at 5 per cent level of significance which shows the effectiveness of the training programme.

Keywords: FCI personnel, Impact, Knowledge index, Knowledge test, Training, t-test

INTRODUCTION

Agriculture is the backbone of national economy. Over 58 per cent of the rural households depend on agriculture as their principal mean of livelihood. Agriculture, along with fisheries and forestry, is one of the largest contributors to the Gross Domestic Product (GDP) (Anonymous, 2015a). With about 70 per cent population living in rural areas and about 58 per cent of its workforce engaged in agriculture, India needs positive change in agricultural sector (Tripathy, 2011). The National objective of growth with social justice followed by Government of India involves assured supply of food grains at affordable prices to different sections of society. In this connection, the Government of India has introduced a scheme called Targeted Public Distribution Systems (TPDS) effective from June 1997 (Anonymous, 2015b).

In India, surplus food grains are accumulated in the warehouses owned by the Food Corporation of India (FCI), the Central Warehousing Corporation (CWC) or the State Warehousing Corporation (SWCs). They have a network of storage depots strategically located all over India (Singh, 2010). The storage function assumes paramount importance in organization such as Food Corporation of India because of its requirement to hold huge inventory of food grains over a significant period of time.

Punjab Agricultural University (PAU) inked a Memorandum of Understanding (MoU) with the Food Corporation of India (FCI) on 18th June 2012 to impart training to FCI's quality control and field staff on the advancements across the world, on various procedures and techniques of handling and preservation of food grains, right from the stage of procurement to its final distribution to reduce post-harvest-losses. PAU would be helpful in honing the skills of the trainees (FCI personnel) and in producing quality manpower (Anonymous, 2015c). Keeping in view the above points in to consideration there is a need to study the impact of the training programmes organized by PAU, Ludhiana for FCI personnel with following objective: (1) To study the impact of the training programmes

MATERIAL AND METHODS

The study was conducted at the main campus of Punjab Agricultural University, Ludhiana in Punjab state. All the

*Corresponding author email id: rampalvk@pau.edu

trainees of the training programme organized by Directorate of Extension Education, PAU, and Ludhiana during the period of 5 month (Oct, 2014 to Feb, 2015) were the respondents of the study. The total numbers of respondents were 180. The details are given in the Table 1.

The impact of the training programme was studied in terms of gain in knowledge by trainees. Knowledge is defined as the degree to which the factual information possessed by the FCI personnel regarding various aspects of the training programme. A Knowledge test was prepared with the help of concerned resource persons and using the well- established methodology. A total of 55 items covering all the aspects of training regarding safe storage of food grains and quality standards were collected. The items were edited and drafted in such a way that each item highlighted only one idea and did not have any ambiguity. After considering the opinion of 20 experts and they were discussed in the advisory committee meeting, 45 items were retained in the knowledge test.

Item difficulty index: The first criterion for item selection is item difficulty, it was work out as the proportion of the respondents answering on items correctly. Usually their proportion is indicated by D.I and it is calculated by the following formula:

$$D.I = \frac{R}{N} \times 100$$

Where, R= number of respondents who answered the item correctly

N= total no of respondents who give the test

Discrimination index: The second criterion for item selection is the discrimination index. A good test item should discriminate between those who score high on the test and those who score low. It is denoted by letter Di and is calculated by following formula:

$$D_i = \frac{R_u - R_L}{N_i/2}$$

Where Di= Discrimination index of an item i

R_u = Number of correct answer to item i among the 27 per cent of the highest test score

R_L = Number of correct answer to item i among the 27 per cent of the lowest test scores

N_i = Number of person in both the group

Final selection of the items: Though, the fore said criteria were the main considerations for final selection of knowledge items, yet care was taken not to eliminate the important aspects if any. The items having difficulty index (D.I) between 0.25 and 0.75, discrimination index (Di) above 0.20 and point biserial correlation coefficient significant at 5 per cent level were selected for knowledge test.

Reliability of knowledge test: The reliability of test was assessed by using the method of split half technique. It was calculated by Spearman Brown Proficiency formula:

$$r' = \frac{2r}{1 + r}$$

The r' value thus calculated was 0.97 which was found significant at 5 per cent level of probability. Therefore, indicating that this test had high internal consistently.

Validity of the test: It is referred to its ability to measure exactly the variable, it is supposed to measure. The validity of the test was established through content validity. This validity indicated by the square root of its reliability. The

Table 1: Training programmes organized by Directorate of Extension Education, PAU, Ludhiana, for FCI personnel

S.No.	Date of the training programme	Name of the training course	No. of trainees
1.	27th Oct 2014 to 1st Nov 2014	Safe storage of food grains and quality standards for officers of category ii and iii of FCI of India	26
2.	10th Nov 2014 to 15th Nov 2014	-do-	32
3.	17th Nov 2014 to 22nd Nov 2014	-do-	22
4.	1st Dec 2014 to 6th Dec 2014	-do-	23
5.	15th Dec 2014 to 20th Dec 2014	-do-	20
6.	19th Jan 2015 to 24th Jan 2015	-do-	28
7.	2nd Feb 2015 to 7th Feb 2015	-do-	29

intrinsic validity of these instruments was also calculated by using the following formula:

$$\text{Validity} = \sqrt{r'} = 0.97$$

For collection of data the questionnaire relating to socio-economic characteristics of the trainees administered before the training programme was started. For studying the gain in knowledge, the data were collected by administering the knowledge test before and after the training programmes during the month of Oct, 2014 to Feb, 2015. The responses elicited from respondents were quantified by assigning the score of 1 and 0 for correct and wrong/ no response respectively.Same procedure followed by Subba and Ghosh in 2016.

Gain in knowledge: It was measured in terms of the difference between before and after training knowledge scores of the trainees. Based on the total scores, the respondents were classified in three categories i.e.

Categories	Score
Low	Mean-SD
Medium	Mean±SD
High	Mean+SD

$$\text{Percent gain in knowledge} = \frac{\text{Post score – pre score}}{\text{Total number of items}} \times 100$$

$$\text{Knowledge index} = \frac{\text{Mean Score Obtained}}{\text{Max. Obtainable Score}} \times 100$$

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents: It relates to the information regarding socio-personal characteristics of the respondents which included age, educational qualification, family type, gender, family background, family occupation, service experience, mass media exposure and extension contacts. The information pertaining to the socio economic characteristics of the respondents has been given in Table 2. The age of the respondents was categorized into three categories i.e. young (20-33), middle (33-46) and old (46-59). Data in Table 2 revealed that age of the respondents varied from 20 year to 58 years. Majority of the respondents (89.44%) belonged to young age group. 6.11 per cent of the respondents were in middle age group and rest 4.44 per cent of the respondents were in old age group. The educational level of respondents varied from graduation to post graduation. So the respondents were categorized into two categories based on their educational level i.e. graduate (43.33%) and post graduate (56.67%). It has been concluded that well educated trainees participated in this training programme. The reason for this might be that the minimum qualification for FCI recruitment (category i, ii, iii) is graduation. The data presented in the Table 2 reveals that 59.44 per cent of the respondents belonged to joint families whereas 40.56 per cent of the respondents belonged to the nuclear families. The trend is contrary to the belief as modern generation likes to live as nuclear. The gender of the respondents was classified into two categories male and female. The results further revealed that nearly three fourth of the respondents (71.67) were male. It may because the males were more oriented towards field jobs than the females. The service experience was categorized into three categories i.e. up to 12 years, 13 -24 year and 25-36 years. It can be inferred from the Table 2 that majority of the respondents i.e. 86.67 per cent had service experience up to 12 years. It is now

Table 2: Distribution of the respondents according to their socio–economic characteristics (n=180)

Characteristics	Category range	Frequency	Percentage
Age	20-33 (young)	161	89.44
	33-46 (middle)	11	6.11
	46-59 (old)	18	4.45
Educational	Graduate	78	43.33
qualification	Post graduate	102	56.67
Family Type	Nuclear	73	40.56
	Joint	107	59.44
Gender	Male	129	71.67
	Female	51	28.33
Family background	Rural	85	47.22
	Urban	95	52.78
Service experience	<12 years	156	86.67
	13 year-24 years	14	7.77
	25-36 years	10	5.56
Mass Media Exposure	Low (<14.37)	37	20.55
	Medium (14.37-20.25)	102	56.67
	High (> 20.25)	41	22.78
Extension Contacts	Low (< 7.98)	15	8.33
	Medium (7.98-14.23)	124	68.89
	High (>14.23)	41	22.78

clear from the data that FCI had nominated newly recruited personnel to this training programme. The responses of the respondents regarding mass media exposure were recorded on a three point continuum i.e. always, sometimes and never. It is clear from the data in Table 2 that more than half (56.67%) of the respondents had medium level of mass media exposure and 22.78 per cent of the respondents had high level of mass media exposure. Only 20.55 per cent of the respondents had low level of mass media exposure. Anecdotal experience shows that almost all trainees often watched TV and were in touch with internet. Newspaper was also used as a source of mass media exposure. About three fourth of the respondents regularly read newspaper, and about half of the respondents had attended seminars and conferences.

A perusal of data in Table 2 shows that majority of the respondents i.e. more than 65.00 per cent had medium level of extension contacts. They were in frequent touch with IFFCO, Warehouses and Markfed personnel, but they have weak linkages with ADOs and SAUs. The reason may be that Markfed, IFFCO, Warehouses activities are closely related with FCI and they are in regular contact with them.

Extent of knowledge among trainees in various aspects of safe storage of training programme: The mean scores obtained by the respondents after the training programme were 13.82, 5.03, 3.41, 2.78 and 10.4 against maximum possible score of 18, 6, 5, 4 and 12 in respective aspects of cleaning, grading and quality assurance, quality control for storage equipment, insect pest & diseases, rodent and bird management and milling, procurement and marketing. However, the mean score on overall knowledge about various aspects of safe storage of food grains and quality control was 35.44 against the maximum possible score of 45. On the basis of mean score and maximum possible score, knowledge index was also calculated to assess the cognitive domains of respondents in knowledge about safe storage and quality control after the training programme. The data in Table 3 revealed that maximum knowledge index of 86.67 was in case of milling, procurement and marketing and minimum knowledge index of 68.20 was in insect, pest and diseases. However, on the basis of knowledge index quality control for storage equipment and cleaning, grading and quality control were ranked 2nd and 3rd respectively. The knowledge index calculated is actually an assessment of level of acquaintances of respondents with these aspects after the training programme. The knowledge index on the overall aspects of safe storage of food grains was 78.76. The findings also supported by Gautam *et al.* (2014). The results on knowledge index can be interpreted in a way that trainees were having maximum acquaintances with milling, procurement and marketing in comparison to other aspects of the training programme after the training programme. This aspect is most familiar among the FCI personnel as they were mostly engaged in procurement. They also came across the latest know how in quality control of storage equipment. The lowest knowledge index was observed in insects, pests and diseases aspect. Hence, the intensive extension and development efforts are needed to improve the knowledge index of respondents especially in insects, pests and diseases and rodents and bird management.

Effectiveness of the training programmes: The data presented in Table 4 pertains to pre-training knowledge score and post-training knowledge score of the trainees with respect to various aspects of safe storage of food grains and quality standards. The t-values of difference between pre and post training mean knowledge score of cleaning, grading and quality assurance, milling, procurement and marketing were significant ($p < 0.01$). Similarly, t-value of difference between pre and post

Table 3: Distribution of the trainees according to their extent of knowledge among trainees in various aspects of safe storage of food grains and quality standards

Aspects	Maximum score	Mean score	Knowledge index	Rank
Cleaning, grading and quality assurance	18	13.82	76.78	3
Quality control for storage equipment	6	5.03	83.83	2
Insect pest & diseases	5	3.41	68.20	5
Rodent and bird management	4	2.78	69.50	4
Milling, procurement and marketing	12	10.40	86.67	1
Overall	**45**	**35.44**	**78.76**	

Table 4: Distribution of the trainees according to their mean knowledge score in pre and post training about safe storage of food grains and quality control

Aspects	Mean knowledge score of the trainees		t-value
	Pre-training	Post-training	
Cleaning, grading and quality assurance	6.52	13.82	4.29*
Quality control for storage equipments	1.88	5.03	2.34**
Insect pest & diseases	1.61	3.41	2.10**
Rodent and bird management	0.78	2.78	1.97**
Milling, procurement and marketing	6.36	10.4	3.43*

*Significant at p<0.01; ** Significant at p<0.05

training mean knowledge score of quality control of storage equipment, insect pest and diseases, rodent and bird management were significant (p< 0.05). The pre-training mean knowledge score ranged between 0.78 (in case of rodent and birds management) and 6.52 (in case of cleaning, grading and quality assurance). The post training mean knowledge score ranged between 2.78 and 13.82 about rodents and birds management and cleaning, grading and quality assurance respectively. They had comparatively little pre- training knowledge but after training, desirable level of knowledge was achieved in all these aspects. Thus, more such training programmes will be organized, so that newly recruited staff could take benefit from these training programmes of safe storage of food grains and quality standards. The results of this study are in tune with the findings of Kumari *et al.* (2018) and Singh and Leelavathy (1999).

Per cent increase in the knowledge of the trainees: It can be observed from the data in Table 5 that as high as 70.27 per cent of the trainees out of those whose pre-training score was low registered 40-60 per cent gain in knowledge. More than 50 per cent of the trainees were with medium pre-training knowledge score with their gain in knowledge was between 20-40 per cent. More than 80 per cent of the trainees, whose pre-training score was high, registered 20-40 per cent gain in knowledge. It can be concluded from the figures that as the pre-training score of the trainees increased, and the per cent increase in the knowledge decreased.

If we see the per cent gain in knowledge on the overall basis, it was interesting to notice that a high number (51.11%) of trainees gained knowledge of 20-40 per cent over their pre-training knowledge level. Another 40.55 per cent trainees recorded 40-60 per cent gain in knowledge over the pre- training knowledge scores. Only a very small number of trainees (5.56%) registered up to 20 per cent gain in knowledge. These observations clearly bring out the extent of effectiveness of these training programmes in terms of gain in knowledge of the trainees. The findings are supported by Nataraju *et al.* (1991) who found that the trainees having lower level of knowledge at pre-training stage gained higher knowledge from the training as compared to the trainees having higher pre-training knowledge.The gain in the score obtained by trainees clearly depict that the training was successful in raising the knowledge level of those who has lesser pre-training knowledge. The results are also in line with the study conducted by Dashora and Meena (2005).

The fact that those with high pre-training knowledge score gained knowledge to a smaller extent. It might be due to the fact that they already know most of the subject matter contents taught to them during the training.

Table 5: Distribution of the trainees according to their pre-training knowledge score and the per cent increase in knowledge (n=180)

Pre training knowledge score	Per cent increase in knowledge				
	<20	**20-40**	**40-60**	**60-80**	**Total**
Low (<13.06)	1 (2.70)	5 (13.51)	26 (70.27)	5 (13.51)	37 (20.56)
Medium (13.06-20.46)	4 (3.70)	58 (53.70)	46 (42.50)	0 (0.00)	108 (60.00)
High (20.47-45.00)	5 (14.28)	29 (82.86)	1 (2.86)	0 (0.00)	35 (19.44)
Total	**10 (5.56)**	**92 (51.11)**	**73 (40.55)**	**5 (2.78)**	**180 (100.00)**

CONCLUSION AND SUGGESTIONS

Based on the research findings, majority of the respondents were belonged to the young age group and lower service experience because FCI nominated newly recruited personnel to this training programme, Youth have a great potential to do work. So there is a need to provide more training opportunities to them so that they can perform well in their jobs. Also efforts could be made by Punjab Agricultural University, State Government and Centre Government for training FCI personnel. FCI personnel had good extension contacts with Markfed, IFFCO, KRIBHCO, etc. Although nearby fifty percent of the respondents had interaction with extension scientists, but still it is not satisfactory. It was felt that FCI personnel must have continuous interaction with extension scientists to equip themselves with the new research findings related to safe storage of food grains. There was a significant gap between pre training knowledge and post training knowledge, post training score was much higher than pre-training score. It shows that the training programme was effective in terms of gain in knowledge. So MoU has to be extended or resigned, so that newly recruited staff could take benefit of these training programmes of safe storage of food grains and quality standards.

REFERENCES

Anonymous. 2015a. India in Business, Ministry of External Affairs, Govt. of India. retrieved fromhttp://indiain business.nic.in/newdesign/index.php? =economy_ landing/ 213/2

Anonymous. 2015b. Agriculture's share in GDP declines to 13.7% in 2012-13. Retrieved from http://articles.economictimes.indiatimes.com/2013-08-30/news/41618996_1_ GDP-food grains-allied sectors

Anonymous. 2015c. PAU to train FCI staff. Retrieved from http://www.tribuneindia.com/2012/20120619/ldh1.htm#18

Basavaraja, H.; S.B. Mahajanashetti and N.C. Udagatti. 2007. Economic Analysis of Post-harvest Losses in Food Grains in India: A Case Study of Karnataka. *Agril. Eco. Res. Rev.*, 20: 117-126.

Dashora, P.K. and S. Meena. 2005. Assessment of training on nutrition education to field functionaries of ICDS in southern Rajasthan. *Rajasthan J. Ext. Edu.,* 5:12-13.

Gautam, A.K.; R.K. Dohrey, B. Jirli; A. Kumar and M. Mishra. 2014. Impact of KVK entrepreneurship training on knowledge of trainees. *Journal of Community Mobilization and Sustainable Development,* 9: 182-185.

Kumari, S.; N. Sethi and J.S. Mlik. 2018. Impact of training on dairy farm women. *Journal of Community Mobilization and Sustainable Development,* 13(2): 267-270.

Nataraju, M.S.; G. Perumal and G.N. Nagaraja. 1991. Transfer of technology in training and visit system. *Indian J. Ext. Edu.,* 27: 14-16.

Singh, N. and K.C. Leelavathy. 1999. Impact of nutrition training on food consumption pattern of Santhal tribe women of Bihar. *Indian J. Nutr Diet.,*34: 99-101.

Subba, S. and S. Ghosh. 2016. Knowledge Test on Large Cardamom (*Amomum subulatum*) Cultivation Practices in Sikkim. *Journal of Community Mobilization and Sustainable Development,* 11(2): 173-181.

Tripathy, K.K. 2011. India's Agricultural growth and stagnation: A Review. *Kurukshetra.,* 60: 3-10.

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Return Migration of Labours in Bihar due to COVID-19: Status and Strategies of Deployment in Agricultural Sector

Ujjwal Kumar[1], Rohan Kumar Raman[2]*, Abhay Kumar[3], Dhiraj Kumar Singh[2], Anirban Mukherjee[2], Jaspreet Singh[4] and B.P. Bhatt[5]

[1]Principal Scientist and Head, [2]Scientist, [3]Principal Scientist, Division of Socioeconomics and Extension, [4]Scientist, Division of Livestock and Fishery Management, [5]Director, ICAR Research Complex for Eastern Region, Patna-800014, Bihar, India

ABSTRACT

Migration of labours is one of the renowned strategies pursued by majority of Indians for their better livelihood which is increased during the last decades due to rapid urbanisation in the country. Bihar is the second largest sources of migrant workers in India. Spreading of COVID-19 and lack of its specific vaccine and control measures compelled India to follow countrywide lockdown strategy and that triggered migrants labour return back to their native pace due to jobless and hopelessness.This article seeks to understand the status of returned migrant labours and possible deployment strategies in agriculture sector in Bihar. Here, data was collected from Bihar Disaster Management Agency, other secondary sources and through telephonic survey. District and zone wise numbers of return migrants labours was estimated. Maximum migrants labours are from flood prone area of north Bihar. The manpower requirement during *kharif* season for rice and maize cultivation was calculated and the possibilities of deployment of return migrants were worked out. Around six hundred lakh man-days demand is estimated for agricultural activities in *kharif* season in Bihar. Maximum man-days requirement was observed in Zone I and minimum in Zone IIIA. The district wise and zone wise registered and estimated labour of Bihar was also presented through GIS mapping. Strategies for return migrants labours deployment in agriculture has been formulated. Farming, MGNREGS activities, food processing and small agri based industries can be helpful for engaging migrants labour in short term. Hence, this study will helpful for policy formulation of migrants labour and livelihood sustainable development.

Keywords: Agricultural, COVID-19, Deployment, Labours, Migration, Strategies

INTRODUCTION

Migration is a well-known livelihood strategy adopted by millions of people in developing as well developed countries. Much of this migration is happening either for work or for small business, directed towards the developed areas. Reports showed that around 232 million people migrates internationally in the year 2013 which is about 3.2 per cent of the world's population. It represents approximately one out of 32 people is an international migrant (Kunuroglu *et al.,* 2016). Europe is the host of the largest 72 million international migrants while India has the second largest diaspora in the world accounting 25 million Indians spread across every major region of the world (Ministry of Overseas Indian Affairs, 2012). India is the largest remittance country in the world having more than two and half times flow of direct investment (World Bank, 2011; Fact Sheet on Foreign Direct Investment, 2011). In internal migration movement within the country happens in terms of "in migration" and "out migration" due to wide disparities in economic and social conditions between origin and destination. The pull forces of the destination place is the main reason for migration in developed country where as in developing country like India people migration is for survival strategies because of poverty, unemployment and underdevelopment of the origin place. Migration can also be described as the oldest action against poverty. However, there is no denying the fact that the people migrate from backward and under developed areas to the developed and prosperous areas for better livelihood in both developing and developed country. Several studies and definition were made for the reasons of migration (Spengler and Myers, 1977; Das and Saha, 2013). In India inter-state migration of males and

*Corresponding author email id: rohan4741@gmail.com

females are still primarily for survival (Mukherji, 1991) and developmental activities (Yadava, 2002). Deshingkar and Start (2003) observed that labour living in rural areas follows the seasonal and circular migration for livelihood strategies. Several changes were also observed in migration pattern (Dyson and Visaria, 2004). However, when global economy change such as slowing down of the growth rates of GDP, unemployment rate at the destination place trigger the migrants to return back to their home. In India, Census (2011), reports showed that there is increase in 30% of internal migrants in 2011 than 2001. The states like Uttar Pradesh (UP) and Bihar are the biggest source states of migrants, followed closely by Madhya Pradesh (MP), Punjab, Rajasthan, -Uttarakhand, Jammu and Kashmir and West Bengal and the major destination states are Delhi, Maharashtra, Tamil Nadu, Gujarat, Andhra Pradesh and -Kerala.

Infectious diseases outbreaks have been the toughest challenge that human being has faced during the last decades worldwide. The outbreak of Severe Acute Respiratory Syndrome (SARS) in China during 2002, Ebola in West Africa in 2015, Middle East Respiratory Syndrome Coronavirus (MERS-CoV) in 2019 and the recently a typical coronavirus (COVID-19) that shook the world very badly (WHO, 2020). The virus SARSCoV-2 is responsible for COVID-19 that generally transmitted mainly through person to person. It affects on the respiratory illness and ultimately causing deaths of mainly older people and persons having serious medical conditions (CDC 2020). The first confirmed case was found in Wuhan, China (December 2019) after that within three months it spreading rapidly around in 210 countries and claiming more than 100,000 lives worldwide (WHO, 2020). Due to lack of specific vaccines and control measures for COVID-19 like other countries Tunisia, China, and Italy, India also had followed lockdown strategy to maintain the social distancing to stop the spreading of COVID-19 to protect the populations.

The implementation of nationwide lockdown due to corona virus pandemic (COVID 19) brought havoc into the lives and livelihood of these migrant workers living in the cities who were primarily depending upon daily wage earning and surviving through contribution of labour to the informal sector. This pandemic has triggered a massive reverse mig-ration or return migration from the "destination" to "source" in large parts of India. The eastern region, comprising of seven states eastern UP, Bihar, Jharkhand, West Bengal, Assam, Orissa, and Chhattisgarh, occupies about 22.5 per cent of the country's geographical area and is inhabited by about 36 per cent of the country's population. Eastern India has a total population of 405.94 million (m), i.e., 33.54 per cent of India's population (Mukherjee, 2020). Near about 83 per cent of the population lives in rural area therefore, agriculture is the mainstay of the economy. It witnessed lakhs of labourers marching back to their villages in order to get food and social security. Taking the different facets of return migration, the present study was undertaken to examine the status of return migrants labourers, opportunity, challenges and their livelihood strategies. The study also explores the social policy measures and employment opportunities that can protect informal and reverse migrant workers from hunger and extreme poverty in Bihar. Since, these migrants labourers returned home during the *Kharif* season so their involvement in agriculture need to be estimated for their work involvement.

MATERIALS AND METHODS

The study was conducted in Bihar state which is located between 24°20'10" - 27°31'15" North and 83°19'50" - 88°17'40" East with geographical area of 94,163 square kilometer in the eastern part of India. Bihar state is divided into two parts north Bihar (Zones I and II) and south Bihar (Zones IIIA and IIIB) (Table 1). The state has a 104 million population with very high population density of 1,106 per square kilometer. Around 88.5% of the population lives in the rural area. It has continental monsoon type of climate with average rainfall of 1200 mm. (ICAR-RCER, 2018).

The returned migrants' data has been collected from the Bihar Disaster Management Agency and other secondary sources. Telephonic surveys were also conducted in the quarantine centers to have better estimation of the data. The estimation of return labour migration was done based on the number of quarantine centers and its capacity in each district and number of estimated migrants labours of the given districts. The estimated returned migrants' and registered labour data was mapped district wise and zone wise separately in Arc GIS 10.1 software. The manpower requirement during *kharif* season for rice and maize cultivation was calculated based on personal observations and farmers feedback. Here manpower for *kharif* rice and maize cultivation was calculated as 80 and 55 man-days respectively.

Table 1: Distribution of 38 districts in four zones and their area in Bihar

Zones	District	Area (million ha)
Zone I	West Champaran, East Champaran, Gopalganj, Saran, Siwan, Sitamadhi, Muzaffarpur, Darbhanga, Vaishali, Samastipur, Sheohar, Madhubani and Begusarai	3.26
Zone II	Purnea, Katihar, Madhepura, Saharsa, Araria, Kishanganj, Supaul, Khagaria	2.08
Zone IIIA	Banka, Munger, Jamui, Lakhisarai, Shekhpura and Bhagalpur	1.1
Zone IIIB	Patna, Gaya, Jahanabad, Nawada, Nalanda, Rohtash, Bhojpur, Aurangabad, Buxar, Kaimur and Arwal	2.92

Source: ICAR-RCER, 2018

RESULTS AND DISCUSSION

Status of Migration flow in rural and urban area in Bihar and India: In Rural India an increase in total workers population during 2001 to 2011 was 7.27% in which male workers' population increased by 5.31 per cent and female workers increased by 12.79 per cent. Wherein in urban area, total workers' population increased by 39.21 per cent. During 2001 to 2011 increase of male and female work force was 33.87 and 68.97 per cent, respectively. In rural Bihar, a negative growth of total working population (-2.03) and male working population (-4.90) was observed during 2001 and 2011. However, this increase was positive (11.43) for female workforce during the same period. In urban area of Bihar, there is a quantum jump of 35.85 per cent in total workforce during 2001 to 2011. Female workforce recorded a notable increase of 86.34 per cent during this period which shows the sign of women empowerment. It was observed that more than 30 per cent increase in both male and female workforce in urban area. Observation showed that the number of total persons and male workers decreased in rural area but female workers increased in rural and urban area of Bihar in the last decades (2001 to 2011) (Table 2).

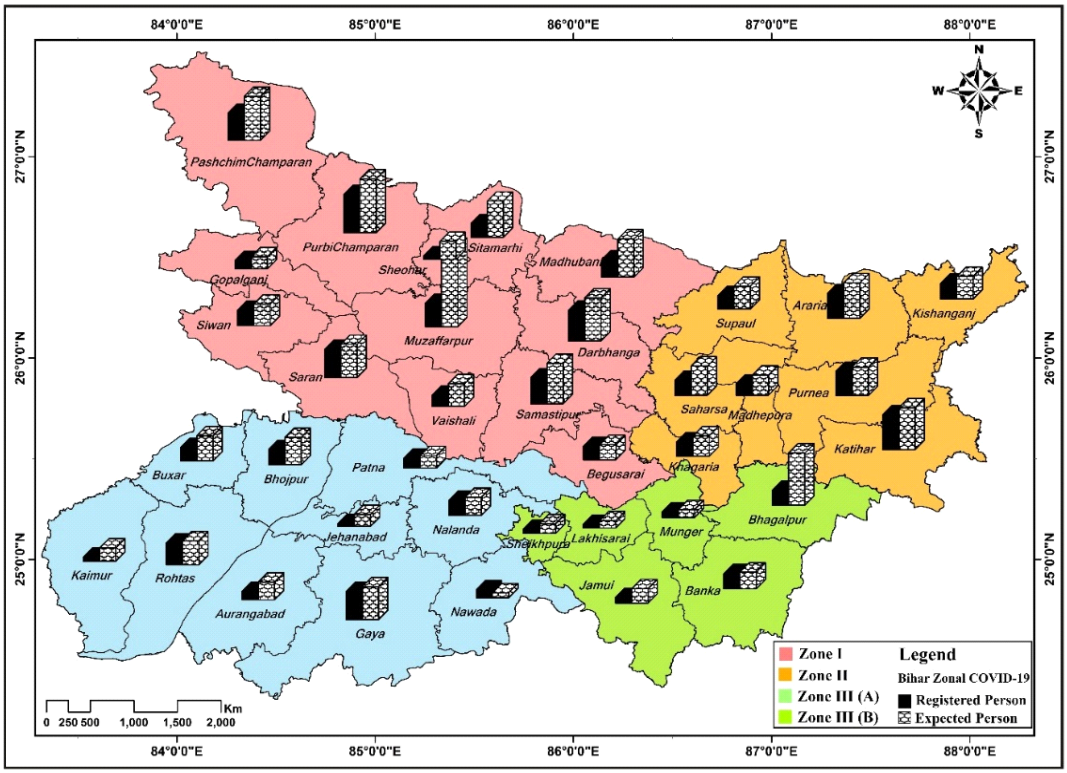
In the present scenario of globalization and urbanization, migrations are mostly pursued for better living and employment opportunities. In case of inter-state migration the trend is mostly to shift from rural to urban area. According to Satapathy and Mishra (2014) mostly, the people within age group of 25 to 50 years move out of villages for jobs a village based jobs are not remunerative enough to meet their requirements. Roy (2016) indicated that to have a dignified employment, devoid of caste based repercussions is the reason for migration. Another reason might be several constraints associated with agriculture like decreasing land man ratio, poor socio-economic condition of the farmers, vagaries nature of agriculture, new risks from environmental deterioration, etc. (Saha and Bahal, 2014). This growing rural to urban migration has a number of severe implications, one of them being its prospective effect on agriculture. Majority of the rural labors migrated to Punjab, Haryana and Delhi to rural and urban areas. The majority of the migrants (31.82%) go to small towns and cities for work. They generally work there in small industries as a labor, construction sites, domestic helps etc. A sizable amount (30.49%) of rural labors moves to rural areas of these cities (Roy, 2016).

Table 2: Percentage increase of male and female workers in India and Bihar during the period 2001 to 2011

Area	Subgroup	India			Bihar		
		No. of persons (lakh)		Increase (%)	No. of persons (lakh)		Increase (%)
		2001	2011		2001	2011	
Rural	Total Persons	2291.86	2458.68	7.27	191.12	187.23	-2.03
	Males	1691.01	1780.95	5.31	157.60	149.88	-4.90
	Females	600.85	677.73	12.79	33.52	37.358	11.43
Urban	Total Persons	838.21	1166.97	39.22	19.40	26.35	35.85
	Males	710.48	951.14	33.87	17.50	22.82	30.39
	Females	127.72	215.82	68.97	1.89	3.53	86.34

Source: Census of India 2011

Figure 1: District wise registered and expected return labour in Bihar



District and zone wise status of registered and expected return labour migrants: An analysis of the return migration of workers of different districts of Bihar showed that maximum registration of the migrant workers was in East Champaran (0.94 lakh) and minimum in Jahanabad (7.3 thousand). The maximum estimated return labours was observed in Muzaffarpur (1.97 lakh) and minimum (12. 3 thousand) in Nawada. The average registered labour per district in Bihar was observed to be 38.6 thousand and expected was estimated 64.6 thousand. The district wise registered and expected return labour is depicted in the Figure 1. East Champaran, Katihar, Darbhanga, Gaya, Saran, West Champaran, Samastipur and Araria districts have more than 60 thousand registered return labour migrants. Except Gaya, which is a drought prone district, rest seven districts are flood prone. People of this area more vulnerable towards migration and hence registered migrants are higher in above eight districts. Expected return migrants was also observed to be more than 1 lakh in seven districts *viz.,* Muzaffarpur, Bhagalpur, East Champaran, Darbhanga, West Champaran, Katihar and Samastipur districts (Table 3).

The zone wise quantification revealed that the zone I has 6.37 lakh and 11.41 lakh, Zone II has 3.8 lakh and 5.5 lakh, Zone IIIA has 1.2 lakh and 2.69 lakh and Zone III B has 3.26 lakh and 4.95 lakh registered and expected number of return labour respectively. Total registered and expected return migrants in Bihar were observed to be 14.67 lakh and 24.57 lakh respectively. The zone wise registered and expected return labour is presented in figure 2. In Zone I and Zone II representing North Bihar, total registered labourers is 10.18 lakh and expected estimation is 16.92 lakh where as in South Bihar total registered labour is 4.48 lakh and expected estimation is 7.64 lakh (Table 4).

Large numbers of people, mostly young are moving away from rural areas to urban centres in search of employment. The migration of rural youth to cities is around 45 per cent in the country and out of total migrants from rural to urban areas youth account for 30 per cent (Hazra, 2012). Furthermore, shifting out of agriculture is high among farmers below 30 years of age (Sharma and Bhaduri, 2009; Chandra *et al.,* 2018). As a result, presently, there is insufficient youth participation in the agriculture in India even though this class of people is the most productive of any society (Mangal, 2009). In another study done using multidimensional scaling developed for perception towards Migration it was observed that farmers of Uttar Pradesh and Bihar were having more favorable perception towards migration than the Maharashtra (Som *et al.,* 2018). Bihar is a major contributor to internal migration and around 15% contributor to out migration in India. Overwhelming proportion of migrants from rural

Table 3: District wise registered and expected return migrants of labour in Bihar

Districts of Bihar	Registered labour*	Expected labour
Jehanabad	7375	30000
Sheohar	9115	45000
Lakhisarai	9398	18080
Sheikhpura	9818	23840
Kaimur	9979	32480
Arwal	12405	28480
Munger	13568	19680
Jamui	14420	36000
Nawada	19714	12320
Aurangabad	20514	43840
Gopalganj	21033	30400
Patna	24360	30720
Vaishali	27486	56000
Madhepura	27603	50000
Buxar	32796	62720
Supaul	33181	57120
Sitamarhi	33765	90000
Begusarai	33784	37920
Khagaria	35599	50720
Saharsa	37065	72640
Nalanda	37074	44960
Bhagalpur	37141	129920
Banka	37589	41680
Bhojpur	38228	68160
Siwan	38625	53920
Kishanganj	39244	56320
Madhubani	42340	95000
Rohtas	54476	60000
Muzaffarpur	57774	197760
Purnea	59824	70560
Araria	61367	88480
Samastipur	64776	100960
Pashchim Champaran	67530	109760
Saran	69676	82880
Gaya	69982	81600
Darbhanga	77244	107680
Katihar	86359	104640
Purbi Champaran	94829	134560
Total	**1467056**	**2456800**

**Source:* http://disastermgmt.bih.nic.in/COVID-19/Block_02060. pdf

Bihar are labour migrants in search of employment opportunity within the state more than they did before (Roy, 2016).

Skill mapping of Migrant Labours: Skill mapping of 16 lakh migrants was done by Bihar Govt. (Table 5). It was found majority (52.5%) are skilled in construction works. Other than these a sizable share of workers were engaged in domestic and household assistance like tailor (0.63 Lakh), cook (0.388 Lakh), driver (0.3 Lakh), domestic workers (0.148 Lakh) etc. Along with that some skilled workers like handicrafts (0.014 Lakh), electronics and electrical (0.22 Lakh), carpenters (0.41 Lakh) and IT (0.15 Lakh) are the some important skills which has been mapped. In a study it was found Bihar contributes 12 per cent of the migrants in search of blue collar jobs in India. The major destinations for all these migrants are the big cities like Bangalore (40%), Gurugram (15%), Hyderabad (14%), Delhi (12%) etc. These migrants are generally works as driver (41%), delivery workers (32%), security guard (9%), housekeeping staff (9%) and others (Ghosh, 2020). These return migrants although are skilled in different area are majorly from rural areas where they had association with or experience of working in agriculture. The willing man force can be absorbed in different agricultural and rural development activities.

Utilization of return migrants labour in agriculture: In Bihar total area under rice is 34 lakh hectare and total maize area is 4.75 lakh hectares during the *kharif* season. It was estimated that around 2720 lakh man-days and 261.25 lakh man-days are required respectively for rice crop and for maize crop cultivation. The total man-days required during *kharif* season are around 2981.25 lakh (Table 6). Hence, in Bihar the returning migrant labours can be utilized in agriculture for their livelihood during kharif season. Besides agriculture, other sectors can also utilize the labour based on their expertise (Table 5). Zone wise requirement of labours for *kharif* was calculated for the engagement of migrant labours who returned in Bihar. The Zone I requires maximum labour force during *kharif* followed by Zone III B as compared to the other zones.

Country wise lockdown raised the sudden increase in labour numbers in the villages of Bihar that created a big challenge to the policy makers for its survival and livelihood. In one hand the labours will be available for agricultural purpose easily but their demand will be less causing they will get less daily wages. Recently mechanisation contribution in agriculture is much more so it will be difficult to replace

Figure 2: Zone wise registered and expected return labour in Bihar

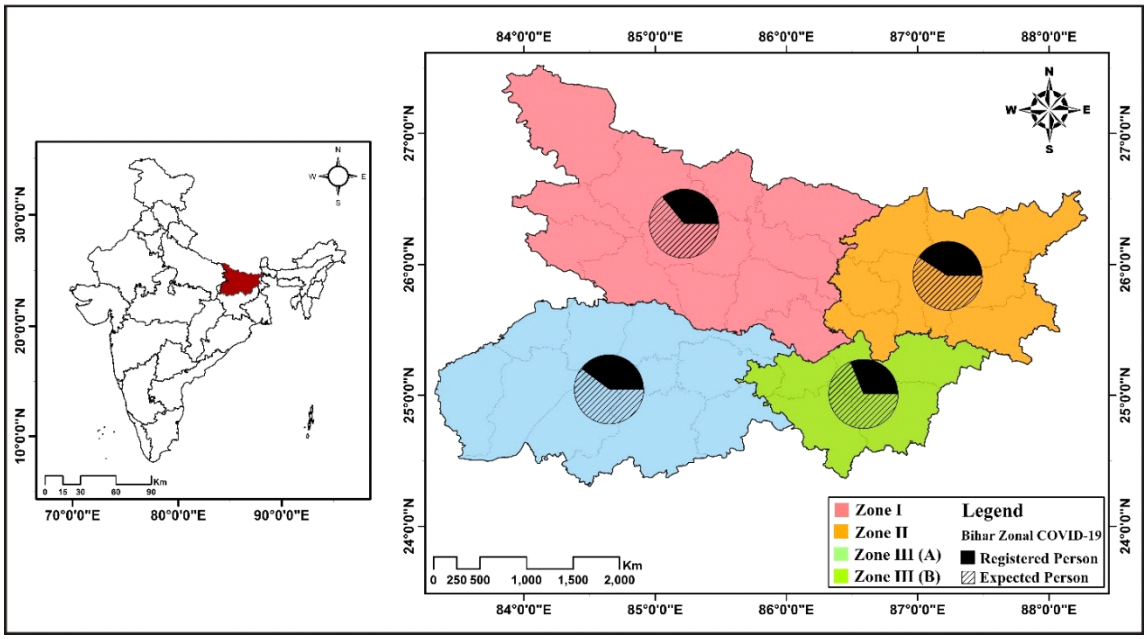


Table 4: Total number of blocks, quarantine centers, registered labour and estimated labour in different zones of Bihar

Zone	No of blocks	No of quarantine centres	Registered labour	Estimated labour
Zone I	229	6712	637977	1141840
Zone II	87	3011	380242	550480
Zone IIIA	59	1620	121934	269200
Zone IIIB	159	3129	326903	495280

Table 5: Skill assessment of return migrant labours

Particulars	Numbers (Lakh)	Percentage
Construction workers	8.4	52.50
Cook	0.388	2.43
Domestic help	0.148	0.93
Driver	0.3	1.88
Tailor	0.63	3.94
Carpenter	0.41	2.56
Food processing worker	0.04	0.25
Handicrafts	0.014	0.09
Electronic and electrical	0.22	1.38
Computer and IT	0.15	0.94
Others	5.3	33.13
Skilled assessment of labours in total	16	100.00

(*Source:* https://timesofindia.indiatimes.com/city/patna/skill-mapping-of-16-lakh-migrants-done-job-options-being-created-bihar-govt/articleshow/76291354.cms; https://www.downtoearth.org.in/news/governance/covid-19-bihar-profiles-returned-migrant-workers-for-skills-71249)

it by labours easily. Since these workers are more vulnerable groups, urgent attention has to be given to explore the social policy measures and employment opportunities that can protect informal and migrant workers from hunger and extreme poverty. The challenge before the state government is to provide jobs to such a large population in the coming days. The state government has initiated the process of skill mapping and is in process of developing a mobile app to easily collect data. The skill mapping of returned migrants will provide opportunities to work as per their skill profile within the state. Based on individual skills of these migrant labourers, govt. would able to engage them in different infrastructural projects of the government and job-oriented schemes. Creating job card for unskilled labourers and the migrants who were working in unorganised would provide another employment opportunity in many govt sponsored schemes, like *Jal Jeevan Hariyali*, Mahatma Gandhi National Rural Employment Guarantee (MGNREGA) scheme, Pradhan Mantri Awaas Yojana–Gramin, Pakki-Nali-Gali Yojana etc.

Table 6: Zone wise manpower requirement for *kharif* 2020 in Bihar

Zone	Rice area (000' ha)	Man- days required for rice crop (in 000')	*Kharif* Maize area (000' ha)	Man- days required for *kharif* maize crop (in 000')	Total man days required in *kharif* (in 000')
Zone I	1256	100,480	224	12293	112,773
Zone II	595	47,600	97	5335	52,935
Zone IIIA	304	24,320	99	5472	29,792
Zone IIIB	1245	99,600	55	3025	102,625
Bihar	**3400**	**272,000**	**475**	**26125**	**298,125**

Strategies for return migrants labour: Following steps should be taken to engage those migrants in agricultural sectors:

(i) Short term and immediate strategy

(a) Farming is major employment generation activities for agricultural labours in rural Bihar. As an estimate, there is a requirement of around 2981.3 lakh man-days in forth coming *kharif* rice and maize crop alone in Bihar. However, still there would be a demand for 600 lakh man-days labour for timely *kharif* operations in Bihar. This demand can be met out from the migrant work force that would engage 6 lakh persons immediately during the *kharif*. Zone wise labour requirement is given in Table 6.

(b) Further, expanding the list of works to be undertaken through MGNREGS, including agricultural activities can also be helpful. Large-scale plantation, horticulture, fishery-related activities can be taken up along with regular activities under MGNREGA to create demand for jobs in rural areas for migrant people. This should be priority area for the govt.

(c) Packaging, grading and safe handling of agricultural and horticultural produce are need of the hours and engagement of unskilled migrants with minimum basic training would provide value addition of those produce.

(d) The government should also facilitate assured credit support to small rural enterprises. It can procure horticulture products from the doorstep of the farmers for a smooth supply chain after imparting required training to the migrant workers. To promote indigenous products/services, cluster and group approach would be more effective, whereas collateral free credit of Rs 20 lakh may be extended to these groups and cluster as part of the Pradhan Mantri Garib Kalyan Yojana (PMGKY). Focus should be on producing items/commodities that have local demand.

(e) Government should facilitate the credit linkage to agri based- SHGs and agencies, including the Farmer Producer Organisations (Mukherjee, 2020) and Panchayats can be engaged in procuring these products with a minimum assured price and facilitating appropriate market linkages.

(ii) Medium and long-term strategies

(a) Local Seed production of important crops can be promoted among migrants farmers. Steps should be initiated to explore and connect with such enterprises who can market non-perishable products including seeds. Migrants need to be trained in handling and adapting to the changed context.

(b) State Government has recently initiated noble approach for sale of Mango and Litchi "*Bagan Se Ghartak*" (Orchard to home) through Post office, government of India. Depending upon its success, similar module may be followed for the vegetables and other farm products involving farmers groups and FPOs, that will provide another employment opportunity to migrants.

(c) Current pandemic has proved that immunity system of a person alone can save life of the person from these type of health hazards, and under this situation demand for herbal and plant based immune-boosting species, like *Tinospora cordifolia* (Guduchi), *Withania somnifera* (Aswagandha), *Piper longum* (Pippali), *Emblica officinalis* (Amlaki), *Curcuma longa* (Turmeric), *Azadirachta indica* (Neem).

(d) Cultivation of such type of plant species should be promoted under contract farming mode engaging

those migrants' population and establishment of rural processing units.

(e) Quality fish feed and feed ingredients have great demand that can be produce from locally available ingredients. Capacity building and credit linkage for the migrant work force would create another opportunity in the field of animal feed manufacturing.

(f) Establishment of rural processing units, agro-based rural clusters, FPOs will bring resilience in those communities who don't want to migrate again. This should be long term strategies to tackle such unprecedented situation.

(g) Further, establishment of a greater number of custom hiring centers and repairing centres for farm implements engaging semiskilled migrants would provide sustainability in the agriculture to cope up risk.

(h) Low cost storage structures like Zero Energy Cool Chamber can be popularized for storage of perishable fruits and vegetables at farm level. The cold storage can be setup at production cluster area through PPP that would provide another opportunity for the migrants.

CONCLUSION

The migrant labours from Bihar have faced a severe economic crisis due to COVID 19 lockdown and slowdown of national and global economy. Return migration has been recorded larger in case of East Champaran, Katihar, Muzaffarpur, Darbhanga, West Champaran and Katihar districts. These districts are in North Bihar having a major share of flood-prone area and therefore, facing severe floods which make these districts more vulnerable to labour migration. The demand of 600 lakh man- days for *kharif* rice and maize cultivation can be met out from the 6.0 lakhs migrant work force. Majority of agricultural labour works required comparatively lesser skills. The Zone I will be requiring more labour force as compared to the other zones of Bihar. Farming, MGNREGS activities, food processing and small agri based industries may engage the maximum unskilled migrants. In medium and long term these labours can be utilized in local seed industries, herbal plant based industries, feed industry and secondary agricultural activities with special emphasis and collaboration in PPP mode.

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REFERENCES

Agricultural Census of India. 2011. Available at http://agcensus.nic.in/.

CDC. 2020. Coronavirus (COVID-19). https ://www.cdc.gov/coronavirus/2019-ncov/index .html. Accessed 10 March 2020.

Chandra, N.; M.L. Roy; A. Mukherjee; R. Jethi and K. Joshi. 2018. A study of migration pattern in Kumaun Hills and associated socio-economic factors. *Journal of Community Mobilization and Sustainable Development,* 13(1): 107-112.

Das, K.C. and S. Saha. 2013. Inter-state migration and regional disparities in India. *online] http://iussp. org/sites/default/files/event_call_for_papers/Inter-state% 20migration_ IUSSP13. pdf*

Deshingkar, P. and D. Start. 2003. *Seasonal migration for livelihoods in India: Coping, accumulation and exclusion* (Vol. 111). London: Overseas Development Institute.

Dyson, T. and P. Visaria. 2004. *Migration and Urbanization, Retrospect and Prospects.* In: Tim Dyson, Robert Cassen and Leela Visaria (Eds.), Twenty First Century India, Oxford: New Delhi, pp. 108-129.

Fact Sheet on Foreign Direct Investment. 2011. Department of Industrial Policy and Promotion, Ministry of Commerce, Government of India available at http://dipp.nic.in/English/Publications/FDI_Statistics/2011/india_FDI_December2011.pdf.

Ghosh, P. 2020. In search of a better place for work: A report on blue-collar workers in India. Available at https://www.peoplematters.in/news/diversity/in-search-of-a-betterplace-for-work-a-report-on-blue-collar-workers-in-india-20486 accessed on 23rd June 2020.

Hazra, A. 2012. Rural India: Still floating towards cities. *Kurukshetra*, 60(4): 345-351.

ICAR-RCER, 2018. Doubling Farmers' Income by 2022. Strategy Document for Bihar, pp. 153.

Kunuroglu, F.; F. van de Vijver and K. Yagmur. 2016. Return Migration. *Online Readings in Psychology and Culture,* 8(2). https://doi.org/10.9707/2307-0919.1143

Mangal, H. 2009. Best Practices for Youth in Agriculture: The Barbados, Grenada and Saint Lucia Experience.

Ministry of Overseas Indian Affairs (MOIA), India. 2012. Annual report 2011–2012. MOIA Emigration Policy Division: New Delhi. Available at: http://moia.gov.in/writereaddata/pdf/Annual_Report_2011-2012.pdf.

Mukherjee, A.; U. Kumar; K. Shubha and S. Anand. 2020. Implications of COVID-19 on agriculture in eastern region. *Food and Scientific Reports,* 1(5): 63-66.

Mukherji, S. 1991. "*The Nature of Migration and Urbanization in India: A Search for Alternative Planning Strategies,"* Dynamics of Population and Family Welfare, Mumbai, pp. 203-245.

Roy, I. 2016. Labour migration from (and in) Bihar: Continuities and change. *University of oxford, IGC working paper January*, 8.

Saha, B. and R. Bahal. 2014. Training needs for livelihood diversification of the farmers of West Bengal. *Journal of Community Mobilization and Sustainable Development*, 9(2). 125-129.

Satapathy, C. and S. Mishra. 2014. Micro-enterprise promotion: Perception of rural youths. *Journal of Community Mobilization and Sustainable Development*, 5(1): 37-41.

Sharma, A. and A. Bhaduri. 2009. The "tipping point" in Indian Agriculture: Understanding the withdrawal of Indian rural youth. *Asian Journal of Agriculture and Development*, 6(1). 64-68.

Som, S.; R.R. Burman; J.P. Sharma; R.N. Padaria; M.A. Iquebal and A. Suresh. 2018. Construction of multi-dimensional scale for measuring perception towards migration. *Journal of Community Mobilization and Sustainable Development*, 13(2): 279-285.

Spengler, J.J. and G.C. Myers. 1977. Migration and socioeconomic development: today and yesterday. In *Internal Migration,* pp. 11-35. Academic Press.

World Bank, Migration and Development brief, 2011 available at http://siteresources.worldbank.org/INTPROSPECTS/Resources/334934111031501516 5/MigrationandDevelopment Brief18.pdf

World Health Organization WHO. 2020. Coronavirus disease (COVID-19) Pandemic. https ://www.who.int/emerg encies/diseases/novel -coronavirus-2019. Accessed 10 April 2020.

Yadava, K.N.S. and *et al.* 2002. *Migration, Urbanization and Economic Development in India,* in Population Stabilization and Development.

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Comparison of Expectation and Experience Values of Various Agri-tourism Aspects: A Multi-stakeholders' Analysis

D.K. Krishna[1]*, N.V. Kumbhare[1], J.P. Sharma[1], D.U.M. Rao[1], D.K. Sharma[1] and Arpan Bhowmik[2]
[1]ICAR-Indian Agricultural Research Institute, New Delhi-110012
[2]ICAR-Indian Agricultural Statistical Research Institute, New Delhi-110012

ABSTRACT

Agri-tourism is an emerging rural enterprise, which incorporates both working farm environment and commercial tourism component. The success of any agri-tourism venture mainly depends upon the satisfaction of both the stakeholders in the business. Thus, the present study was conducted to compare the expectations and experience of various agri-tourism aspects of multi-stakeholders. The sample of respondents in the study comprised of forty-five agri-tourism centres drawn from both states (30 from Maharashtra and 15 from Goa). The total number of 200 agri-tourists (visitors) selected, which consist of 100 visitors each from respective states. It followed an *ex-post facto* research design and was purposively conducted in Maharashtra and Goa states. Paired sample T-test shows, altogether seven attributes of agri-tourism such as accessibility, diversity of attractions and activities, rural cuisines, participation in the farming activities, accommodation facility, adequate safety and agri-products purchasing opportunity had statistically significant difference between expectation and experience of the agri-tourists. On the other hand, three pairs of agri-tourism values for hosts (farmers) such as the sale of agri-product, interaction with tourists and tourist behaviour with farmer, family and staff were found statistically significant difference.

Keywords: Agri-tourism, Experience, Expectation, Rural enterprises, Satisfaction

INTRODUCTION

Agriculture and its allied activities are on the brink of a change for both the farmers as well as consumers. A plethora of diversified activities amalgamated with scientific methods of cropping is paving the way for a secure future. Agri-tourism is one such activity where people from outside visit a farm on vacation. Agri-tourism has been defined and labelled in various ways in the literature. Philips *et al.* (2010) provide a typology of definitions of agri-tourism. Agri-tourism may be defined as "rural enterprises which incorporate both a working farm environment and a commercial tourism component" (Weaver and Fennel, 1997, McGehee, 2007). Barbieri and Mshenga (2008) referred to agri-tourism as "any practice developed on a working farm to attract visitors." Agri-tourism is the nascent growing sector in the tourism industry in recent years. The concept has been successfully implemented in states like Maharashtra, Kerala, Rajasthan, Goa, Jharkhand, Gujarat, Punjab and Himachal Pradesh. It has become a new avenue for earning income for rural farmers. Farm visits, farm stays and trail visits are gradually picking up amongst tourists to experience something different from clichéd sightseeing packages of a destination. Training on product processing, value addition, marketing, advertising, branding can be offered and organized largely by agricultural extension agencies. Promotion of agro-tourism will also provide opportunities for youth to get ideas to create new livelihood options (Som *et al.,* 2018).

Agri-tourism provides a platform for a mutual learning experience, farmers share their abilities with guests and affirm; in this way, their role as loyal partners in the food chain (Sidali *et al.,* 2007). At the same time, customers recall their memory of the past (a past of more authentic food and forgotten tastes) and rediscover their traditions. The expectation is the probability of the future results and consequences based upon gathered information, previous experience and existing conditions. In other words, expectations can be termed as ideal or desirable aspects of the tourism experience. Expectation takes place before the actual visit to the destination. Tourists tend to imagine and visualise the destination, products and services and experience about their tour. Expectations of the consumer

*Corresponding author email id: krishnadkarjigi@gmail.com

from the product are highly influenced by the 'perceived image' of that product by the consumer.

An individual's expectations are confirmed when a service performs as expected, negatively when the service performs worse than expected, and positively when the service performs better than expected (Truong and Foster, 2006). Observing the importance of perception and expectation in satisfaction and overall success of the business, the present study has included 'expectation' as an important variable. It reveals the comparison of expectation and experience of the visitors and agri-tourism hosts whose perceptions bear a lot on the satisfaction of both of them.

MATERIALS AND METHODS

The study was conducted in purposively selected Maharashtra and Goa states during 2016-17 to 2018-19 by following *ex-post facto* research design. The sample respondents in the present study comprised of forty-five agri-tourism centres drawn from both states (30 from Maharashtra and 15 from Goa). The total number of 200 agri-tourists (visitors) includes 100 visitors each from respective states selected for the study. Paired sample T-test was used to compare the expected value with the perceived or experienced value of various agri-tourism attributes. The attributes were mainly taken from research conducted by Malakanthi and Routray (2012). Finally 13 pairs of attributes for visitors and 8 pairs of attributes for operators (farmer hosts) were selected to compare the values of expectation and experience of the agri-tourism aspects for respective stakeholders. A semi-structured interview schedule containing appropriate questions for data collection was prepared. The data were collected by personal interview as well as focused group discussion methods. The Statistical Package for the Social Sciences (SPSS Version 17) was used to perform the statistical analysis.

RESULTS AND DISCUSSION

Comparison of expectation and experience values of agri-tourism aspects as perceived by the visitors/ agri-tourists: The five point continuum scale ranging very low expectation (1) to very high expectation (5) was used to collect the responses. In the same way, very poor experience (1) to very good experience (5) was also collected on a five point continuum. Paired sample T-test was used to compare visitors' expected value with the experienced value of various aspects of agri-tourism. The researcher has selected these aspects through review of literature and investigator's discussions with the agri-tourism visitors. The Table 1 shows the mean, standard deviation and standard error for all the aspects, respectively.

Table 2 shows the various aspects of paired differences in terms of mean, standard deviation, standard error, 95% Confidence Interval of the Difference, T value and p-value to assess the level of significance. Detailed discussion on each aspect is carried out following the data presented in Table 2.

The data related to paired sample test of agri-tourists depicted in the Table 2 revealed that; Seven attributes of agri-tourism, had statistically significant difference at 5% level between the experience and expectation of the respondents. These attributes are accessibility, diversity of attractions/activities, authentic rural cuisines, opportunity to participate in the farming activities, accommodation facility, adequate safety and agri-products purchasing opportunity. In the case of accessibility, authentic rural cuisine, accommodation and safety the statistically significant difference shows that the respondents' experience regarding these aspects was much higher than their expectations. These results are in line with the results of Malakanthi and Routray (2012).

Whereas, the result shows that the respondent's experience was lesser than their expectations regarding agri-products purchasing opportunity, opportunity to participate in the farming activities and diversity of attractions as well as activities. Although there were some negative opinions of the respondents regarding accessibility i.e. bad roads, lack of connectivity and signage, the general image about rural roads kept their expectation very low (2.97), which made their otherwise low-scoring experience level (3.20), significantly higher. Respondents highlighted their dissatisfaction regarding the lack of variety in the activities and practical experience of farming activities. The similar findings noted by Borlikar (2017).

Comparison of Expectation and Experience values of agri-tourism aspects as perceived by the farmers/ operators: The data in Table 3 and 4 displays comparative study results of agri-tourism operator's expectations and experiences of agri-tourism business. As the result shows, three attributes of agri-tourism business, 'sale of agri-products'; 'interaction with tourists' and 'tourist behaviour with you, family and staff' had their 'p-value' less than 0.05, which means that there is a statistically significant

Table 1: Paired Samples Statistics-Agri-tourists

Aspects of Agri-tourism		Value category	Mean	Std. Deviation	Std. Error Mean
Pair 1	Attractive and appealing natural attractions	Expectation	4.02	1.008	0.050
		Experience	3.93	0.590	0.029
Pair 2	Facilities	Expectation	3.52	0.862	0.043
		Experience	3.62	0.750	0.037
Pair 3	Clean - Green & Pleasant environment	Expectation	4.05	0.904	0.045
		Experience	3.97	0.740	0.037
Pair 4	Accessibility	Expectation	2.97	0.879	0.044
		Experience	3.20	0.897	0.045
Pair 5	Diversity of attractions / activities	Expectation	3.47	0.907	0.045
		Experience	3.22	0.967	0.048
Pair 6	Working farm & allied activities	Expectation	3.68	1.052	0.052
		Experience	3.57	0.794	0.039
Pair 7	Authentic Rural Cuisine / F & B	Expectation	3.35	1.208	0.060
		Experience	4.15	0.773	0.038
Pair 8	Opportunity to participate in the farming activities	expectation	2.93	1.049	0.052
		Experience	2.78	0.921	0.046
Pair 9	Learning opportunities	Expectation	3.11	0.933	0.046
		Experience	3.04	0.833	0.041
Pair 10	Opportunity to experience rural culture	Expectation	3.20	1.052	0.052
		Experience	3.23	0.804	0.040
Pair 11	Accommodation facilities	Expectation	2.91	0.785	0.039
		Experience	3.59	0.724	0.036
Pair 12	Safety	Expectation	3.79	0.790	0.039
		Experience	4.20	0.590	0.029
Pair 13	Agri-products purchasing opportunity	Expectation	3.09	1.165	0.058
		Experience	2.90	0.798	0.040

difference between the experience and expectation of these attributes. Sales of agri-products as discussed earlier are an untapped area of the agri-tourism venture. Lack of awareness about this issue is reflected in the results, which shows that the experience of the sale of agri-products was more satisfactory than operator's expectation. It was observed that tourists were interested in buying the agri-products as well as processed products like pickles during their stay at agri-tourism centre.

'*Interaction with tourists'*, also has an observed positive experience. The mean difference shows that the experience of operators to interact with the tourists was better than their expectation. Operators, who were from rural areas, assume their agri-tourists, are mainly from an urban background, to be different and difficult to interact with. This was proved wrong with their experience.

The experience of agri-tourism operators' with 'tourist behaviour with farmer, their family and staff', was not up to their expectations. It is observed, that, the irresponsible, insensitive and uninformed tourists, who were not aware or understood the difference between a hotel-resort and an agri-tourism centre, may have caused this experience for the operators. The tourists sometimes fail to realise that, unlike the hotel manager, the operator of agri-tourism was the owner of the farm, and the people serving food to them were not waiters, but the family members of the operator. On the other side, the rationale behind this might also be seen in operator's self-image.

Table 2: Paired samples test of agri-tourists (n=200)

S.No.	Paired Samples (Expectation and Experience)	Paired Differences					t	df	Sig. (2 tailed)
		Mean	S.D.	Std. error mean	95% confidence interval of the difference				
					Lower	Upper			
1.	Natural attractions	0.091	1.217	0.060	-0.028	0.210	1.509	199	0.132
2.	Facilities	-0.094	1.107	0.055	-0.202	0.014	-1.703	199	0.089
3.	Environment	0.079	1.165	0.058	-0.035	0.192	1.363	199	0.173
4.	Accessibility	-0.236	1.280	0.064	-0.361	-0.112	-3.723	199	**<.001***
5.	Diversity of attractions / activities	0.251	1.337	0.066	0.121	0.382	3.785	199	**<.001***
6.	Working farm	0.108	1.297	0.064	-0.018	0.235	1.684	199	0.093
7.	Authentic rural cuisine	-0.796	1.482	0.074	-0.940	-0.651	-10.813	199	**<.001***
8.	Participation in the farming activities	0.150	1.437	0.071	.010	0.290	2.107	199	**0.036***
9.	Learning opportunities	0.069	1.273	0.063	-0.055	0.193	1.092	199	0.276
10.	Opportunity to experience rural culture	-0.032	1.388	0.069	-0.167	0.103	-0.465	199	0.642
11.	Accommodation facilities	-0.682	1.174	0.058	-0.797	-0.568	-11.712	199	**<.001***
12.	Adequate safety	-0.406	1.013	0.050	-0.505	-0.308	-8.080	199	**<.000***
13.	Agri-products purchasingopportunity	0.190	1.428	0.071	0.050	0.329	2.675	199	**0.008***

Table 3: Paired Samples Statistics of Operator Expectation and Experience

S.No.	Agri-tourism operation attribute	Mean	N	Std. deviation	Std. error Mean
Pair 1	Income - expectation	3.80	45	0.757	0.113
	Income - experience	3.64	45	0.908	0.135
Pair 2	Sale of agri-products expectation	2.89	45	0.647	0.097
	Sale of agri-products experience	3.40	45	0.580	0.086
Pair 3	Interaction with tourists - expectation	3.22	45	0.765	0.114
	Interaction with tourists - experience	3.60	45	0.837	0.125
Pair 4	Family support expectation	3.84	45	0.601	0.100
	Family support experience	4.02	45	0.583	0.087
Pair 5	Support from farm workers expectation	3.51	45	0.843	0.126
	Support from farm workers experience	3.24	45	0.933	0.139
Pair 6	Tourist behaviour with you, family and staff - expectation	3.93	45	0.688	0.102
	Tourist behaviour with you, family and staff - experience	3.64	45	0.645	0.096
Pair 7	Tourist behaviour at farm/activity site - expectation	3.80	45	0.842	0.126
	Tourist behaviour at farm/activity site - experience	3.58	45	0.543	0.081
Pair 8	Tourist behaviour at Accommodation - expectation	3.76	45	0.933	0.139
	Tourist behaviour at Accommodation - experience	3.58	45	0.812	0.121

Table 4: Paired Samples Statistics of Expectation and Experience

Pair No.	Paired Samples (Expectation and Experience)	Mean	Std. Deviation	t	P Value
Pair 1	Income	0.156	1.147	0.910	0.368
Pair 2	Sale of agri-products	-0.511	1.036	-3.309	**0.002***
Pair 3	Interaction with tourists	-0.378	1.230	-2.060	**0.045***
Pair 4	Family support	-0.178	0.806	-1.480	0.146
Pair 5	Support from farm workers	0.267	1.572	1.138	0.261
Pair 6	Tourist behaviour with farmer, family and staff	0.289	0.944	2.052	**0.046***
Pair 7	Tourist behaviour at farm/activity site	0.222	1.064	1.402	0.168
Pair 8	Tourist behaviour at accommodation	0.178	1.527	0.781	0.439

The farmers were owners of the farm and they have their identity as a 'food provider of the society' in their mind. Thus, the experience of playing the role of a 'service provider' might not be as pleasing as they expected.

In the paired sample T-test for farmer (operators), out of the three pairs, which were found with statistically significant difference, i.e. 'sale of agri-products'; 'interaction with tourists' and 'tourist behaviour with farmer, family and staff', only the last one was negative experience. From the operator's point of view, all the educated urban tourists were expected to be behaving in the much nicer way with their family and staff. The tourists with a lack of understanding of the agri-tourism concept's difference from regular leisure tourism along with farmer's self-image may be the cause of this displeasure among the operators. Although the rest of the tested aspects were found to be with positive experience or without significant difference between the experience and expectation value, support from staff can be seen with a comparatively negative experience value. Lack of motivation, orientation and training to the support staff may be regard as the cause for this.

CONCLUSION

The difference between agri-tourists' expectation and experience is an effective measure to assess the gaps in the delivery of the services provided by the farmers in their field. Here in the present study, it was found that apart from few shortfalls in the diversity of attractions, practical exposure to the farming activities and direct sale of the agri-products at the centre, the respondent's expectations were duly satisfied by their experience. In general, agri-tourism farmers should pay more attention to several aspects of their operations, especially regarding the attributes that were identified as less than their expectation on the part of the visitors. The farmers' experience regarding attributes likes additional income, support from family and staff and behaviour of agri-tourists was found to be more or less similar to their expectations. In times of mission like doubling farmers' income by 2022, non-farm activities with systematic agribusiness approach must be the top priority for both farmers and policy makers. In this context, agri-tourism is well placed and can be expanded in and extended to remote rural areas. Thus, the findings of this research may be useful in developing policies and undertaking promotional measures to improve the current agri-tourism sites along with setting standards for upcoming ventures.

REFERENCES

Barbieri, C. and P.M. Mshenga. 2008. The role of the firm and owner characteristics on the performance of agritourism farms. *Sociologia Ruralis*, 48(2): 166-183.

Borlikar, R.R. 2017. A study on agri-tourism operations in Pune region : The perspective of tourists and operators. Published doctoral dissertation. Department of Tourism, Studies School of Management, Pondicherry University, Puducherry, India.

Dubois, C.; M. Cawley and S. Schmitz. 2017. The tourist on the farm: A 'muddled' image. *Tourism Management*, 59: 298-311.

Fennell, D.A. and D.B. Weaver. 1997. Vacation farms and ecotourism in Saskatchewan, Canada. *Journal of Rural Studies*, 13(4): 467-475.

Malkanthi, S.H. and J.K. Routray. 2012. Visitor satisfaction in agritourism and its implications for agritourism farmers in Sri Lanka. *International Journal of Agricultural Management*, 2(1): 17-30.

McGehee, N.G. 2007. An agritourism systems model: A Weberian perspective. *Journal of Sustainable Tourism*, 15(2): 111-124.

Phillips, M.; D. Thilmany-McFadden and M. Sullins. 2010. Possible roles for social networking in agritourism

development. *Agricultural Marketing Report (Colorado State University. Department of Agricultural and Resource Economics);* AMR 10-01.

Shukla, S. 2019. Agro-tourism-prospects, possibilities and challenges in India. *Journal of Accounting, Finance & Marketing Technology*, 2(3): 1-15.

Sidali, K.L.; H. Schulze and A. Spiller. 2007. Success factors in the development of farm vacation tourism (No. 690-2016-47340).

Singh, S.; N.L.M. Raman and B.S. Hansra. 2017. Perspectives of Agritourism in Himachal Pradesh: A new dimension in hill agricultural diversification. *Journal of Community Mobilization and Sustainable Development,* 12(2): 207-215.

Som, S.; R.R. Burman; J.P. Sharma; R.N. Padaria; S. Paul and A.K. Singh. 2018. Attracting and Retaining Youth in Agriculture: Challenges and Prospects. *Journal of Community Mobilization and Sustainable Development*, 13(3): 385-395.

Srivastava, S. 2016. Agritourism as a strategy for the development of rural areas case study of Dungrajya Village, Southeast Rajasthan, India. *Journal of Medical and Dental Science Research*, 3(6): 35-39.

Truong, T.H. and D. Foster. 2006. Using HOLSAT to evaluate tourist satisfaction at destinations: The case of Australian holidaymakers in Vietnam. *Tourism Management*, 27(5): 842-855.

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Participation of Farm Women in Value Addition of Farm Produce and Constraints Faced by Them

Divya Martolia[1]*, Narinderjit Kaur[2] and Sharanbir Kaur Bal[3]

[1]Research Scholar, [2]Extension Specialist and [3]Assistant Professor, Department of Family Resource Management, College of Community Science, Punjab Agricultural University, Ludhiana, Punjab

ABSTRACT

Women have a crucial role in agriculture mostly dominated in processing sector which helps in growth of economic section of Indian society, where agriculture has been pivotal part, to reduce the wastage of agriculture produce. The patriarchal society has always neglected the hard work of farm women though their role is nourishing the society. So, the present study was conducted to obtain the information regarding participation of women in activities of value addition of farm produce and problems faced by them. The study was conducted in Ludhiana district of Punjab state and simple random sampling was used in selection of 120 farm women. Personal interview schedule was used for data collection. The result showed that farm women lack basic infrastructure, technical knowledge in adding value of farm produce at local or commercial level as well as they face problems of personal constraints.

Keywords: Constraints, Farm produce, Farm women, Value addition

INTRODUCTION

Women in agriculture participate in all the kind of agricultural activities. Although in some of the farm activities like processing and storage, female predominance is so strongly that male workers are counted as insignificant (Agarwal, 2003). The numbers of women involved in processing activities are observed more in small scale industries working under supervision of any organization whereas least numbers of the women were observed to start their own venture at local or commercial level. As they lack infrastructure facilities, decision making ability and personal constraints which drop their growth as self empowered farm women.

It has been stated that if a women had the same access to productive resources as men, they could yield more on their farms. But women bear the burden of getting paid with low wages compared to men. However, SHGs are now seen as a means for eliminating poverty and become influential in the empowerment of rural women (Rana and Ansari, 2019). Such self-help groups can help women farmers by providing financial support in terms of loans and promote best agricultural practices through training. Women's economic empowerment is a prerequisite for sustainable development and growth. It increases women's access to economic resources and opportunities including jobs, financial services, property and other productive assets, skills development and market information (Roy *et al.,* 2018).

Agricultural extension has to play a crucial role in promoting agricultural productivity, increasing food security, improving rural livelihoods, and promoting agriculture training for women as an engine of pro-poor economic growth to enhance the income of farm families (Afroz and Singh, 2018). If we want the agricultural sector to thrive in the country, acknowledging the contribution of women farmers becomes an absolute necessity. So, it is clear that we need to provide women farmer with opportunities and upgrade their skills through collective training and capacity building programs. Therefore, the present study was undertaken to acquire the information regarding participation of women in activities of value addition of farm produce and problems faced by them in Ludhiana district of Punjab state.

MATERIALS AND METHODS

The study was conducted in the rural area of Ludhiana district of Punjab. There are twelve blocks in Ludhiana district. Out of these, two blocks were randomly selected

*Corresponding author email id: dishumartolia68@gmail.com

for this study. A total of four villages from the two blocks namely Ludhiana –I block and Ludhiana-II block were randomly selected out of which thirty farm women from each villages were randomly selected thus, comprising in all total 120 respondents. Simply those women were selected whose family hold the agriculture land as occupation. The data were collected using personal interview technique with the help of self structured interview schedule.

RESULTS AND DISCUSSION

Farm women participation in value addition to farm produce: Women have played a major role in post harvest activities since ancient period. Value addition is one of the activity in which women make products such as pickle, juice, jam etc. to increase the shelf life of farm produce for their household consumption or commercial use.

Table 1 unveils the data regarding the participation of women in value addition of farm produce. The data showed that about half of the respondents (54.16%) were involved in value addition of dairy (milk) such as curd, butter etc. but for household purpose only they do not involved in any commercial selling of products as they lack in infrastructure as well as personal support system from their family members. Around 49.16 per cent of the respondents who participated in value addition of fruit in form of jam, pickle, juice etc. in this some of the participant were involved at household level whereas near about 22 farm women who were part of SHGs they only add value for commercial purpose at local level. Moreover the value addition done by farm women were basically performed for household consumption and this shows the reason that being women they were not supported by the family to self empowered them and curb the loss of farm produce in post harvest segment. Nearly 18.33 per cent of the respondents' added value in cereals (wheat) in form of flour making and 8.33 per cent of the respondents' added value in form of pickle in vegetable (garlic) was performed by only SHGs women for selling at commercial level in their locality. It can be concluded that women dominance in values addition area was observed to be invisible as they lack personal support to raise their talent as self made women because of busy household chores, lack of decision making ability and lack of financial control in their hand.

Table 1: Distribution of the respondents according to participation in value addition of farm produce (N=120)

Farm produce	Participation of farm women in value addition	
	Frequency	Percentage
Cereals (Wheat)	22	18.33
Fruits (Mango, Jamun, Amla, Kinnow etc.)	59	49.16
Vegetables (Garlic)	10	8.33
Dairy (Milk)	65	54.16

Multiple responses

Constraints faced by farm women: The data pertaining to constraints faced by farm women in value addition of farm produce was further divided into technical, personal, infrastructure and miscellaneous constraints.

Technical constraints: The data in Table 2 reveals that majority (90.83%) of farm women faced lack of technical knowledge regarding process of value addition. As some of the farm women working under SHGs were not fully skilled in handling the modern technology for value addition. Subsequently the other farm women who performed value addition for household purpose they use basic treatment and methods to add value without the use of any technology. 84.16 per cent faced lack of knowledge about equipment and machines whereas, 72.50 per cent of the respondents had lack of access to technological tool.

Table 2: Distribution of respondents according to the technical constraints faced by them (N=120)

Technical Constraints	Frequency	Percentage
Lack of technical knowledge regarding process of value addition	109	90.83
Lack of knowledge about equipment and machines	101	84.16
Lack of access to technological tool	87	72.50

Multiple responses

Personal constraints: Data in Table 3 unfolds that maximum number of respondents (85.83%) showed unwillingness to practice value addition to start their own venture because of busy household chores and poor time management, while few farm women who were part of SHGs they performed value addition for sake of earning and supporting their families. Whereas, some respondents observed low self confidence and motivation factor (80.00%), poor health (68.33%) lack of family support

Table 3: Distribution of respondents according to the personal constraints faced by them (N=120)

Personal Constraints	Frequency	Percentage
Unwillingness to practice value addition	103	85.83
Low self confidence and motivation factor	96	80.00
Poor health	82	68.33
Lack of family support	69	57.50
Shyness from male trainer	51	42.50

Multiple responses

(57.50%) and least percentage of respondents (42.50%) reported that they were shy to get training from male trainer.

Infrastructure: The perusal of data in Table 4 reveals that due to lack of cold chain (94.16%), lacks of storage facility (89.16%), lack of equipment to run the value addition process to farm produce (80%); respondents were not able to do value addition to farm produce. However, poor transportation facility (28.33%) and poor supply of resource like electricity and water (41.67%) also hinders the value addition to farm produce. These findings are in line with those of Kumar *et al.* (2010) who reported that respondents were not going for value addition, because of lack of storage infrastructure, high storage charges and unsatisfactory condition of cold storage.

Miscellaneous: Training can play a key role in helping farm women to become self-dependent. Other vocational training programmes help them to build a wide set of soft skills, and increase their family income (Dunning, 2013). Table 5 unveils that majority of the respondents (91.66%) felt lack of training opportunity, 86.66 per cent respondents reported lack of contact with extension workers, 72.50 per cent were lacking in time management and 58.33 per cent respondents gave the reason of less demand of value addition products to refrain from it.

Table 4: Distribution of respondents according to the infrastructure constraints faced by them (N=120)

Infrastructure Constraints	Frequency	Percentage
Lack of cold chain	113	94.16
Lack of storage facility	107	89.16
Lack of equipment	96	80.00
Poor supply of electricity and water	50	41.67
Poor transportation facility	34	28.33

Multiple responses

Table 5: Distribution of respondents according to the miscellaneous constraints faced by them (N=120)

Miscellaneous Constraints	Frequency	Percentage
Lack of training opportunity	110	91.66
Lack of contact with extension agents	104	86.66
Lack of time management	87	72.50
Less demand of value added products	70	58.33

Multiple responses

Furthermore no knowledge about improved technology was the most important problems affecting the participation of rural women in agriculture activities .Other factors in order of sequence was lack of information about new technologies, poor economic status of the family, family withdraw their support if the women goes out for work in rural areas, lack of knowledge, lack of awareness, family norms, high cost of farm material.

CONCLUSION

Value addition of farm produce is important to increase their shelf life. Women can play a significant role in reducing the wastage of farm produce by increasing their shelf life through value addition. However personal, technical, infrastructural and other constraints come in the way of farm women to add value to farm produce. Farm women may be encouraged to take up value addition of products for household consumption or they can take up this venture for commercial purpose and can support their families financially. Encouragement and support from family members and guidance, training and women friendly policies from government can help farm women to overcome all their constraints.

REFERENCES

Agarwala, B. 2003. Agricultural modernisation and the third world women: pointers from the literature and empirical analysis, ILO, Geneva.

Afroz, S. and R. Singh. 2018. Farmers' attitude towards digital green participatory videos for agricultural information dissemination. *Journal of Community Mobilization and Sustainable Development,* 13(2): 239-244.

Dunning, D. 2013. Vocational training for young women: what works and what doesn't. *The Guardian*, UK. Retrieved from https://www.theguardian.com/...professionals-network/2013/jul/16/vocation on Aug 12, 2018.

Kumar, K.; A. Sharma; P. Kaur and D.S. Dhillon. 2010. Value addition of potatoes and chillies by farmers of Jalandhar district of Punjab. *Int. J. Agri. Sci.*, 6(2): 620-624.

Roy, P.; D. Shekhar and A.K. Singh. 2018 Impact of farm interventions on empowerment of sub-marginal women farmers *Journal of Community Mobilization and Sustainable Development,*13(2): 211-220.

Rana, K. and M.A. Ansari. 2019. Women empowerment through shelf help groups: a study in north Himalayan state of India. *J. Community Mobilization and Sustainable Development,* 14(3), 389-396.

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Women's Participation in Bihar Agriculture: Evidences from Cost of Cultivation Data

Priyanka Kumari[1], K.M. Singh[2], Nasim Ahmad[3]*, Dibyanshu Shekhar[4] and Santosh Kumar Atre[5]

[1]PhD Scholar, [2]Professor & Dean, [3]Senior Technical Officer, Department of Agricultural Economics, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur-848125, Bihar

[4]Senior Scientist and Head, Krishi Vigyan Kendra, Jale, Darbhanga- 847302, Bihar

[5]Coordinator, HSI

ABSTRACT

Understanding the nature of rural landscape change during the urbanization process is vital to formulate more elaborate rural landscape management plans for sustainable development. However, there is a few information depicting how rural landscapes change at a local level and limited evidence addressing how to improve the practicability of these management approaches. According to the 2011 Socio-Economic Caste Census (SECC), there were 244.9 million households in India of which 179.7 million households or 833 million people were in rural areas. The SECC numbers show that 87.2 million rural households reported one of more criteria of deprivation. And 92 million households are engaged in casual manual labour and agricultural activities. In agriculture, the role of women cannot be denied. They contribute in every operation of agricultural activities and are also active in allied sectors like cattle management, dairying, beekeeping, goat rearing mushroom production and poultry farming etc. Women participation in total workforce was assessed 27.44 per cent as against 72.56 per cent by male workforce in 2011. Share of women agricultural workforce in total workforce was computed to be 16.57 per cent in 2001 which declined to 6.23 per cent in 2011. Causes of decline may be their participation other sectors with improvement in their literacy rate which rose to 51.50 per cent in 2011 as compared to 33.57 per cent in 2001. The male-female sex ratio has registered a decline of 0.11 per cent as compared to 2001 census. Women holding land account for only 13.31 per cent as against 87.27 per cent by men in Bihar. Share of women agricultural workforce in total agricultural workforce was estimated to be 19.32 per cent as per census 2011. Analysis of CACP unit level data of Bihar for the year 2013-14, revealed that the contribution of women in agricultural activities was assessed to be 35.94 per cent. Women's contribution in agriculture is significant and plays diverse role, still their wages were found 7.04 per cent less than their male counterparts during 2015-16. To strengthen women's participation in agriculture and allied sectors and to improve their access to land, loan and other facilities, Ministry of Agriculture and Farmers Welfare has policy provisions like joint leasing for both domestic and agricultural land under National policy for farmers. Under credit facility provisions government has framed policy for issuing Kisan Credit Cards to women for creating livelihood through livestock practices and agricultural processing. Beside all efforts, there is still a wide gender gap in the state which may be addressed properly for overall development of women and enhancing the rural landscape of the state in particular and nation in general. The paper tries to analyze the role women in agricultural development of Bihar and the issues confronting them.

Keywords: Gender studies, Women in Agriculture, Bihar, Agricultural development, Kisan credit cards, Socio-economic caste census

INTRODUCTION

Recently we have marked 150th birth anniversary of father of nation, M.K. Gandhi, it is perhaps fitting to revisit the Gandhian approach to rural development. During the struggle for independence Gandhi ji had thought that the development of India could be made possible only when the villages would develop as India is a country of villages. Even after 73 years of Indian independence, 66.46 per cent of people are living in rural areas and 58 per cent people are depending on the agricultural sector for their livelihood. According to the Indian Fiscal commission, "Agriculture is not merely an occupation; it is a way of life

*Corresponding author email id: nasim.rau@gmail.com

which for centuries has shaped the thought and outlook of many millions of people."

Agriculture is the first culture that man learnt to practice as a means of living and a way of life. It is the primary sector of any economy either it is developed or developing. Agriculture is considered as the backbone of the Indian rural economy and is a family enterprise. It is an important engine of growth and poverty reduction. India's economic security is heavily dependent on agriculture. In terms of employment, it is the most important source of income, especially for rural women. According to Economic Survey of India only, 17-18 per cent of India's Gross Domestic Product (GDP) is accounted for by agricultural production. Based on 2012 data, India is home to the fourth largest agricultural sector in the world. It has an estimated 180 million hectares of farmland with 140 million of which are planted and continuously cultivated.

Women in India are the backbone of the society and important resource in agriculture and rural economy. They make essential contributions to the agricultural development and allied and household activities and pursue multiple livelihood strategies. These activities include producing agricultural crop, cleaning animals, preparing food, working in rural enterprises, engaging in trade and marketing, caring family members and maintaining their homes. About 63 per cent of all economically active men are engaged in agriculture as compared to 78 per cent of women. Traditionally, women have always played an important role in agriculture- as farmers, co-farmers, wage labours and managers of farms. They have conventionally been producers of food from seed to kitchen. They carry the heavier work burden in food production and because of gender discrimination, get lower returns for their work. The multiple role of women leads to a significant contribution in real terms to the productive system. But it is unfortunate that her role is not adequately recognized and properly her contribution not qualified in the male-dominated society. They have been underrepresented in the development process. Despite their dominance of the labour force, women in India still face extreme disadvantage in terms of pay, land rights and representation in local farmers' organizations. Apart from this, women face many challenges due to limited access to productive resources in agricultural production which prevent them in enhancing their productivity (Slathia, 2015).

The scenario of agriculture has completely changed with change in time but from centuries one thing that didn't change is the visualization of women as key labour in this sector. Agriculture sector as a whole has developed and emerged immensely with the infusion of science and technology. But this latest emergence is not capable of plummeting the ignorance of women labour as an integral part of this sector. In developing countries like India, agriculture continues to absorb and employ 2/3rd of the female work force but fails to give them recognition of employed labour. The female labour force in developing nations still faces the oppressive status of being majorly responsible for family and household maintenance. In addition to that their contribution of being an agriculture labour is suppressed under the status of family labour who works in farm in addition to her regular household chores. These problems of the rural women are further accentuated by the tribulations of illiteracy, underdevelopment, unemployment and poverty. Despite of the major productive women labor force in agriculture their needs and problems are somewhat ignored by the rural development initiatives. The multitasking potentiality of female labour bought significant propositions for agricultural productivity, rural production, economic vitality, household food security, family health, family economic security and welfare (Ghosh and Ghosh, 2014).

The status of female employment in India has been the subject of much debate of late in the national fora, due to its intrinsic relationship with female empowerment. The Economic Survey 2017-18 mentions an Organisation of Economic Cooperation and Development (OECD) analysis that indicates that the proportion of women who work has steadily reduced over time, from 36 per cent to 24 percent in a decade, (when examined in 2015-16) signalling a decline of 33.3 percent in Female Labour Force Participation (FLFP) in ten years. It also showed that the gender gap in Labour Force Participation Rate (LFPR) is more than 50 percentage points in India. As the Survey Report notes, women workers often constitute the most vulnerable of the workforce as they are "*employed in the least secure, informal, unskilled jobs, engaged in low- productivity and low-paying work*". Among peers, India performs the worst compared to Brazil, Mexico and Indonesia, according to both indicators analysed by OECD. This is also corroborated by the estimates released by the International Labour Organisation (ILO) and World Bank. They have defined FLFP as percentage of working female population in the 15 years and above demographic.

Agriculture is the backbone of economy of not only Bihar but of country as a whole. In Bihar the average

farm size is approximately 0.39 ha, that too is highly fragmented, resulting in many miniscule plots. Further about 60 percent rural households are landless in the state. This situation is more critical in case of women farmers who hold only 13.31 per cent land which is lower than the national average of 13.50 per cent.

Women play multidimensional role in sustainable development of economy through their contribution in household and agricultural activities (Singh *et al.,* 2012). They contribute in every field of agriculture- from land preparation to harvesting of crops. Apart from this, they also manage allied activities like dairy cattle, fodder collection, beekeeping, mushroom production, goat rearing and poultry etc. They contribute substantially in family income generation directly thus help enhancing social status of their families (Shahi *et al.,* 2018). Income and its source are important measures to understand the level of households' living standard and ways to achieve that level. Income along with households' expenditure and possessions reveal aspects of income volatility and provides an additional measure of inequality (Meena *et al*., 2017; Meena *et al.,* 2018). Women play prime role in traditional farming from manual farm activities to agro-processing to homemaking (Majumdar and Shah, 2017). On various occasions, women have proved that they can step up farm modernization using modern farm implements, however contribution are less recognized (Shahi *et al.,* 2018). In the era of gender equality and emphasizing women empowerment in all round development of the society can't be denied. Women sacrifices for the family are incomparable.

Taking into consideration the productive and optimistic participation of women in agriculture the present study "Women Participation in Changing Rural Landscape: Evidences from Cost of Cultivation Data of Bihar has been undertaken. Many of the systematic studies identify the trends of working female labour in agriculture. Empirical studies were conducted and explained on gender roles and gender analysis. This piece of research will further highlight agricultural operations wise female participation in agriculture with reference to the state of Bihar. Efforts were also put to highlight the wage discrimination to women.

MATERIALS AND METHODS

The simple statistical methods like averages and percentage were used to analyze the status of women, gender wise population, literacy, share in total and agricultural workforce, and share in landholdings, wage rate and operation-wise participation. The data were taken from Census 2001 and 2011, different Wages Report, Govt. of India, and for operation wise participation of women in agriculture, unit level data was taken from Cost of Cultivation Scheme, Ministry of Agriculture and Farmer's Welfare running in the state of Bihar.

RESULTS AND DISCUSSION

Table 1 presents the population of women, their literacy rate and sex ratio in the state. It can be seen from the table that population of women has increased by 25.13 per cent from 2001 to 2011 as compared to national increase of only 17.6 per cent. The faster population increase in population of women is a positive sign of growth of the state. Female literacy rate is still low (51.50%) as compared to male literacy. It is also much below with respect to national female literacy of 65.5 per cent as per census 2011. Sex ratio has declined by 0.11 per cent from 2001 to 2011. But at nation level it has registered increase of 0.75 per cent. Increase in female literacy and population share is good sign of socio-economic growth of the society.

Table 1: Population and literacy rate of women in Bihar

Particulars	2001	2011	% change from 2001 to 2011
Total population (lakh)	830	1041	25.42
Female population (lakh)	398	498	25.13
Male population (lakh)	432	543	25.69
Female literacy rate (%)	33.57	51.50	-
Male literacy rate (%)	59.70	71.20	-
Sex ratio (female per 1000 male)	919	918	-0.11

Source: Census data for Bihar

The share of agricultural workers in total workforce is presented in Table 2. The table revealed that share of agricultural work force in total workforce has declined from 47.98 per cent in 2001 to 27.46 per cent in 2011. Women's share has also come down from 16.57 to 6.23 per cent in as per census of 2011. The decline could be due to increase in literacy rate among women, as literate women are getting engaged in other vocations like SHG's, government and private jobs. Work participation in public and private sector has improved the status of women and

Table 2: Share of agricultural workers in total workforce

Year	Particulars	Work force (lakh)	Agricultural work force (Lakh)	Gender wise participation in total work force (%)	Participation of agricultural work force to total work force (%)
2001	Total	279.74	134.22	100.00	47.98
	Female	74.91	46.87	26.78	16.57
	Male	204.83	128.16	73.22	45.81
2011	Total	347.25	95.37	100.00	27.46
	Female	95.28	21.64	27.44	6.23
	Male	252.22	73.73	72.56	21.23

Source: Census data for Bihar

Table 3: Total workers in agriculture in Bihar

Particulars		2011 (lakh)		
		Total	Rural	Urban
Cultivators	Total	54.13	52.61	1.52
	Female	7.24	7.09	0.14
	Male	46.89	45.51	1.37
Agricultural labour	Total	95.37	92.26	3.12
	Female	21.64	21.13	0.51
	Male	73.73	71.13	2.60
Total Agricultural workers	Total	149.50	144.87	4.64
	Female	28.88	28.22	0.65
	Male	120.62	116.64	3.97
Total Work force	Total	347.25	313.60	33.65
	Female	95.03	89.23	5.79
	Male	252.22	224.37	27.85
% of female/male in total	Female	19.32	19.48	14.01
agricultural work force	Male	80.68	80.51	85.56

Source: Census 2011 data for Bihar

socio-economic background of family has also improved (Meena *et al*., 2015).

The increase in farm land holdings a consistent trend since the 1970s, has been slowing down in the past 20 years but there is a rise in the number of female land holders, a possible indicator of higher involvement in farm activities, the provisional agriculture census 2015-16, has revealed.

The trend may reflect migration of men to cities for non-agricultural activities and also explain slowing down of land division as rural people seek alternate livelihoods. The figures show landholdings have doubled in past 45 years (from 71 million in 1970-71 to 146 million in 2015-16), resulting in decline in average size of farms by more than 50 per cent, a real worry for policy-makers as this makes agriculture un-remunerative for farmers.

The gender wise worker participation in agriculture in rural and urban Bihar is presented in Table 3. The table reflected that as per census 2011, out of total 54.13 lakh cultivators in the state women cultivators were only 7.24 lakh with majority 7.09 lakhs living in rural area of the state. The share of female agricultural workforce in total agricultural workforce was estimated to be 19.32 per cent in the state. Female agricultural workers in total agricultural worker were computed to be 19.48 and 14.01 per cent, for rural and urban areas, respectively.

Participation of women in different agricultural operations: Participation of women in different activities of agricultural operation was estimated using plot level data of Cost of Cultivation Scheme for the year 2013-14 for the state of Bihar and the findings thus obtained are shown in Table 4. The findings pointed out that major participation of women labour was observed in harvesting of crops (14.56%) followed by sowing of crops (11.36%). Overall participation in all the farming operations was assessed to be 35.94 per cent.

Ownership of land resources is another issue confronting the women farmers in Bihar. Female land holdings accounted for 8.50 lakh ha in the state (Table 5) which constituted only 13.31 per cent of the total land holdings 66.88 lakh ha of the state. Out of total marginal land holding accounted 14.55 per cent followed by small 12.82 per cent. Total share of male in landholdings in the state was recorded 86.27 per cent which reflected dominancy of male in the society.

Table 4: Percentage participation of female in different agricultural activities in Bihar (%)

Operations	Male	Female
Land preparation	2.79	0.01
Sowing	14.34	11.36
Plant protection	0.25	0.00
Manuring	6.32	0.07
Inter-culture operations	3.10	5.00
Irrigation	10.34	0.06
Harvesting	16.46	14.56
Threshing /Winnowing	9.68	4.85
Transport on farm	0.78	0.01
Total	**64.06**	**35.94**

Source: Computed from plot level data of Cost of Cultivation Scheme for Bihar of 2013-14.

Meena *et al.* (2018) reported that in Madhubani district of Bihar despite low resources at their disposal women headed households performed all the agricultural operations including taking crucial managerial decisions.

Gender wage gap: Women agricultural worker represent sizeable proportions continue to receive lower wages than men. The ministry of labour puts the difference at 60 per cent of women wages, while the Indian Labour Journal showed that women are paid 75 per cent of men wages (Yadav, 2014). Low wage rates of female labour are due to the seasonal and informal nature of employment, wrong pre-assumption that female do less work than their men counterpart (Sakamma and Umesh, 2018). Table 6 revealed that the gap between wages of male and female decreased. It was 14.35 per cent in TE-2008 and a wide gap of 17.33 per cent was computed during TE-2011 thereafter, this gap between male wage rate and female wage rate was decreased to 7.04 per cent during TE-2016.

Table 7 show the ratio of female to male wage rates for sowing /transplanting /weeding, harvesting /threshing / winnowing, and unskilled labour for three time periods: 1998-99 to 2000-1, 2006-7 to 2008-9, and 2013-14 to 2016-2017, at real prices. We use a three-year average to compare the beginning and end of the sub-periods under study.

Table 6: Gender wise wage rate (Rs/day) in Bihar for different period

Period	Male (Rs/day)	Female (Rs/day)	Percentage difference
TE-2008	67.33	57.67	14.35
TE-2011	100.00	82.67	17.33
TE-2014	172.00	150.67	12.40
TE-2016	203.67	189.33	7.04

Source: Wages Report, GoI

Table 5: Gender wise distribution area (lakh ha) in different classes in Bihar

Particulars	Marginal	Small	Semi-medium	Medium	Large	Total
Female Land holdings	5.34	1.52	1.23	0.38	0.035	8.50
Male Land holdings	31.28	10.29	9.45	3.73	0.36	55.11
Total land holdings	36.69	11.86	10.73	4.15	0.45	63.88
% of female land holding in total land holding	14.55	12.82	11.46	9.16	7.78	13.31
% of male land holding in total land holding	85.25	86.76	88.07	89.88	80.00	86.27

Source: Agricultural census 2010-11

Table 7: Changes in female-male ratio of wage rates for different operations in Bihar

Particulars	1998-99 to 2000-01	2006-07 to 2008-09	2014-15 to 2016-17
Sowing/transplanting/weeding	0.90	0.91	0.85
Harvesting/threshing/winnowing	0.85	0.92	0.91
Wage rate of unskilled labour	0.87	0.89	0.85

Source: Computed from Wage Rates in Rural India, various issues.

Table 8: Real wage rates for different agricultural operation in Bihar, 1998–2017 (Rupees)

Year	Operation wise wage rate					
	Ploughing		Sowing/transplanting/ weeding		Harvesting/threshing/ winnowing	
	Male	Female	Male	Female	Male	Female
1998-99	71.56	-	67.1	59.80	65.60	55.26
1999-2000	75.73	-	67.80	60.16	65.36	55.28
2000-01	85.18	-	76.45	69.62	73.13	62.30
2001-02	91.14	-	79.47	72.29	78.70	69.63
2002-03	92.40	-	84.84	76.74	87.50	76.36
2003-04	93.67	-	83.94	75.54	85.97	74.01
2004-05	92.41	-	81.26	73.55	83.96	72.08
2005-06	91.56	-	78.35	71.03	85.59	76.65
2006-07	91.69	-	72.78	66.65	77.25	69.32
2007-08	93.34	-	73.46	66.06	72.90	67.09
2008-09	96.17	-	76.82	69.66	77.88	72.29
2009-10	107.09	-	83.28	79.92	82.38	75.05
2010-11	114.40	-	89.10	86.16	84.36	77.02
2011-12	126.44	-	105.25	100.30	101.24	90.60
2012-13	144.85	-	122.06	109.19	111.53	98.19
2014-15	151.88	-	135.70	113.89	126.63	113.78
2013-14	162.79	-	153.49	128.77	149.85	136.81
2015-16	178.00	-	167.47	141.81	160.54	147.50
2016-17	181.24	-	173.3	146.45	159.21	145.27

Note: CPI-RL (2009–10=100) is used as a deflator. Source: Das and Usami, 2017

For major agricultural operations the male-female wage rate disparity at the state level is not very large (above 0.80). The disparity in wage rates has either been stagnant or declined at the State level

Women are paid most unequally in India, compared to men, when it comes to hourly wages for labour as evident from the Table 8, below. A perusal of Table 8 shows that on average, women are paid 34 per cent less than men. A recent report by the International Labour Organization (ILO) has found that this gap in wages, known as the gender wage gap, is the highest among 73 countries studied in the report. The trend holds true globally as well, but with lower levels of inequality among the sexes, where on average, hourly wages of women are 16 per cent less than those of men. Inequality is higher in monthly wages, with a gap of 22 per cent. Overall, real wages grew just 1.8 per cent globally (136 countries) in 2017. With empirical evidences pointing towards gender wage gap there is a need to give more emphasis on ensuring equal pay for women and men.

CONCLUSION

In Bihar about 30.39 per cent of the total female agricultural workforce of total female work force is engaged in farming occupation (Singh *et al.,* 2018). The share of female agricultural workforce in total agricultural workforce was estimated to be 19.32 per cent in the state. Female agricultural workers in total agricultural worker were computed to be 19.48 and 14.01 per cent, for rural and urban areas, respectively. Major participation of women labour was observed in harvesting of crops (14.56%) followed by sowing of crops (11.36%). Overall participation in all the farming operations was assessed to be 35.94 per cent. Thus, women play a key role in the agricultural activities of the state. In spite of these, women have share of only 13.32 per cent in total landholdings of the state and there is a gap of 7.04 per cent between wage rate of men and women during TE-2016. Disparities in wages are narrowing i.e. likely to be equal in coming days. It was also tried to analyze the role women in agricultural development of Bihar and the issues confronting them.

To strengthen women's participation in agriculture and allied sectors and to improve their access to land, credit and benefit of different Govt. programs, Ministry of Agriculture and Farmers Welfare has policy provisions like joint leasing for both domestic and agricultural land under National policy for farmers. Under credit facility provisions government has framed policy for issuing Kisan Credit Cards to women for creating livelihood through livestock practices and agricultural processing. Further, in each KVK there provision of Subject Matter Specialist (SMS) of Home Science is provided to educate and create awareness among women farmers about their role in upliftment of socio-economic conditions of the society (Meena *et al.,* 2010). Beside all efforts, there is still a wide gender gap in the state which may be addressed properly for overall development of women and enhancing the rural landscape of the state in particular and nation in general. Men and women are like two sides of a balance. Balance in society can be achieved only when both the sides are considered equal. Hence, ignoring the role of women especially in a developing state like Bihar cannot bring development in real senses.

REFERENCES

All India report number and area of operational holdings: Agricultural Census Report 2010-11.

Census Reports 2001 and 2011, Government of India.

Das, A. and Y. Usami. 2017. Wage Rates in Rural India, *Review of Agrarian Studies*, 7(2): 105-109.

Ghosh, M.M. and A. Ghosh. 2014. Analysis of Women Participation in Indian Agriculture. *IOSR Journal of Humanities and Social Science,* 19(5): 1-6.

Majumdar, J. and P. Shah. 2017. Mapping the role of women in Indian Agriculture. *Annals of Anthropological Practices,* 4(2): 46-54.

Meena, M.S.; K.M. Singh and M.A. Khan. 2010. Evaluation of training on effective water management: A case of capacity building of extension personnel in Bihar. *Journal of Community Mobilization and Sustainable Development*, 5(1): 50-53.

Meena, M.S., K.M. Singh and H.M. Meena. 2015. Gendered approach to climate resilient agriculture: technology and policy-led options. *Journal of Agri Search,* 2(3): 206-211.

Meena, M.S., K.M. Singh; R.K.P. Singh; Anjani Kumar; Abhay Kumar and V.P. Chahal. 2017. Inequality and determinants of income among rural households in tribal dominated areas of Jharkhand. *Indian Journal of Agricultural Sciences,* 87(1): 92-96.

Meena, M.S.; K.M. Singh and H.M. Meena. 2018, Participation and perception towards changing farming practices in eastern India: A study of women headed households. *National Academy Science Letters,* 41(4): 203–205. https://doi.org/10.1007/s40009-018-0656-8

Reports on Agricultural wages in India, Directorate of Economics and Statistics, Department of Agriculture and Co-operation, Ministry of Agriculture and Farmers Welfare, Government of India, New Delhi.

Role of women in agriculture. http://agropedia.iitk.ac.in/content/role-Indian-women-agriculture accessed: 28.08.2019.

Sakamma, S. and K.B. Umesh. 2018. Gender issues in Indian agriculture: An overview. *Indian Journal of Economic Development,* 6: 1-6.

Shahi, V.; B. Shahi; V. Kumar and K.M. Singh. 2018. Performance evaluation and impact of small weeding tools for drudgery reduction of farm Women. *Journal of Pharmacognosy and Phytochemistry*, SP-4: 5-7.

Shahi, V.; B. Shahi; K.M. Singh and P. Kumari. 2018. Impact study on mushroom cultivation for micro entrepreneurship development and women Empowerment. *Journal of Pharmacognosy and Phytochemistry*, SP-4: 1-4.

Singh, K.M.; M.S. Meena; Abhay Kumar and R.K.P. Singh. 2013. An Overview of Gender Issues in Agriculture. *SSRN Electronic Journal,* 5(34): http://dx.doi.org/10.2139/ssrn.2237993

Singh, R.K.P.; Abhay Kumar; K.M. Singh; N. Chandra; R.C. Bharati; U. Kumar and P. Kumar. 2018. Farm size and

productivity relationship in smallholder farms: Some empirical evidences from Bihar, India. *Journal of Community Mobilization and Sustainable Development,* 13(1): 61-67.

Singh, R.K.P.; K.M. Singh and A.K. Jha. 2012. Effect of migration on agricultural productivity and women empowerment in Bihar. *Political Economy: International Political Economy eJournal*, 6(109) http://doi.org/10.2139/ssrn.2111155.

Slathia, N. 2015. Participation of women in agricultural production. *Agriculture: Towards a New Paradigm of Sustainability* ISBN: 978-93-83083-64-0

Yadav, M. 2014. Inequality between male and female in agriculture sector in Maharashtra (pre and post reform) *Research Front,* 2(1): 49-56.

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Selection of Elite Murrah Buffaloes Based on Association of Production Traits

Ramandeep Kaur*, Puneet Malhotra, Neeraj Kashyap, Shakti Kant Dash and Simarjeet Kaur
Department of Animal Genetics and Breeding, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004, Punjab

ABSTRACT

The present study was conducted on lactation records of 445 Murrah buffaloes of 171 sires from history cum pedigree sheets maintained at Directorate of Livestock Farms, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab from 2001 to 2016. The milk production traits included in the study were 305-day milk yield (305 MY), total lactation milk yield (TLMY), peak yield (PY), days to attain peak yield (DPY) and lactation length (LL). Normality parameters viz. skewness and kurtosis for the said variables were estimated from the data, followed by data transformation and estimation of genetic and phenotypic correlation coefficients. Based on the estimates of correlation coefficients regression analysis was performed for predicting 305 MY, LL and by considering PY and DPY as independent variables using both transformed and untransformed variables. Results indicated that TLMY had high and positive genetic correlation with 305 MY, LL and PY while non-significant low and negative genetic correlation was observed with DPY. Highly significant correlation between PY, 305 MY and TLMY indicated the strong genetic association among them. The 305 MY, LL and TLMY were predicted from PY and DPY using stepwise multiple linear regression models. The results indicated that when two traits were considered together for prediction, PY and DPY were found to be significantly associated with 305 MY, LL and TLMY. Hence, selection based on PY can be used as a better criterion for improvement of other performance traits through their correlated response in Murrah buffaloes.

Keywords: Elite Murrah Buffaloes, Production, Total lactation milk yield, Days to attain peak yield, Days to attain peak yield

INTRODUCTION

The buffalo is considered as back bone of Indian dairy farming. India possess the largest (108.70 million) buffalo population of the world and is rich in genetic resource for buffaloes as it possesses 13 defined breeds of buffaloes (www.nbagr.res.in). The majority of well-defined breeds of buffalo are native of India such as Murrah, Nilli-Ravi, Surti, Jaffrabadi, Mehsana, Bhadawari, etc. Among the established breeds of buffalo in India, the Murrah which originated in valleys of Haryana (Jhajjar, Rohtak, Bhiwani, Jind) is considered as most suitable dairy breed and has now spread all over the world. The reason for such wide acceptability of Murrah buffalo lies in its better conception rate and higher production potential as compared to other breeds. Although, the buffalo population in India is only half that of the cattle population, buffaloes produce 51.17 per cent (74.71 million tons) of total milk production (DADF, 2017). Milk yield in dairy animals can be defined as average daily yield or total milk yield in a specified period such as standard lactation of 305 days or completed lactations. Success of dairy industry/dairy farms depends on the selection of high producing animals. Maximization of genetic improvement in traits especially of economic importance is the primary objective of breeding programme. The potential for genetic improvement of a trait largely depends on the access to genetic variability existing in the population. Knowledge of genetic association among traits of economic importance help in deciding the appropriate selection strategy.

The genetic correlation estimates the degree of association between genes responsible for genetic part of the variance, indicative of the probability that the same genes influence the expression of both traits whereas phenotypic correlation is an expression of the observed

*Corresponding author email id: raman95305@gmail.com

relationship between phenotypic performances of traits of interest. This knowledge of genetic and phenotypic correlation is valuable in determining the method of selection and breeding system adopted for improvement of economic traits and for the estimation of genetic response (Sarubbi *et al.,* 2012). Similarly, prediction of 305 MY from peak yields can result in identification of early peak yield days for early genetic selection of Murrah buffaloes. Therefore, the present investigation was conducted to figuring out correlation among production traits for early selection of high producing Murrah buffaloes.

MATERIALS AND METHODS

Data for the present study was collected from pedigree and production records of Murrah buffaloes maintained at Directorate of Livestock Farms, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab from 2001 to 2016. The study was on conducted on lactation records of 445 Murrah buffaloes of 171 sires. The milk production traits included in the study were 305-day milk yield (305 MY), total lactation milk yield (TLMY), peak yield (PY), days to attain peak yield (DPY) and lactation length (LL). Lactation records of less than 200 days' length or less than 1000 kg of TLMY, and abnormal records like abortion, still birth as well as data from experimental animals, sold or auctioned animal and break lactation records were excluded for analysis. Least squares means for different production traits were estimated and estimation of correlation and regression coefficients were obtained after adjusting the data for significant non-genetic factors.

Genetic and phenotypic parameters were estimated by paternal half sib correlation method using mixed model analysis.The genetic and phenotypic correlations were calculated from the analysis of variance and covariance among sire groups as given by Becker (1984).

The genetic correlations between two traits were estimated as:

$$r_g(x, y) = \frac{Cov_{S(x,y)}}{\sqrt{[\sigma^2_{s(x)} \cdot \sigma^2_{s(y)}]}}$$

Where, x,y = Two different characters in the same individuals

$Cov_{S(x, y)}$ = Sire components of covariance between character x & y

$\sigma^2_{s(x)}$ = Sire component of variance of trait x

$\sigma^2_{s(y)}$ = Sire component of variance of trait y

The standard error of genetic correlation (r_g) was estimated by using the following formula as given by Robertson (1959).

$$S.E. = \frac{1-r_g^2}{\sqrt{2}} \sqrt{\frac{SE(h_x^2) \times SE(h_y^2)}{(h_x^2) \times (h_y^2)}}$$

where, h^2x and h^2y were the heritabilities of traits x and y, respectively.

The phenotypic correlations between two traits were estimated as:

$$r_p(x, y) = \frac{Cov_{S(x,y)} + Cov_{e(x,y)}}{\sqrt{[\sigma^2_{s(x)} \cdot \sigma^2_{e(x)}] + [\sigma^2_{s(y)} \cdot \sigma^2_{e(y)}]}}$$

where, $Cov_{S(x, y)}$ = Sire component of phenotypic covariance between traits x and y

$Cov_{e(x, y)}$ = Error component of phenotypic covariance between traits x & y

$\sigma^2_{e(x)}$ = Error component of variance for trait x

$\sigma^2_{e(y)}$ = Error component of variance for trait y

$\sigma^2_{s(x)}$ = Sire component of variance for trait x

$\sigma^2_{s(y)}$ = Sire component of variance for trait y

The standard error of phenotypic correlation was obtained as per following formula given by Panse and Sukhatme (1967).

$$\frac{[1 - r^2_{p(x,y)}]}{\sqrt{N-2}}$$

where, $r^2_{p(x,y)}$ = Phenotypic correlation between traits x and y

(N-2) = Degree of freedom

The significance of phenotypic correlation was tested by comparing estimated value with the table value given by Snedecor and Cochran (1967) at (N-2) degrees of freedom.

The normality of the variables was evaluated by Skewness and Kurtosis parameters and by observing the distribution with the help of histogram (with normal curve). Data transformation was carried out using Box and Cox transformation (1964) and square root transformation. The regression analysis was performed on both transformed and untransformed independent variables to evaluate whether transformation had any effect on improving the R square estimate. Stepwise linear regression analysis was conducted in SPSS 24.0 by

considering peak yield (PY) and days to attain peak yield (DPY) as explanatory variables and 305 day milk yield (305MY), total lactation milk yield (TLMY) and lactation length (LL) as response variables. Following model was used:

$$\hat{Y} = a + b_1PY + b_2DPY + e$$

Where, $\hat{Y}$ is expected lactation yield for 305 MY, LL and TLMY. ais the intercept; b_1 and b_2 are the partial regression coefficients. PY and DPY are explanatory variables peak yield (PY) and days to attain peak yield (DPY). The criteria for entering the dependent variable into the model was probability of $p<0.05$. The explanatory variables in a number of combinations were used to construct the regression model and R^2values were estimated for each model,

$$R^2 (\%) = (SSR / SST) \times 100$$

Where, SSR = sum of squares due to regression and SST = sum of squares due to total. Based on value of R^2 estimate and early expressed independent traits, appropriate models were selected. Regression analysis was attempted using both untransformed and transformed variables and R^2 change was observed.

RESULTS AND DISCUSSION

Production traits of Murrah buffaloes

The average performance of Murrah buffaloes up to four lactations for total lactation milk yield, 305-day milk yield, lactation length, peak yield and days to attain peak yield along with their standard deviation (SD), standard error (SE) and coefficient of variation (CV) are presented in Table 1.

The overall means of 305-day milk yield, total lactation milk yield, lactation length, peak yield and days to attain peak yield of Murrah buffaloes in the present study was found to be 2258.17±17.48 kg, 2465.48±23.35 kg, 340.48±2.54 days,13.17±0.09 kg and 63.45±1.34 days respectively. The mild variation was observed in the traits (LL, PY, 305 MY and TLMY) ranging from 21% to 28%, while days to attain peak yield was found to be highly variable trait (64.47%). The 305 MY considered as an indicator trait for production comparisons and for evaluating the test bulls on their daughter's 305 MY. So, this trait holds a lot of economic importance. The estimates in the present study for different production traits were substantially higher than those reported for Murrah buffaloes at different places in India (Katneni, 2007; Barros *et al.,* 2014; Thiruvenkadan *et al.,* 2010; Thiruvenkadan *et al.,* 2014; Jamuna *et al.,* 2015; Sigdel *et al.,* 2015; Jakhar *et al.,* 2016 and Verma *et al.,* 2016). While lower estimates were reported by Sarkar *et al.* (2006) and Geetha (2005) in Murrah buffaloes.

Table 1: Descriptive statistics of production traits of Murrah buffaloes

Classes	N	Mean±SE	SD	CV%
TLMY	928	2465.48±23.35 (kg)	711.26	28.85
305 MY	928	2258.17±17.48 (kg)	532.46	23.58
LL	928	340.48±2.54 (days)	77.26	22.69
PY	928	13.17±0.09 (kg)	2.77	21.01
DPY	928	63.45±1.34 (days)	40.90	64.47

TLMY = total lactation milk yield, 305 MY = 305-day milk yield, LL = lactation length, PY = peak yield, DPY = days to attain peak yield, SD = standard deviation, CV = coefficient of variation, N = no. of observations

Normality of distribution

The estimates of skewness and kurtosis along with their standard errors, which help in quantifying the departures from normality, pertaining to the distribution of various production traits are presented in Table 2. Since, the production variables deviate from normality, data transformation was carried out using Box-Cox transformation (by considering geometric mean, T & without geometric mean, TG) and also by square root transformation (SQT) method. The transformation was done without changing the linear relationship or correlation between variables.

Total lactation milk yield: The skewness and kurtosis coefficients for TLMY on the original, transformed variables by considering geometric mean, without geometric mean and square root scales were 0.67±0.08 & 1.26±0.16, -0.31±0.08 & 0.18±0.16, -0.31±0.08 & 0.18±0.16 and 0.16±0.08 & 0.32±0.16, respectively. A comparison of skewness and kurtosis for TLMY on original and transformed scales showed that the transformation by using both the methods results in considerable decreased in asymmetry of distribution. However, the transformation by considering geometric mean and without geometric mean predicted negative skewness while square root transformation predicted positive skewness and kurtosis although their estimates were lower than the original scales.

305 day milk yield: The deviations from normality for 305 DMY were in the form of positive skewness and

Table 2: Skewness and kurtosis analysis of production traits of Murrah buffaloes

Parameters	Skew-ness	Std. error of Skewness	Kurto-sis	Std. error of Kurtosis
LL	0.78	0.08	0.44	0.16
LLT	0.21	0.08	-0.23	0.16
LLTG	0.21	0.08	-0.23	0.16
LLSQT	0.50	0.08	-0.01	0.16
DPY	1.25	0.08	1.53	0.16
DPYT	-0.39	0.08	0.18	0.16
DPYTG	-0.39	0.08	0.18	0.16
DPYSQT	0.50	0.08	-0.07	0.16
PY	0.66	0.08	1.13	0.16
PYT	-0.10	0.08	0.44	0.16
PYTG	-0.10	0.08	0.44	0.16
PYSQT	0.28	0.08	0.51	0.16
305 MY	0.13	0.08	0.14	0.16
305 MYT	-0.61	0.08	0.38	0.16
305 MYTG	-0.61	0.08	0.38	0.16
305 MYSQT	-0.24	0.08	0.06	0.16
TLMY	0.67	0.08	1.26	0.16
TLMYT	-0.31	0.08	0.18	0.16
TLMYTG	-0.31	0.08	0.18	0.16
TLMYSQT	0.16	0.08	0.32	0.16

LL = lactation length, DPY = days to attain peak yield, PY = peak yield, 305 MY = 305-day milk yield, TLMY = total lactation milk yield; T, TG and SQT are transformed variables without geometric mean, with geometric mean and square root transformation respectively.

kurtosis. A comparison of skewness and kurtosis coefficients for 305-days milk yield on the original and transformed scales showed that transformation increased the asymmetry of distribution by increasing skewness in negative direction and kurtosis in positive direction. However, square root transformation reduced the estimates of kurtosis and with minimal skewness in negative direction. None of the two transformations were effective in eliminating the deviations from normality for 305-days milk yield.

Lactation length: The estimates of skewness and kurtosis for lactation length clearly depict the asymmetry. The deviations from normality were in the form of positive skewness and negative kurtosis. A comparison of skewness and kurtosis coefficients for lactation length on the original and transformed scales showed that the transformation decreased the asymmetry of distribution by decreasing both skewness and kurtosis. Box-Cox transformation was highly effective in eliminating the deviations from normality for lactation length while square root transformation resulted in lesser decrease in the asymmetry.

Peak yield: The deviations from normality were in the form of positive skewness and positive kurtosis. The skewness and kurtosis coefficients for PY on the original and transformed variables by considering geometric mean, without geometric mean and square root scales were 0.66±0.08 & 1.13±0.16, -0.10±0.08 & 0.44±0.16, -0.10±0.08 & 0.44±0.16 and 0.28±0.08 & 0.51±0.16, respectively. A comparison of skewness and kurtosis coefficients for peak yield on the original and transformed scales showed that transformation considerably decreased the asymmetry of distribution by decreasing skewness in negative direction and kurtosis in positive direction.

Days to attain peak yield: The estimate of skewness and kurtosis for days to reach peak yield were positive which clearly depicts the asymmetry. The skewness and kurtosis coefficients for DPY on the original, and Box-Cox transformed variables with geometric mean, without geometric mean and square root scales were 1.25±0.08 & 1.53±0.16, -0.39±0.08 & 0.18±0.16, -0.39±0.08 & 0.18±0.16 and 0.50±0.08 & -0.07±0.16, respectively. A comparison of skewness and kurtosis coefficients for days to reach peak yield on the original and transformed scales showed that transformation decreased the asymmetry of distribution by decreasing both skewness in negative direction and kurtosis in positive direction.

The overall results for testing for the normality of distribution showed that none of the traits conformed to normality. Transformation of data resulted in reducing the departures from normality for most of the traits. For some traits viz. 305-day milk yield, total lactation milk yield, peak yield and days to reach peak yield, data transformation changed the direction of skewness while kurtosis remained in the same direction. Similar results were reported by Malhotra (2014).

Genetic and Phenotypic correlation

The results of this study revealed significant genetic and phenotypic correlations among various production traits. The correlations among production traits along with standard errors are presented in Table 3.

Genetic correlation: The total lactation milk yield had high and positive genetic correlation with 305-day milk

Table 3: Genetic and Phenotypic correlation among production traits of Murrah buffaloes

	LL	PY	305 MY	TLMY	DPY
LL		0.09±0.01**	0.41±0.09**	0.70±0.20**	0.07±0.01**
PY	0.24±0.09**		0.75±0.19**	0.62±0.21**	-0.17±0.03**
305 MY	0.49±0.16**	0.74±0.21**		0.92±0.32**	-0.06±0.01
TLMY	0.74±0.22**	0.67±0.15**	0.93±0.31**		-0.01±0.001
DPY	0.15±0.02	-0.22±0.08**	-0.20±0.06**	-0.09±0.01	

Genetic correlations below diagonal and phenotypic correlations above diagonal; **p<0.05; TLMY = total lactation milk yield, 305 MY = 305-day milk yield, LL = lactation length, PY = peak yield, DPY = days to attain peak yield

yield, lactation length and peak yield of the order 0.93±0.31, 0.74±0.22 and 0.67±0.15 respectively, while non-significant low and negative genetic correlation (-0.09±0.01) was observed with days to attain peak yield. Higher genetic correlation among total lactation milk yield, 305-day milk yield, lactation length and peak yield revealed that selection can be done based on any of the milk production trait. Selection for higher total lactation milk yield will also result in higher values for 305-day milk yield, lactation length and peak yield. The present findings were in accordance with Chaudhari (2015); Sigdel *et al.* (2015); Jakhar *et al.* (2016) and Jakhar *et al.* (2017). A high positive genetic correlation observed between milk yield and lactation length was reported by Malhado *et al.* (2009) and Barros *et al.* (2016). A low negative but significant genetic correlation was observed between 305-day milk yield and days to attain peak yield (-0.20±0.06).

A highly significant (p<0.05) and positive genetic correlation was observed between peak yield and 305-day milk yield (0.74±0.21 and 0.75±0.19, respectively) which indicated that selection based on peak yield simultaneously will increased 305-day milk yield in Murrah buffaloes. Peak yield was negatively and significantly (p<0.05) correlated with days to reach peak yield with low magnitude of genetic correlation (-0.22±0.08). Lactation length had positive but low estimates of genetic (0.24±0.09) correlation with peak yield and days to attain peak yield (0.15±0.02). Similar findings were reported by Kumar (2000); Chaudhari (2015); Dev *et al.* (2015); Jakhar *et al.* (2016) and Jakhar *et al.* (2017). The high genetic correlation among different production traits indicated that these traits had strong genetic association. Thus, selection for the improvement in one trait will also result in the improvement in the other trait as a correlated response because many of the genes responsible for one production trait is also responsible for another trait (Lasley, 1978).

Phenotypic correlation: The phenotypic correlation of total lactation milk yield was found to be positive and highly significant (p<0.05) with 305-day milk yield, peak yield and lactation length whereas, negative and non-significant with days to attain peak yield. A low non-significant negative phenotypic correlation was found between 305-day milk yield and days to attain milk yield (0.06±0.01). The strong phenotypic correlation between lactation length and total lactation milk yield (0.70±0.20) as found in the present study indicated that both the traits have strong phenotypic correlation. This study showed that the animals which had long lactation length also produce high milk yield. A highly significant (p<0.05) and positive phenotypic correlation was observed between peak yield and 305-day milk yield (0.74±0.21 and 0.75±0.19, respectively) which indicated the correlated response, if selection would be done based on peak yield simultaneously, increased 305-day milk yield in Murrah buffaloes. The findings were supported by Chaudhari (2015); Jakhar *et al.* (2016) and Jakhar *et al.* (2017).

Peak yield was negatively and significantly (p<0.05) phenotypically correlated with days to reach peak yield (-0.17±0.03). Similar findings were reported by Suresh *et al* (2004). Lactation length had low but positive estimates of phenotypic (0.09±0.01) correlation with peak yield and days to attain peak yield (0.07±0.01). The present results were in accordance with Kumar (2000); Chaudhari (2015); Dev *et al.* (2015); Jakhar *et al.* (2016) and Jakhar *et al.* (2017).

The highly positive genetic and phenotypic correlations of peak yield and lactation length with total lactation milk yield and 305-day milk yield, as well as negative genetic and phenotypic correlation with days to attain peak yield indicated the fact that the selection on the basis of peak yield and lactation length would not only reduce the unproductive life in the form of days to attain peak yield but also increases the total lactation milk yield in Murrah buffalo.

Table 4: Stepwise regression analysis of production traits of Murrah buffaloes

Response variable	Regression Coefficients of predictor variable					
	Model	Intercept	PY	DPY	R^2	Sig.
305 MY	1	374.513±55.873	142.929±4.148		56.2	0.000**
	2	284.741±61.964	145.233±4.185	0.936±0.286	56.7	0.000**
305 MYT	1	2.356±0.029	0.887±0.026		54.8	0.000**
	2	2.269±0.035	0.906±0.026	0.039±0.008	55.8	0.000**
305 MYTG	1	5165.390±64.629	150.789±4.502		54.8	0.000**
	2	4974.547±75.743	153.998±4.503	1.642±0.350	55.8	0.000**
305 MYSQT	1	6.455±1.206	11.281±0.332		55.5	0.000**
	2	4.053±1.333	11.507±0.334	0.210±0.051	56.2	0.000**
LL	1	304.463±12.188	2.733±0.905		1.0	0.003**
	2	288.113±13.541	3.153±0.915	0.171±0.062	1.8	0.000**
LLT	1	2.427±0.038	0.085±0.034		0.7	0.013**
	2	2.367±0.045	0.098±0.035	0.027±0.011	1.3	0.002**
LLGT	1	806.227±12.762	2.201±0.889		0.7	0.013**
	2	786.247±15.085	2.537±0.897	0.172±0.070	1.3	0.002**
LLSQT	1	16.689±0.645	0.457±0.178		0.7	0.010**
	2	15.859±0.717	0.535±0.180	0.072±0.028	1.4	0.001**
TLMY	1	380.682±88.374	158.190±6.560		38.6	0.000**
	2	222.375±97.871	162.252±6.611	1.651±0.451	39.4	0.000**
TLMYT	1	2.389±0.040	0.886±0.036		39.5	0.000**
	2	2.278±0.047	0.911±0.036	0.049±0.011	40.8	0.000**
TLMYGT	1	5648.687±94.844	162.586±6.606		39.5	0.000**
	2	5385.872±111.312	167.005±6.618	2.261±0.514	40.8	0.000**
TLMYSQT	1	6.579±1.760	11.791±0.485		39.0	0.000**
	2	3.059±1.945	12.122±0.488	0.307±0.075	40.1	0.000**

**$p<0.05$, TLMY = total lactation milk yield, 305 MY = 305-day milk yield, LL = lactation length, PY = peak yield, DPY = days to attain peak yield, R^2 = Coefficient of determination; T, TG and SQT are transformed variables without geometric mean, with geometric mean and square root transformation, respectively.

Prediction of Dependent traits

Prediction of 305-day milk yield: The results of regression analysis for prediction of 305-day milk yield with peak yield and days to attain peak yield are given in Table 3. The regression equations developed with different combinations of variables i.e. with peak yield only (model 1); peak yield and days to attain peak yield (model 2) for prediction of 305-day milk yield in Murrah buffaloes. In the prediction of 305-DMY in Murrah buffaloes, the stepwise regression found both the models were significantly ($p<0.05$) associated with305MY. When two traitswere considered together for prediction, PY and DPY were found to be significantly associated with 305 MY with an R^2 value of 56.70 per cent. The R^2 for the model with both the variables (PY and DPY) was higher with marginal R^2 change of 0.05. The R^2 indicated that both the variable explained variation in dependent variable appreciably.

Prediction of lactation length: While, predicting the lactation length, the stepwise regression found both the models were significantly ($p<0.05$) associated with LL. The first step, which was model 1 having only PY as a predictor, explained only 2 per cent of the variation in LL. Then at the second step (model 2), PY and DPY were entered in the prediction equation and these explained 2.10 per cent of the variation in lactation length. Hence, the prediction equation incorporating both the variables (PY and DPY) explained slightly higher variation for the prediction of

LL than the model 1 equation but due to low R^2 value, it is not reliable to make any conclusion.

Prediction of total lactation milk yield: By considering the peak yield and days to attain peak yield as explanatory variables for the prediction of total lactation milk yield, the results of regression analysis indicated the significant ($p<0.05$) association of both the variables with the dependent variable i.e. TLMY. At the first step in model 1 only PY was entered for the prediction of TLMY which explained 38.60 per cent of the variation in TLMY while model 2 at the second step included both the variables (PY and DPY) for the prediction of TLMY explained more variation (39.40%). The R^2 for the model with both the variables (PY and DPY) i.e. model 2 was higher with marginal R^2 change of 0.08. The R^2 indicated that both the variable explained variation in dependent variable appreciably.

CONCLUSION

This study revealed that the total lactation milk yield (TLMY) had high and positive genetic and phenotypic correlation with 305-day milk yield (305 MY), lactation length (LL) and peak yield (PY) while low non-significant and negative genetic and phenotypic correlation with days to attain peak yield (DPY). Highly significant correlation between PY, 305 MY and TLMY indicated the strong genetic association among them. Therefore, improvement in one trait could be achieved by selecting the other trait which will improve the performance of the animal and overall productivity of the herd. The overall results for testing for the normality of distribution showed that none of the traits conformed to normality. Transformation of data resulted in reducing the departures from normality for most of the traits. Stepwise regression analysis concluded that when two traits were considered together for prediction, PY and DPY were found to be significantly associated with 305 MY, LL and TLMY. Analysis of genetic and phenotypic correlation revealed that PY trait can serve as better criteria in selection programme for Murrah buffaloes. This will help the dairy industry in early selection of high producing animals on basis of early production traits and improvement in other production traits as a correlated response.

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REFERENCES

Barros, C.D.C.; R.R. Aspilcueta-Borquis; A.B. Fraga and H. Tonhati. 2016. Genetic parameter estimates for production and reproduction traits in dairy buffaloes. *Revista Caatinga,* 29(1): 216-221.

Becker, W.A. 1984. *Manual of quantitative genetics.* Academic Enterprises.

Box, G.E.P. and D.R. Cox. 1964. An analysis of transformations. *Journal of the Royal Statistical Society, Series B,* 26: 211-252.

Chaudhari, M. 2015. *Genetic studies on production, fertility and longevity traits in Murrah and Niliravi buffaloes*. Ph.D., Thesis, Lala Lajpat Rai University of Veterinary and Animal Sciences, Haryana, India.

DAHDF. 2017. *Annual Report 2017-18*. Department of Animal Husbandry, Dairying &Fisheries, Ministry of Agriculture, Government of India. (dahd.nic.in/reports/annual-report-2017-18).

Dev, K.; S.S. Dhaka; A.S. Yadav and S.K. Sangwan. 2015. Genetic parameters of early performance traits in Murrah buffaloes. *Haryana Veterinarian,* 54(2): 144-146.

Geetha, E. 2005. *Studies on breeding values for persistency in Murrah buffaloes*. M.Sc. Thesis, National Dairy Research Institute, Karnal, Haryana, India.

Jakhar, V.; A.K. Vinayak and K.P. Singh. 2016. Genetic evaluation of performance attributes in Murrah buffaloes. *Haryana Veterinarian,* 55(1): 66-69.

Jakhar, V.; A.S. Yadav and S.S. Dhaka. 2017. Estimation of genetic parameters for production and reproduction traits in Murrah Buffaloes. *International Journal of Current Microbiology and Applied Sciences,* 6(11): 4297-4303.

Jamuna, V.; A.K. Chakravarty and C.S. Patil. 2015. Influence of non-genetic factors on performance traits in Murrah buffaloes. *Indian Journal of Animal Research,* 49(3): 279-283.

Katneni, V.K. 2007. *Studies on genetic persistency of milk production in Murrah buffaloes.* Ph.D. Thesis, National Dairy Research Institute, Karnal.

Kumar, A. 2000. *Genetic studies on first lactation traits in Murrah buffaloes*. M.V.Sc. Thesis, Haryana Agricultural University, Hisar, India.

Lasley, J F. 1978. *Genetics of Livestock Improvement.* New Delhi, India: Prentis Hall of India Pvt. Ltd.

Malhado, C.H.; A.A. Ramos; P.L. Carneiro; D.M. Azevedo; P.R. Affonso; D.G. Pereira; J.C. Souza. 2009. Estimates of genetic parameters for reproductive and productive characteristics of crossbred buffalo in Brazil. *Brazilian Journal of Animal Health and Production,* 10(4): 830-839.

Malhotra, P. 2014. *Genetic evaluation of Murrah buffaloes at organised herds*. Ph.D. thesis, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab, India.

Panse, V.G. and P.V. Sukhatme. 1967. *Statistical Methods for Agricultural Workers*. IARI, New Delhi.

Robertson, A. 1959. The sampling variance of the genetic correlation coefficient. *Biometrics,* 15: 469-485.

Sarkar, U.; A.K. Gupta; T.K. Mohanty; V.S. Raina and S. Prasad. 2006. Genetic and non-genetic factors affecting milk yield and milk constituents in Murrah Buffaloes. *Journal of Dairying Food and Home Science,* 25(2): 125-128.

Sarubbi, F.; G. Auriemma; R. Baculo and R. Palomba. 2012. Milk yield and quality to estimate genetic parameters in Buffalo cows. *Journal of Buffalo Science,* 1(1): 102-106.

Sigdel, A.; N. Bhattarai; M.R. Kolachhapati and S. Paudyal. 2015. Estimation of genetic parameters for productive traits of Murrah Buffaloes in Kaski, Nepal. *International Journal of Research,* 2(5): 248-257.

Snedecor, G.W. and W.G. Cochran. 1967. *Statistical Methods*, 6th Edn. Oxford and IBH Publishing Co., New Delhi, India.

Thiruvenkadan, A.K.; S. Panneerselvam; N. Murali; S. Selvam and V.R. Saravanakumar. 2014. Milk production and reproduction performance of Murrah buffaloes of Tamil Nadu, India. *Buffalo Bulletin,* 33(3): 291-300.

Thiruvenkadan, A.K.; S. Panneerselvam; R. Rajendran and N. Murali. 2010. Analysis on the productive and reproductive traits of Murrah buffalo cows maintained in the coastal region of India. *Applied Animal Husbandry & Rural Development,* 3: 1-5.

Verma, M.K.; G.K. Sachdeva; A.K. Yadav; S. Gautam; M.M. Ali and S. Kumar. 2016. Effect of genetic and non-genetic factors on milk yield and milk constituents in Murrah buffalo. *Indian Journal of Animal Research,* 51(2): 387-390.

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Solar Energy Utilisation in Dairy and Food Processing Industries – Current Applications and Future Scope

Mukul Sain[1]*, Amandeep Sharma[2] and Ruchika Zalpouri[3]

[1]Department of Agricultural Engineering, Baba Banda Singh Bahadur Engineering College, Fatehgarh Sahib-140407 Punjab

[2]Department of Dairy Engineering, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004 Punjab

[3]Department of Processing and Food Engineering, Punjab Agricultural University, Ludhiana-141004 Punjab

ABSTRACT

The dairy and food processing operations consume a lot of thermal energy for which mainly conventional energy sources are used, which lead to environmental pollution and contributing to the factors responsible for climate change. To overcome this problem, renewable energy resources, especially solar energy can be the best option as India has an abundance of sunshine for around 300-330 days/year with an average intensity of 5-7 KW/m^2. Solar energy has wide applications in various dairy and food processing operations like heating, steam generation, cooling, transportation, lighting, drying, etc. Along with multiple applications, this paper explores the current researches and needs to develop solar technologies so that it can be effectively used for various operations in the dairy and food industries.

Keywords: Dairy, Food, Processing, Renewable, Solar, Sustainable development

Abbreviations: KW/m^2 = Kilowatt/square meter; NDDB = National Dairy Development Board; MT = Million Tons; Km^2 = Square Kilometer; GW = Gigawatt; CFL = Compact Fluorescent Lamp; l = litre

INTRODUCTION

India is a world leader in the production of milk, pulses, jute, and the second-largest producer of crops like rice, wheat, sugarcane, cotton etc. The post-harvest losses in various food crops vary from 20 to 40 per cent due to lack of suitable energy sources. The non-availability of energy sources in production catchments forced the industry to set up the processing plants in faraway places where Government ensures supply of high-grade energy. This not only necessitates the transport of food crops from production catchments to faraway place but also need more fuel for such transports. Similarly, the top eight milk-producing states are Uttar Pradesh, Rajasthan, Madhya Pradesh, Andhra Pradesh, Gujarat, Punjab, Maharashtra and Haryana (NDDB, 2020).

Milk is considered a complete food and it contains all the major nutrients, including lactose and protein. Worldwide, more than six billion people consume milk and dairy products. India is the world 's largest exporting nation with an annual output of 187.7 MT and availability of 394 grams of milk per capita per day (NDDB, 2020). In India, since independence 70 per cent of the milk produced comes from marginal and small milk producers, milk has played a prominent role in strengthening the rural economy and socio-economic transformation (Bhaskar, 2020). After the white revolution, India never looked back in terms of milk production, which is also contributing broadly in terms of the well being of Indians.

The dairy and food processing industries mainly depend on conventional or non-renewable energy resources, which result in a lot of pollution, emission of greenhouse gases, and global warming. According to data given by the World Health Organization (WHO), due to climate change, 160,000 people die per year, and the rate may become double by the year 2024. Climate change also causes disasters like droughts, floods, a rise in atmospheric temperature, etc. To overcome this issue, the need is to switch to non-conventional energy resources of which Mother Nature has an abundance. The non-renewable energy resources are free and do not cause such pollution problems and depletion to nature (Shrivastava *et al.,* 2016). It has been found that globally India ranks fifth in terms of energy consumption in which industries

*Corresponding author email id: mukulsain95@gmail.com

contribute to 49 per cent of total energy consumption (Desai and Zala, 2010) and the energy demand is still increasing with the increasing population.

Among different clean or energy resources viz. biogas, biomass energy, geothermal energy, tidal energy, solar energy, wind energy, etc., solar energy can be the best option in a country like India where sun energy is abundantly available (Sharma *et al.,* 2018; Sharma and Tanwar, 2019). In India, there is plenty of sunshine for almost 300-330 days in a year with an average intensity of 5-7 KW/m^2. This much solar energy is sufficient to set up 20 MW/km^2 solar power plants (BEE, 2010). It is found that the use of solar energy can save about 4.5 MT of conventional fuel (Bhave, 2012). Using solar energy as a fuel can prevent 32000-144000 tons of CO_2 emission (Sharma *et al.*, 2016). Also, this alternative energy resource can be used to fulfil almost every requirement of a dairy and food processing plants like cooling and heating operations, lighting the premises, pumping of fluids along with steam generation, which are the basic needs of a dairy or food processing plant and most of the energy is consumed in these processes.

On the other hand, about 67 per cent of Indian population that lives in villages still lack in availability of conventional energy resources. Due to these various reasons, there are less opportunities for the food processing or value addition farmers resort to selling the milk to the cooperatives, providing reduced benefits and low status. It has been reported that 40 per cent of the food processing sector is unorganized (MoFPI, 2004). In milk and food processing, mainly heating and cooling operations are required, and solar energy can be easily used for both the heating as well as cooling operations of milk (Desai and Zala, 2010; Bhave, 2012; Sharma *et al.*, 2016; Ayadi *et al.*, 2008; Chopde *et al.*, 2016). Solar energy can be used for value addition processes like pasteurisation, sterilisation, etc. at farm level (Franco *et al.*, 2008; Jaglan *et al.*, 2018; Jaglan, 2018; Sain, 2019). The only need is of developing suitable technologies that can help in efficient milk processing (Sain *et al.*, 2019a; Sain *et al.*, 2019b; Kreetz *et al.*, 2000).

Historical perspective of solar energy: Solar energy is stated to generate electricity for two centuries. Alexandre Edmond Becquerel discovered a substance in 1839 that, when exposed to light, created tiny quantities of electric current. It was also believed that shining light could produce electric current on an electrode immersed in a conductive solution. Aleksandra Stoletov invented the first solar cell in the late 19th century, based on the photoelectric effect. Solar power has become common among the human community slowly after 2008. Few big projects have been proposed in India where 35000 Km^2 of the Thar Desert (Rajasthan) region has been retained for solar power projects capable of producing 700 GW-2100 GW of adequate electricity (Desai *et al.*, 2013).

Use of solar energy for various milk-heating operations: The temperature requirement for different milk products varies, as shown in Figure 1. Solar energy can replace conventional fuel required for processing of these milk products. For the processes where very high temperature is required, some thermal energy storage oils can also be used that can attain very high temperature using solar energy and the stored thermal energy can be further utilized in off-peak sun hours for milk processing operations like milk pasteurization (Sain *et al.*, 2019a). Pasteurization is the primary processing operation that milk undergoes, which can be accomplished using solar energy with suitably developed heat exchangers (Sain *et al.,* 2019b). In a study for milk pasteurisation, it has been found that the use of a glass window in solar milk pasteurizer increases heat gain and gives effective results (Pandey *et al.*, 2004). In another report, it has been noted that 10 l of milk can be pasteurised with the solar energy in only 1-hour duration (Franco *et al.*, 2008) and a research study was also performed in Pakistan where pasteurizer was able to achieve a temperature of 100°C (Zahira *et al.*, 2009).

Also, in dairy industries, the sun's heat energy is sufficient for various operations like cheese production, pasteurisation, preheating of cheese milk, outside cleaning, whey conditioning, cleaning in place (CIP), etc. (Schnitzer *et al.,* 2007).

For milk products like milk powder and other dried products where temperature requirement is up to 200°C, solar energy can be helpful if large-sized solar concentrators are used. A unit is installed for 20,000 to 30,000 l of milk pasteurisation daily by using solar energy at Mahanand Dairy, Latur. The setup works without igniting the traditional furnace oil boiler and helps in saving 80 to 100 l of furnace oil. The technology has the potential to save up to 6-10% of oil imports in India (Kedare *et al.*, 2012).

In another study, it was reported that solar energy with the use of a parabolic dish concentrator, could be used for sterilization of milk. It was found that using a solar

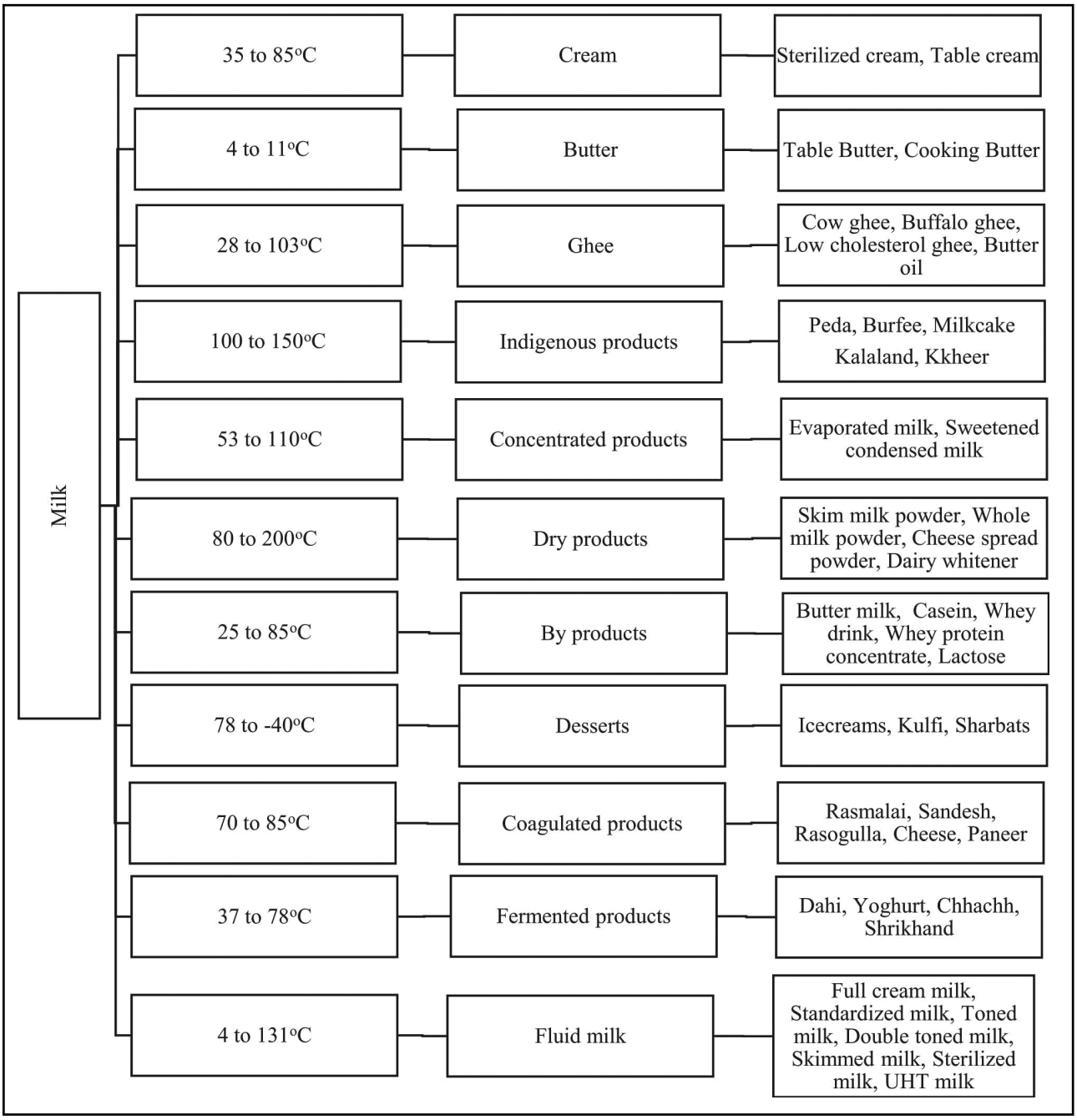

Figure 1: Temperature requirement for various dairy products (adapted from Jaglan *et al.,* 2018)

parabolic concentrator with suitably designed pressure vessels could be used for in-bottle milk sterilization and saved a tremendous amount of water. The texture and nutritional values of milk sterilized with the help of solar energy were found more likely and can be adopted at the farm level (Jaglan, 2018).

Solar technology for pumping of milk fluids: In the dairy sector, there are different types of pumps, which are used, for transferring fluid milk from one processing equipment to another. Also, these pumps are used to convey hot water, cleaning solutions, chilled water and compressed air from the point of production to the utilisation point. All around the world, solar thermal pumping systems as a part of the research has been used in a wide range (Biziak *et al.*, 1985).

Also, solar photovoltaic (SPV) cells can be used to run hot water pumps, chilled water pumps, milk pumps, and cleaning in place (CIP) pumps. Most of the time, an array is connected to a DC or AC pump, and these pumps are utilised to draw water for irrigation and drinking purposes.

The SPV array helps in the conversion of sunlight into electricity and operating the motor and pump. Hence, it can help in pumping water during the non-sunny time.

Solar energy for producing steam in the dairy and food industries: Steam is used for every heating operation, cleaning of processing equipment, and many other applications. Currently, steam is mainly produced with the help of a boiler using conventional fuels, but solar energy can help in fulfilling this requirement. It can be used in two possible ways for the production of steam, i.e. indirect steam generation and direct steam generation (BEE, 2010; Sharma *et al.*, 2017). In this parabolic disc, collectors are used to changing the water into steam by different procedures: steam flash method, direct or in situ method, and unfired-boiler.

Lightning industry offices and premises: Solar energy is used for lightening the industry premises. A solar lighting system comprised of a PV module of 74 W capacities with a flooded lead-acid battery of 12 V, and a CFL of 11 W rating has been designed to operate throughout the night. As surrounding gets dark, CFL in solar lighting system automatically lights (SLS), and during sunrise hours, it gets switched off. The cost of SLS was reported to be 19,000 Rupees. (Date, 2010).

Chemical processes in food and dairy industries: Solar energy is generally used for drying, pasteurisation, and sterilization, but it can be utilized in different chemical processes viz. boiling and distillation. Besides, solar energy can be used to preheat the water for cleaning in place (CIP) in various industrial settings (Jradi and Riffat, 2014).

Space cooling and refrigeration using solar energy: Milk needs sudden cooling at around 4°C to prevent the growth of pathogens and microorganisms. For milk cooling, cold storages are used. Solar energy is an alternative resource for cooling applications also, which includes space cooling, food, and water refrigeration, milk chilling, etc. In this field, various technologies have been developed that include absorption cooling cycles, adsorption cycles, as well as integrated solar and conventional mechanical compression cycles. Solar heat can be utilised for cooling by using phase change materials as the refrigeration unit (Ayadi *et al.*, 2008; Sharma *et al.*, 2016; Sharma *et al.*, 2019) shown in Figure 2.

The solar cooling systems are efficient, and their efficiency is dependent on the PV devices. Thus total energy conversion capacity of the grid driven vapour compression system is derived from the grid power plant's energy conversion output and the vapour compression system's coefficient of performance (Desai *et al.,* 2013). Solar collectors can be used for space heating and solar cooling applications (Bhave, 2012).

Solar Electric Fencings: Solar electric fences are used in the dairy and poultry sector to deter animals or predators from entering or leaving a surrounding field. These fences give the animal a painful, but harmless shock that sinters the restricted periphery. A photovoltaic system that has solar cells, a power conditioner, and a battery can meet these requirements (Carr *et al.*, 1999). Solar collectors are one of the devices, which help transform solar radiation into thermal energy, and this energy can be further used as commercial applications such as industrial thermal processes, which include electricity generation.

Solar Drying: The main aim of solar drying is to provide a sufficient amount of heat for drying and reduce the water activity of the produce. Solar thermal energy with low temperatures is ideal for preheating procedures and drying of milk to produce milk powder. Solar energy is typically used for air preheating which is then transmitted to the air heater. This not only raises the air temperature but also decreases the air heater load. Hence, it helps in cost saving and reduces air pollution. A Solar cabinet dryer was developed on by Society for Energy, Environment, and Development (SEED) based on a forced circulation system that could be utilised for dehydration of locally grown

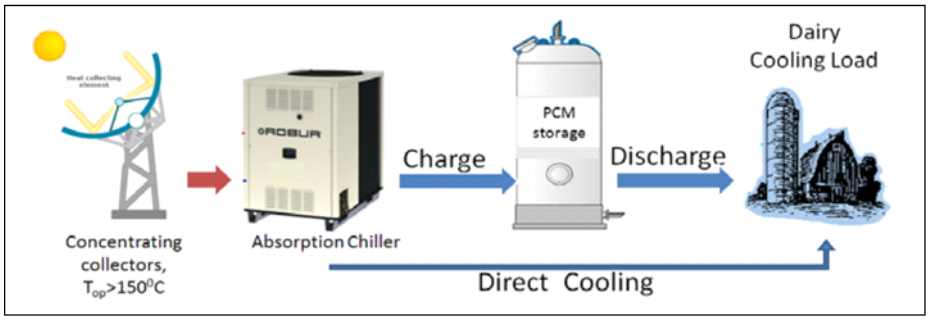

Figure 2: Simplified flow diagram of solar cooling system (adapted from Ayadi *et al.,* 2008)

Table 1: Types of solar dryers

Type of dryer	Construction	Advantage	Disadvantage	Reference
Tent dryer	• Simple in construction • Comprise of a frame in addition to that wood poles covered with a black plastic sheet • Black plastic sheet facing away from the sun	• Protects agricultural produces from dust, dirt, rain, wind, or predators	• Easily damaged by strong winds	Bordoloi *et al.* (2018)
Box dryer	• Comprises of a wooden box with a transparent lid • Black painted from an inside surface • A mesh tray is used to keep the product above the dryer floor			Tiwari (2016)
Solar cabinet dryer	• Cabinet made up of wooden or metal box • Trays or shelves were used to keep the product inside a drying cabinet	• Products are not exposed to the direct rays of the sun • Hence the loss of colour and vitamins is reduced • Heat storage systems can be applied	• Product in lower trays could be over-dried	FAO (1995)
Active solar cabinet dryer	• Optimum airflow can be provided in the dryer to control temperature and moisture	• Drying time is reduced by thrice with the use of forced convection and reduces the collector area by 50%.		Sreekumar (2010)

produce. It could be an ideal choice for food processing operations at the farm level. Hence, it eliminates expensive storage systems for fresh produce and also creates employment prospects for the rural population (Eswara and Ramakrishnarao, 2013).

The small scale dryer can be used to reduce the risk of spoilage of large quantity of agricultural crop due to weather as well as the solar dryer can be utilised for drying fruits and vegetables. The quality of dried products is found far better than sun-dried, as crops are not in direct contact with sunlight (Tiwari, 2016). There are different types of dryers, which can be used for drying of fresh produce, as explained in Table 1.

Solar concentrators for baking, cooking operations, and medicinal plant processing: In another study, it was observed that Scheffler concentrator of 10 m^2 had a successful application in bakery tasks. Single concentrator successfully baked 180 leaves of 200 g per day. The quality of the bread was excellent with excellent texture and puffiness. This study was conducted in March month, when the sun's intensity is not on its peak (Chandak *et al.*, 2006). While parabolic dish type concentrators can be used for boiling the herbs and syrups or kadha preparation, used in traditional herbal medicines, the product prepared using a solar concentrator has been found to be more potent in comparison to the product cooked traditionally (Chandak *et al.*, 2006).

Status of Research and Developments in India: Table 2 shows the research and development activities being carried out in India at various institutes during the past decade. It can be seen that the agricultural universities are mainly focusing on the development of crop dryers, there is only one institute (GADVASU) located in Punjab, which is focusing on the application of solar energy in milk processing. The various technologies explored in India are solar grain dryers, solar dryers for leafy vegetables, solar energy-based milk chilling technologies, solar milk steriliser, solar energy with thermal storage materials etc.

CONCLUSION

A large amount of energy is spent on heat generation in dairy and food industries all over the globe. India uses 100 million tons of oil a year, 40 per cent of which is used in industrial sectors. For this, 60-70 per cent is used in the form of thermal energy. The increasing population and limited conventional energy resources compel for switching to green energy resources. Among various green energy resources, solar energy is the best option for India

Table 2: Research and development activities being carried out in India at various institutes

Type of solar dryer/ appliance	Application	Reference
Solar cabinet dryer	Dry gum karaya	Ramakrishna Rao (2004)
Solar paraboloid concentrator (Department of Renewable Energy Sources, CTAE, Udaipur)	Melting of wax of capacity 5 kg/h	Maruti (2007)
Tunnel solar dryer	Drying of red pepper, turmeric, maize, paddy, green leafy vegetables	Sharma (2009)
Solar powered evaporative cooled rural storage structure for fruits and vegetables (Division of Agricultural Engineering, ICAR-Indian Agricultural Research Institute, New Delhi)	For storage of fruit and vegetables	Shekh (2015)
Solar poly-tunnel dryer (G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand)	Drying of herbs and spices	Bhat (2016)
On-farm solar dryer (Division of Agricultural Engineering, ICAR-Indian Agricultural Research Institute, New Delhi)	Drying of paddy	Dubey & Sharma (2018)
Solar milk sterilising vessel (GADVASU- Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana)	In-bottle milk sterilisation using a parabolic dish type solar concentrator	Jaglan (2018)
Solar thermal reservoir (GADVASU- Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana)	Milk pasteurisation in off peak sun hours	Sain *et al.* (2019a); Sain *et al.* (2019b)

as the country has plenty of solar energy availability, which is pollution-free and abundant in nature. The available sunshine can be used for almost every processing operation in the food and dairy processing sector like heating, cooling, transporting, lighting, etc. India has a large number of small-decentralized industrial units implementing this technology, but still more awareness and developed technologies are required for industrial heating applications. Despite heating applications, solar cooling is a major thrust area, which is not very common and needs a particular focus in terms of developing commercial solar energy-based refrigerating units.

REFERENCES

Ayadi, B.O.; J. Doell; M. Aprile; M. Motta and T. Nunez. 2008. Solar cooling system description. *Solar Energy Cools Milk*, 2: 2-12.

BEE. 2010. *A Report on Energy Conservation Achievements*, Raichur, Bellary and Koppal district co-operative milk Producers Societies union limited, Bellary Dairy, Karnataka.

Bhaskar. 2020. Online at https://www.moneycontrol.com/news/business/budget-2020-fm-sitharaman-proposes-doubling-milk-processing-capacity-by-2025-but-is-it feasible-4933011.html. (Accessed on 30 March 2020).

Bhat, M.S. 2016. *Developmental modification and performance evaluation of solar poly-tunnel drier for drying of herbs & spice*. Thesis. G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India.

Bhave. A.G. 2012. Industrial Process Heat Applications of Solar Energy. *International Journal of Modern Engineering Research*, 2(5): 3800-3802.

Biziak, R.B.; K.R. Swartzel and Jones. 1985. Energy use for continuous thermal processing of milk. Journal of Food Science, 50(6): 1607-1614.

Bordoloi, R.; K. Mahesh; S.P. Kumar; B. Sonmoina and R. Ankur. 2018. Low Cost Solar Tent Dryer -An Improved Tool for Quality Dry Fish Production for Increasing Farmers' Income. *Journal of Community Mobilization and Sustainable Development*, 13(3): 527-531.

Carr, A.; S. Fletcher; K. Mara and M. Rayner. 1999. *Solar cell principle and applications*, Australian CRC for Renewable Energy Ltd.

Chandak, A.; P. Sham, and S. Vilas 2006. *Solar energy for quality improvement in food processing industry*, Solar Cookers and Food Processing International Conference, Parque de las Ciencias, Granada, Spain.

Chopde. S.S.; S.S. Chopde; M.R. Patil and A. Shaikh. 2016. Solar technology: A way to the prosperity of Indian dairy industry. *Indian Journal of Dairy Science*, 69(4): 375-381.

Date, V. 2010. Financial feasibility of solar power project with reference to rural electrification of 39 talukas in Karnataka, By NICMR.

Desai, D.D.; J.B. Raol; S. Patel and I. Chauhan. 2013. Application of Solar energy for sustainable Dairy Development. *European Journal of Sustainable Development*, 2(2): 131.

Desai, H. and A. Zala. 2010. *An overview on present energy scenario and scope for energy conservation in Dairy Industry*. In National Seminar on Energy Management and Carbon Trading in Dairy Industry, Pp. 1-7.

Dubey, A. and P.K. Sharma 2018. Innovative On-Farm Solar Dryer for Paddy. *Agricultural Research New Series*, 40(1): 1-6.

Eswara, A.R. and M. Ramakrishnarao. 2013. Solar energy in food processing-a critical appraisal. *Journal of Food Science and Technology*, 50(2): 209–227. DOI: https://doi.org/10.1007/s13197-012-0739-3.

FAO. Agricultural services bulletin No.119, Food and Agriculture Organization of the United Nations, Rome, 1995.

FPI. 2016. Food Processing Industry – Mega Food Parks in India. Retrieved from https://www.pmfias.com/food-processing-mega-food- parks/. (Accessed on 5 April 2020).

Franco, J.; L. Saravia; V. Javi; R. Caso and C. Fernandez. 2008. Pasteurization of goat milk using a low cost solar concentrator. *Solar Energy*, 82(11): 1088-1094.

Jaglan, N. 2018. Process technology optimization for heat treatment of milk using solar concentrators, M. Tech thesis, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, India.

Jaglan, N.; A. Sharma; M. Sain and L. Singh. 2018. Solar technologies and Thermicmaterials for value addition to perishable commodities: Future research & development. *Green Farming*, 9(3): 534-540.

Jradi, M. and S. Riffat. 2014. Medium temperature concentrators for solar thermal applications. *International Journal of Low Carbon Technologies*, 9: 214-224.

Kedare, S.B.; D. Ashok; A.D. Paranjape and R. Porwal. 2012. ARUN Solar concentrator for industrial process heat applications. Retrieved from Google scholar.

Kreetz, H.; K. Lovegrove and W. Meike. 2000. *Solar PACES—Solar Thermal Concentrating Technologies*, Industrial Statistics, pp 121-129.

Maruti, P.R. 2007. *Design and Development of Paraboloid Solar Concentrator for Wax Melting*. Thesis. Department of Renewable Energy Sources, CTAE, Udaipur, Rajasthan, India.

MoFPI. Present status and future prospects of Indian food processing industries. Annual Report of Ministry of Food Processing Industries, 2003-04.

NDDB-National Dairy Development Board. Retrieved from https://www.nddb.coop/information/stats/milkprod-india, 2020 (Accessed on 25 May, 2020).

Pandey, M.M. and C.P. Gupta. 2004. *Pasteurization of Milk by Solar Energy*, Pergamon Press, New York.

Sain, M. 2019. *Study on development of solar energy based thermal reservoir for milk processing*. M. Tech thesis, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, India.

Sain, M.; A. Sharma; G. Talwar and N. Goel. 2019b. Thermic Fluid Based Solar Thermal Energy Storage System for Milk Processing. *International Journal of Current Microbiology and Applied Science*, 8(10): 1962-1973. DOI: https://doi.org/10.20546/ijcmas.2019.810.229

Sain, M.; A. Sharma; G. Talwar and N. Kumar. 2019a. Study on behaviour of thermal energy storage materials under conventional and solar heating systems. International Journal of Chemical Studies, 7(5): 732-738.

Schnitzer, H.; B. Christoph and G. Gwehenberger. 2007. Minimizing greenhouse gas emissions through the application of solar thermal energy in industrial processes: Approaching zero emissions. *Journal of Cleaner Production*, 15: 1271-1286.

Sharma, A.K.; C. Sharma; S.C. Mullick and T.C. Kandpal. 2017. Potential of solar industrial process heating in dairy industry in India and consequent carbon mitigation. *Journal of Cleaner Production*, 140: 714-724.

Sharma, A.; A.B. Agrawal and N. Shrivastava. 2018. Solar Energy based Refrigeration System using Peltier Device. *International Journal of Theoretical & Applied Sciences*, 10(1): 110-116.

Sharma, A.; A.B. Agrawal and N. Shrivastava. 2019. Thermoelectric Based Solar Powered Refrigeration System. *International Journal of Emerging Technologies,* 10(2): 365–370.

Sharma, A.; K. Kaur and S. Gupta. 2016. Design of a milk chilling system under country location. *Green Farming: International Journal of Applied Agriculture and Horticulture Science*, 7(1): 1-5.

Sharma, A. and P.S. Tanwar. 2019. Awareness Regarding Fuel Conservation to Motivate Rural Women Regarding Adoption of Solar Cooker at Household Level. *Journal of Community Mobilization and Sustainable Development*, 14(1): 195-199.

Shekh, M.M. 2015. *Development of solar powered evaporative cooled rural storage structure for fruits and vegetables*. Division of Agricultural Engineering, ICAR-Indian Agricultural Research Institute, New Delhi, India.

Shrivastava, A. and A. Khan. 2016. A Review of Three Level Inverters for Renewable Energy Resources System.

International Journal of Electrical, Electronics and Computer Engineering, 5(1): 67-74.

Sreekumar, A. 2010. Techno-economic analysis of a roof-integrated solar air heating system for drying fruit and vegetables. *Energy Conversion Management Journal*, 51: 2230-2238.

Tiwari, A. 2016. A Review on Solar Drying of Agricultural Produce. *Journal of Food Processing and Technology*, 7(9): 1-12. DOI: 10.4172/2157-7110.1000623.

Wikimedia Commons. 2008. Major crop areas India. Retrieved from https://commons.m.wikimedia.org/wiki/File:Major_crop_areas_India.png. (Accessed on 30 March 2020).

Zahira, R.; H. Akif; N. Amin; M. Azam and Z. Haq. 2009 Fabrication and performance study a solar milk pasteurizer. *Pakistani Journal of Agriculture Science*, 46(2): 162-170.

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Effect of Vocational Training Programme on Vermicompost and Other Organic Input Production as Income Generating Enterprise

R. Bezbaruah[1]* and R.S. Deka[2]

[1]Regional Agricultural Research Station, Assam Agricultural University, North Lakhimpur-787032, Assam

[2]KVK, Morigaon, Assam

ABSTRACT

The agrarian system of our country is in state of transition from subsistence oriented to commercialization. The modern farming system is gradually becoming unsustainable and the increasing problems of chemical agriculture, cost of cultivation and upsetting environmental as well as health impacts have many negative impacts over agrarian society. The vermicompost and organic input production plays a major role in organic production of all types of field crops, vegetables and fruits etc. Vermicomposting is a method of preparing enriched compost with the use of earthworms. It is one of the easiest methods to recycle agricultural wastes and to produce quality compost. This organic input production could become an income generating activity. Therefore a vocational training was conducted for rural youth and farmers (25-53 yr) of Bhurbandha, Morigaon for a period of 7d at Block office campus, Bhurbandha, Morigaon under Krishi Vigyan Kendra, Morigaon. The skill regarding production of vermicompost, azolla and pit compost were imparted to a group of 25 rural youth through lectures, demonstration and hand on training for different organic products like vermicompost, vermiwash, azoll, compost etc. After completion of the training course, the outcome was evaluated through a questionnaire using appropriate statistical tools like frequency and percentage. The study revealed that 45 per cent of the trainees of the rural youth adopted vermicompost production on a commercial basis as an income generating source

Keywords: Organic input, Vermicompost, Azolla, Composting

INTRODUCTION

Vermicomposting is a simple biotechnological process of composting, in which certain species of earthworms are used to enhance the process of waste conversion and produce a better end product (Gandhi *et al.,* 1997). It is one of the easiest methods to recycle agricultural wastes and to produce quality compost. Earthworms consume biomass and excrete it in digested form called worm casts. Worm casts are popularly called as Black gold. The casts are rich in nutrients, growth promoting substances, beneficial soil micro flora and having properties of inhibiting pathogenic microbes. Vermicompost is stable, fine granular organic manure, which enriches soil quality by improving its physicochemical and biological properties. Vermicompost is becoming popular as a major component of organic farming system. The earlier workers have also reported a positive effect of vermicompost application on growth and productivity of cereals and legumes (Banik and Bezbaruah, 2004). Bio composting process is the available means of converting various organic wastes generated from the industry and the agricultural sectors into beneficial products such as biofertilizers and as a soil conditioners (Radhakrishnan *et al.,* 2011). Azolla is a free floating water fern which lives in symbiotic association with a N-fixing Blue Green Algae (Anabaena azollae), has potential of providing 30-60 kg N/ha under normal field conditions. Because *Azolla* has a higher crude protein content (ranging from 19 to 30%). In Asia *Azolla* has been long used as green manure for crop production and a supplement to diets for pigs and poultry. Some strains of *Azolla* can fix as much as 2-3 kg of nitrogen/ha/day. The value of *Azolla* as a fish feed. Azolla compost is rich in nutrient content and very good supplement of N-fertilizer in soil. Compost manure as explained by Olaitan and Lombin (1988) is a mixture of partially decomposed organic materials. According to the authors, in the preparation of compost manure, two methods are used the stack and pit methods. The extent to which farmers formulates the above organic manures

*Corresponding author email id: ranjitabezbarua@gmail.com

especially for enhancing soil fertility depends on the knowledge of the farmers about plants parts that serve as organic manure and skills utilized in formulating organic manure.

Unemployment and underemployment are two major constraints in generating livelihood options for young farmers. Agripreneurship has been recognized as an effective means for economic transformation and poverty reduction. More than sixty per cent of India's arable land is under traditional agriculture where use of synthetic inputs are strictly avoided. Young farmers are active stake holders in the agri-preneurship design and are enable to transform rural communities in a sustainable basis. The youth in any nation is responsible for steady economic development and demographic evolution. India is an agrarian country and is having the largest democratic dividend as compared to other developing nations. But they have lack of education, limited vocational guidance and ineffective training facilities. Several studies mentioned about the prime preference of choosing agriculture as livelihood (Pawar, 1983; Banchare, 1989; Deshmukh, 2000; Gavit, 2012).

The modern farming system is gradually becoming unsustainable and the increasing problems of chemical agriculture, cost of cultivation and upsetting environmental as well as health impacts led organic farming to gain momentum as a new paradigm for ecological and economic sustainability in farming. Environmental concerns in India have enforced several NGOs and government agencies to promote organic farming (Sharma, 2011). Organic farming truly came into practice after the clear picture of negative effects of modern agriculture was realized in the late 1990's. Organic farming follows the principles of care, ecology, health and fairness for the interest of human, environment and soil welfare. The GOI started National Project on Organic Farming (NPOF), National Horticulture Mission, technology Mission for North-East and Paramparagat Krishi Vikas Yojana (PKVY) for promoting organic farming in India. An agri-entrepreneur is a person who recognizes an opportunity in agricultural sector and takes risks to pursue it. The qualities and skills of agripreneurs can be utilized for the establishment of various agricultural enterprises like dairying, sericulture, apiculture, floriculture, fisheries, poultry, piggery, composting unit etc. along with crops grown in the field. The objectives of the training is to make each farmer as well as rural youth self sufficient in its organic manure requirement thus reducing cost of cultivation of various crops, promoting organic farming through the use of organic manures such as vermicompost and reduced dependence on chemical inputs, to provide opportunities for generating additional income to the rural youths through sale of the compost, earthworms and vermiwash to promote entrepreneurship.

MATERIALS AND METHOD

Selection of the trainees and training imparted: A group of 25 rural youths and farmers (25-53 yr) were selected from five different villages Dandua, Bhurbandha, Rupohiborinigam, Borsola and Moirabari of Morigaon district based on their interest on agriculture. Out of 25 numbers 5 youths already have initiated the production of vermicompost on their own way without undergoing any skill training. There is need for other organic input production also with locally available raw materials. In order to sharpen their knowledge and skill, a vocational training programme on vermicompost production and organic input production of 7d duration was conducted by Krishi Vigyan Kendra, Morigaon during 30.10.2017 to 05.11.2017 at Block office Bhurbandha of Morigaon. The trainees prepared the vermicompost unit during hand on training. The method of vermicompost preparation included five components regarding vermicompost technology. These components categorized as (a) Preparation of vermicompost pit and shed. (b) Preparation of Vermi-bed and filling of vermicomposter. (c) Practices during vermicomposting. (d) Preparation of Vermi-wash and Vermi-culture. (e) Harvesting and packing of vermicompost. The data related to demographic profile (age, caste, income and education etc.) of the selected participants were collected on an interview questionnaire.

Intervention of training course: To evaluate the intervention of training course among participants post-testing was done using the well structured questionnaire and the impact of training was used to explore the new opportunities for vermicompost and other organic input production to generate income. In order to make improvement in the conductance of vocational training programme during near future, an attempt was made to get the feedback from training in which teaching, demonstration, fooding, time management and duration of training were evaluated.

RESULTS AND DISCUSSION

Demographic information: The data Table 1 on age wise distribution revealed that majority of the participants were above the age of 25 yr to 28 yr followed by 28-31 yr. The age profile showed that most of the men were

Table 1: Demographic profile of selected Trainees (n=25)

Characteristic	Percentage
Age (years)	
25-28	32
28-31	12
31-34	8
34-37	0
37-40	16
40-43	8
43-46	4
46-49	4
49-52	8
52-55	8
Caste	
General	36
OBC	48
ST	16
Education	
Illiterate	12
Primary	12
Middle	28
Matric	20
Senior Secondary	20
Graduate to P.G	8
Post Graduate	
Total monthly income	
Less than 10,000	12
10,000-20,000	24
20,000-30,000	32
30,000-40,000	16
40,000-50,000	12
>50,000	4
Adoption of training	
Domestic scale	53
Commercial scale	47

interested to start their own enterprise to earn something. The distribution of trainees on basis of caste revealed that majority belonged to OBC Caste (48%) followed by general category (36%). Regarding the education status, data revealed that 12 per cent of trainees were illiterate and 12 and 28 per cent of the subjects have passed up to primary level and middle standard, respectively. The data further showed that 20 per cent of the trainees have passed up to matriculation level as well as 20 per cent were educated

up to senior secondary and 8 per cent were educated up to graduate level, respectively. The data (Table 2) showed that only 12 per cent of the males were having average monthly income >Rs.40, 000/- and 16 per cent of the trainees were having between Rs. 30,000-40,000/-. It was found that majority of the selected trainees were having average family monthly income ranged from Rs. 20,000 - 30,000/- (32%) followed by 24% having in the range of Rs. 10,000-20,000/-.

Adoption of the vermicompost production technology: The response to prepare vermicompoting unit was highest at Moirabari compared to Rupohiborinigam and Dandua. The least response observed in case of Bhurbandha. It has been observed that younger farmers had acquired more skills in vermicomposting technology than older one. This observation is at par with Sushant Sourabh *et al.* (2018).

Feed Back: The data Table 2 on post testing revealed that majority of the trainees found that method of training

Table 2: Post Testing of training by trainees (n=25)

Characteristic	Percentage
Method of Teaching Theory	
Very Good	89.2
Good	10.8
Average	-
Poor	-
Method of Practical Demonstration	
Very Good	85.3
Good	13.2
Average	1.5
Poor	-
Need based	
Yes	100
No	-
Time (5 hrs)	
Adequate	93.2
More	-
Less	6.8

was very good (89.2%) and rest 10.8 per cent were found good. Similarly, 85.3 per cent of the trainees evaluated practical demonstration as very good while 13.2 per cent evaluated as good and rest as average (1.5%).

The training was found 100 per cent need based by the trainees. Related to timings of training 93.2 per cent of the trainee found it was adequate to acquire new skills for practical while rest (6.8%) were found inadequate.

CONCLUSION

It was inferred from the study that youths and farmers were satisfied with the training and they had developed the interest for preparation of vermicompost as a commercial basis. As large quantities of vermicompost required by many nurseries located around 20-25 km and they used to bring the vermicompost from far location of 200km away so if the youths and the farmers gradually build the units in a large numbers then marketing will not be a problem and thus automatically entreprenuremind set will take place. Extension workers can play a crucial role in helping agripreneurs in identifying, investigating and evaluating opportunities. Respect for organic farming should be built and more awareness should be created for recognizing the role of youth in agriculture. it is necessary to identify the training institutions providing trainings in agricultural sector (particularly KVKs) and whether the competency of the trainers motivate the youth to adopt the same can also be done. Despite having ample scope in agricultural enterprises, unmatched skill sets of youth force them to undertake labour operations (Das, and Amardeep, 2018). The need of the hour is to bring out the inner skill of the rural youths of the villages. These type of hand on vocational training would work as an motivation force for the unemployed rural youths.

REFERENCES

Banchare, T.S. 1989. A study of employment situation of tribal (Adivasi) people and their effect on some selected aspects of tribal life of Junnar block, Pune district. M.Sc. (Agri.) Thesis, M.P.K.V., Rahuri, (unpublished).

Banik, P. and R. Bezbaruah. 2004. Effect of vermicompost on rice (*Oryza sativa*) yield and soil fertility status of rainfed humid sub-tropics. *Indian Journal of Agricultural Sciences*, 74(9): 488-491.

Dash, D. and Amardeep. 2018. A Review on organic farming as a potential sector of agripreneurship development among the tribal youth of India. *International Journal of Agriculture, Environment and Biotechnology,* 11(5): 761-767.

Deshmukh, B.A. 2000. A study of tribal youth beneficiaries under TRYSEM programme from Ambegaon block of Pune district. M.Sc. (Agri.) Thesis M.P.K.V., Rahuri, (unpublished).

Gandhi, M.; V. Sangwan; K.K. Kapoor and N. Dilbaghi. 1997. Composting of household wastes with and without earthworms. *Environment and Ecology,* 15(2): 432–434.

Gavit, J.M. 2012. Indigenous communication system in Kokana tribes. M.Sc. (Agri.) Thesis, M.P.K.V., Rahuri, (unpublished).

Olaitan, S.O. and G. Lombin. 1988. Introduction to tropical soil science. London: Macmillan Intermediate Agriculture Series.

Pawar, H.S. 1983. A study of tribal farming system and constraints in the tribal agricultural development of Surgana taluka of Nashik district. M.Sc. (Agri.) Thesis, M.P.K.V., - Rahuri, (unpublished).

Radhakrishnan, S.; Anita Das; Ravindranath; U.S. Sarma and J. Nair. 2018. Azolla & soya hulls-substitutes for urea in coir pith composting using Pleurotus Sajor Caju *Krishi Vigyan,* 7(Special Issue): 44-47.

Sharma, A.K. 2011. The potential for organic farming in the Drylands of India, Central Arid Zone Research Institute (CAZRI), Jodhpur, India.

Sushant, S.; S. Kumari; Satyaprakash and D.U.M. Rao. 2018. Impact of vermicomposting technology training conducted by KVK in acquiring the skills by the respondents. *Int. J. Curr. Microbiol. App. Sci.,* 7(5): 3512-3521.

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Use of Audio Cassette Technology in Higher Agricultural Education: Constraints and Suitable Strategy for its Effective Utilization

O.P. Singh[1]*, Ruma Sharma[2] and A. Prasad[3]
[1]Assistant Professor (Extension Education), T.D.P.G. College, Jaunpur, Uttar Pradesh
[2]P.G. Student (Agri. Ext.), NDUAT, Kumarganj, Ayodhya, Uttar Pradesh
[3]Professor (Extension Education), Central Agricultural University, Imphal, Manipur

ABSTRACT

The term "agricultural education" has been referred as a collective term for all education in agriculture, encompassing plant and animal sciences, engineering, economics and others. If, ACT is fully exploited for educational system in our country, it may fulfill all the challenges and demand of educational needs of ever growing population. It is fact that ACT may not be at par with the printed literature, but it may reduce the consumption of paper and pressure on our forest resources at considerable extent and hand in hand, it may give a new dimension in the educational system of India. To know the constraints and suitable strategy for effective utilization of ACT in agricultural higher education in Uttar Pradesh, a study was conducted during the year 2008-10. Altogether, 135 number of students studying at two agricultural colleges in the state of Uttar Pradesh were randomly selected and constituted the sample size for present study. Percentage, mean, standard deviation were reckoned with the collected data for drawing the results. It was found that 93.33 per cent teacher respondents reported the major constraint as to use ACT for practical and field work topics whereas 97.04 per cent student respondents reported 1st rank to 20th constraint – "Extra-financial obligation required for ACT". On further analysis, it was found that 80.00 per cent of teachers had agreement with constraints number 7 and 8 where these two constraints got equal rank. Similarly, the state of rank of constraints number 3 and 17 and 6 and 12 were also equal reported by 40.00 per cent and 36.67 per cent teachers, respectively. In case of constraints experienced by the student respondents, the constraints number {VI - "It can't be introduced due to a lot of technical difficulties." and VIII – "It will be difficult to get cassette of our own choice."} had ranked 16th by 43.70 per cent respondents. The rank correlation of the constraints was highly significant which refers that the level of perception regarding the constraints of ACT introduction were almost the same among the teachers and students.

Keywords: ACT, Constraint, Higher Agricultural Education, Strategy, Technology

INTRODUCTION

The new higher educational system offers an exciting opportunity for innovation and experiment not only in particular discipline, but in multi-disciplines. It will be much comprehensive and in-depth rather an open-ended, experimental, multifaceted and evolutionary. It will attempt to convey an understanding of life and involve balancing and coordination of satisfaction along many dimensions rather than maximizing concerns along with narrowly defined dimension. It will entail an ecological and self realization ethics. It will be both creative and critical and focus attention on and reflect about the values of environmental quality. It may look to be somewhat fanciful to the conventional educationalist, but seems to be the only alternative to resolve the various conflicts and fundamental dilemmas of the higher education.

Higher education in India was initiated during British Rule. During 1857, Calcutta University, Bombay University and Madras University were established for undergraduate and post-graduate degree programmes. The Allahabad University was established in 1887. When India became independent, there were only 19 universities and 650 colleges. After independence, Government of India laid great emphasis and efforts for higher education programme in the country. Therefore, University Grant Commission was established in 1953 to give systematic and pragmatic approach to the higher education in the country. Presently, there are 400 universities and 20,000

*Corresponding author email id: opsinghgorakhpur10@gmail.com

colleges for higher studies. It is increasingly essential that agricultural education be further developed as a profession. We need leaders in our profession who will work together in charting a new course for the future. We need intellectual discussions and debate concerning the nature of our program. This intellectual discussion and debate will require for us that we become academicians and philosophers (McCracken, 1983).

Historically, the planned agricultural education was initiated in the country with the establishment of Imperial Agricultural Research Institute in 1903 at Pusa in Bihar with an objective to offer diploma courses and training in agriculture to desirous candidates. The institute, later on, was shifted to New Delhi in 1937 which is now known as Indian Agricultural Research Institute with the status of a Deemed University. Establishment of Imperial Agricultural Research Institute was followed by the establishment of five Agricultural colleges in 1907 to offer degree programmes in Agriculture. By the year 1947, there were 17 institutions offering basic first degree programme in Agriculture with an enrollment of 15,000 candidates. The candidates passing out from these institutions with either Diploma or Degree courses were mainly absorbed by the Government institutions for running various Departments.

Regular agricultural education was started in the beginning of the 20th century, yet the importance of agricultural education in India to meet the requirement of the farming community and food security of the country was realized only after the independence of the country in 1947 when there were 14 per cent literacy and 17 universities. The Govt. of India appointed an Education Commission in 1948 under the chairmanship of Dr. S. Radha Krishnan which recommended the establishment of Rural Universities in the country. Later on, two Indo-American study teams headed by Dr. R.K. Damale (1955) and Dr. M.S. Randhawa (1959) also recommended the establishment of Agricultural Universities on the Land Grand pattern of U.S.A. Consequently in 1960, the Govt. of India appointed an Agricultural University Commission headed by Dr. Raiph W. Cumings from the United States, which prepared the blue print and guidelines for the establishment of agricultural universities in different states. The first agricultural university was established at Pantnagar in 1960, which was a landmark in the history of agricultural education in India. It was a significant innovation and turning point for higher agricultural education system in the country. The appointment of another education commission by Govt. of India under the chairmanship of Dr. D.S. Kothari (1964-66) was yet another landmark in the history of agricultural education in India, which stressed the need and importance for an agricultural university in each state of the country. By 1968, there were eight Agricultural Universities in India. Presently, the country has 52 State Agricultural Universities, 5 Deemed Universities and three Central Agricultural Universities.

In addition, three Central Universities i.e., Banaras Hindu University, Vishva Bharati and Aligarh Muslim University also have strong programmes in agricultural education. There are 18 other general universities also offering UG and PG degree programmes in Agriculture. These institutions provide U.G. education in eleven fields of specialization in 194 constituent colleges with an intake capacity of above 15,520 graduate and 5,500 post-graduate students annually. Degrees are awarded in Agriculture, Veterinary Sciences, Agricultural Engineering, Forestry, Home Science, Horticulture, Food Science, Dairy Technology, Fisheries, Sericulture and Agricultural Marketing. There are 65 disciplines in which specialization at the P.G. programmes are available.

Today's education has been considered as – "a process of transformation for shaping our future in desired ways". Educators deliberately create the conditions by designing and developing the instructional system to direct teaching learning process for behaving the learners in a specified manner through which desired educational goals are achieved. Here so, instruction refers more or less preplanned goal directed teaching process. There are several methods of imparting instructions like lecture, discussion, talk, dramatization, tutorial, demonstration, field-experience methods etc. Instructional aids are backbone of teaching-learning process. With the rapid transformation of science and technology, mass media has become integral part of educational system and technology. Alarming population growth, increasing educational needs and making teaching learning more effective have forced the educationists to include the mass media and teaching aids for sharing the burden of teachers to cope up the situation.

A number of mass media like radio, television, video, computers, printed literatures etc. are helping learners in self learning process even in absence of a teacher. However, printed media like books are the major instrument in teaching-learning process as a supplementary aid. Growing educational concept, needs and population

explosion have increased the demand of paper for books, lecture notes monographs etc. Due to increasing demand of paper in teaching-learning process, the pressure on our forest has increased. Forests are vanishing and cost of paper is escalating day-by-day hence, it has become difficult to provide cheap printed material to masses under present education system. Today, India has only 22.5 per cent forest cover whereas, only 11 per cent is under closed forest. However, as per the environmental standards, country's 33 per cent geographical area should have forest cover. Alarming situation of environment specially the depletion of forest cover has compelled each and every one to find other supplementary alternatives to cope up the ever-growing demand of paper for our educational system and technology.

Breakthrough in technology has provided a number of electric and electronic means as alternate and helping hand in teaching-learning process to save our forest and environment. Word processors, CD-ROMs, electronic books, video technology, radio, television etc. are becoming common in view of the situation. Wonderful breakthrough in electronic publishing electronic books can be held in hand with tiny clicks of information to slot in, but such technologies are suitable to developed countries. It is not sustainable for the countries like India and other third world countries as well. However, radio, television, video and computers are being used in education since last two decades, but extensive use could not be made so far in Indian situations.

In an important study in Educational Technology entitled 'Big Media-Little Media', Wilbur Schramm (1973) has aptly mentioned that the developing countries especially count upon the media to raise the quality of instruction faster than it could be done by making changes in the teacher corps, to supplement even good teaching by adding learning experiences impossible to create in individual class rooms and to extend the reach of education to areas where schools and teachers are not otherwise available. In these less developed countries, the choice of instructional media represents a decision to invest scare resources. He opined "the richer countries can afford to make an occasional mistake in their investments in education; the less developed one, many of them already spending 25 per cent or more their annual budget on education, can hardly afford such a mistake".

The choice between big and little media is particularly important for the developing countries. Big media imply the more complex and costly devises of instruction such as television, films, video, computer etc. These are not only sophisticated and expensive but also require highly skilled and trained personnel for production and utilization of programmes. Little media means the less costly and less complex media like radio, tape recorder, film strip, slides, transparencies, maps, charts etc. New instructional technology and system has induced new communication technologies like television, video and radio in distance education. In India, these new communication technologies have numerous technical, financial, cultural, physical and like limitations. Therefore, there is need to study the viability of that instructional aid which is appropriate and sustainable in Indian situation.

Audio cassette technology (ACT) can overcome all those limitations and barriers which radio has. Moreover, induction of ACT in educational system may bring exciting results and from the pedagogical points of view in terms of knowledge, cognitive aspects and retention rates. Even further, there are many more other advantages in this medium like there will be fully control of learner on medium, easy availability of equipment, comparatively cheap, may interact with learner as both mass media and interpersonal. Therefore, if ACT is fully exploited for educational system in our country, it may fulfill all the challenges and demand of educational needs of ever growing population. It is fact that ACT may not be at par with the printed literature, but ACT may reduce the consumption of paper and pressure on our forest resources at considerable extent, hand in hand it may give a new dimension in the educational system of India. In view of the above facts, a study was planned to find out the constraints of ACT introduction in higher agricultural education and to evolve a suitable strategy for effective utilization of ACT in higher agricultural education.

MATERIALS AND METHODS

The State of Uttar Pradesh was selected as locale of the present study purposively being the home State and well versed with the socio-cultural as well as educational environment The State has three central universities, five Deemed Universities, three state agricultural universities and 38 other state universities. Excluding the three state agricultural universities out of 38 state universities, seven universities offer degree programmes in agriculture also through their affiliated colleges. It was difficult to conduct such type of study in all the colleges of all the seven state universities where agricultural higher education programmes

are being offered. Therefore, in view of objective of the study, only two state universities *i.e.,* Deen Dayal Upadhyay Gorakhpur University, Gorakhpur and VBS Purvanchal University, Jaunpur were selected purposively. The purposive selection of two universities was made because of maintaining accessibility, smooth collection of data and acquaintance as well as contacts with the officials and teachers of the universities. The agricultural higher education programmes are being run by 3 and 8 affiliated colleges of these two universities, respectively. To make the study in-depth, comprehensive and adequate size of sample, two affiliated colleges one each from two selected universities where agricultural courses at postgraduate degree programmes were offered randomly selected. These selected postgraduate agriculture colleges were Baba Raghv Das Post Graduate College, Deoria of Gorakhpur University and Sri Durgaji Post Graduate College, Chandesar, Azamgarh of VBS Purvanchal University, Jaunpur.

Further, in view of objective of the study, two categories of respondents *i.e.,* students and teachers were selected. To begin with the new approach of Audio Cassette Technology (ACT), the students of Post Graduate courses were selected on the basis of stratified random sampling method where in first stage, the courses of post graduate degree programme were selected. The affiliated Post Graduate Degree colleges of selected universities offer Post Graduate Degree programmes in 8 disciplines *i.e.,* Agronomy, Horticulture, Soil Science, Agriculture Botany & Genetics, Entomology and Agricultural Zoology, Agril. Economics, Agril. Extension and Animal Husbandry and Dairying. Out of 8 offered disciplines of Post Graduate Degree programmes, M.Sc. (Ag.) previous and final year students of five disciplines were selected randomly. These selected disciplines were Agricultural Extension, Agronomy, Horticulture, Agricultural Economics and Agricultural Zoology and Entomology. Thereafter, lists of students of each selected discipline were prepared separately. There from, 75 per cent students were selected from each list making the total size of student sample (135). Second category of respondents was of the teachers, who were selected purposively. Only those teachers were selected who were teaching the Post Graduate courses of selected disciplines during the investigation. The selected teachers were 30 in number as respondents.

Variables are the components, characteristics or dimensions around which the study made centered. Scientific social research requires to sharpen the formulated objectives by the selection of important and significant variables based on review of literature, experiences etc. The variable limits the study and provides direction of quantification in the light of objective, so the in-depth analysis can be made to arrive at any conclusion. In view of objective of the study, two types of variables were selected – independent and dependent variables.

The collected data were processed, classified and tabulated by giving scores to each appropriate answer. Further, the statistical treatments were applied in light of the objective to arrive at conclusions. The following statistical tools were used in the present investigation for precise and meaningful analysis and interpretation of the collected data. Frequency and Percentage, Standard Deviation (S.D.), Correlation test and Spearman's Rank Correlation were used for reckoning the result.

RESULTS AND DISCUSSION

As per objective this part deals with the extent and type of constraints which may come in the introduction of ACT as were perceived by the respondents. For this purpose, a questionnaire was prepared consisting of 20 statements related to probable constraints and the respondents were asked to give positive or negative response to each statement. Thereafter, percentages of respondents giving affirmative answers were calculated on the basis of total responses. Then, ranks were assigned to each constraint on the basis of percentage. A list of all the 20 probable constraints has been given in the Table 1.

Table 2 reveals that constraint (C_1) "Practical and field work cannot be explained through audio cassettes" ranked first as 93.33 per cent teachers and 91.93 per cent students ranked first to the constraint (C_{20}) *i.e.,* "it will be a costly affair in view of recurring cost of battery". It is in fact that where demonstration and practice are needed, ACT will not be appropriate and it is also fact that recurring cost of battery will be extra burden with books also, however, effective and interesting presentation of contents through audio cassettes, this barrier can be overcome. The 15th constraint *i.e.,* "it will not stimulate thinking" ranked last as 30.00 per cent teachers and 22.96 per cent students agreed with this constraint. However, any content of teaching material is always released when its presentation is interesting, effective and purposeful. The apprehension of this constraint may be rejected as ACT is being used under distance learning programme already by the number of universities.

Table 1: Different types of constraints as perceived by teachers and students

Constraint No.	Statements
C_1	Practical and field works cannot be explained through audio-cassette.
C_2	Agricultural courses cannot be taught through audio-cassette.
C_3	We are so much dependent on books and literatures that it is very difficult to introduce audio-cassette technology.
C_4	Preparing relevant and interesting course contents for audio-cassette is a very difficult task.
C_5	Audio-cassette and its equipments are very costly in comparison to books and printed materials.
C_6	It cannot be introduced due to a lot of technical difficulties.
C_7	It will be difficult to make such cassettes easily available.
C_8	It will be difficult to get cassette of our own choice.
C_9	Audio-cassette and its equipments require repair and maintenance.
C_{10}	It will change our teaching systems.
C_{11}	It will change life style of the students.
C_{12}	It will create noise pollution.
C_{13}	Introduction of ACT in higher agricultural education will drop the student attendance.
C_{14}	Checking of contents of audio-cassette will require more time in comparison to books at the time of purchasing.
C_{15}	It will not stimulate thinking.
C_{16}	Personal appearance is absent in audio-cassette in comparison to lecture or video.
C_{17}	It will be difficult to prepare assignment/notes through audio-cassette.
C_{18}	Availability of audio-cassette will create problem in controlling examination.
C_{19}	Audio-cassette library is required for its introduction in higher agricultural education.
C_{20}	It will be a costly affair in view of recurring cost of battery.

The first constraint *i.e.,* "Practical and field works cannot be explained through audio cassette" was agreed by 93.33 per cent teachers and 90.37 per cent students. It is fact that for practical and field oriented aspects, the students are required to have practice and experience, where the steps and explanation of practical and field aspects can be put in audio cassettes which will certainly help to the students to be on the tract for right approach. Moreover, no practical and field work can be done without theoretical concepts steps methods etc. which will certainly be a part of classroom teaching for which audio cassettes can be prepared.

The second constraint *i.e.,* "Agricultural courses cannot be taught through audio-cassette" was agreed by 43.33 per cent teachers and 50.37 per cent students. This is true for only a few course contents where real objects or specimens are necessary. As it is observed in earlier pages that audio-cassette can be effectively prepared on 83.92 per cent topics for teaching post-graduate courses hence, teaching through audio-cassettes is not a difficult task. Even through effective treatment and format of presentation in audio-cassettes can create real field situation. The third constraint *i.e.,* "We are so much dependent on books and literatures that it is very difficult to introduce audio cassette technology" ranked 15th and 14th by the respondents respectively. Their percentages were 40.00 and 53.33 of teachers and students, respectively who had agreed with this. It is not a constraint, rather it is a type of habit hence after repeated use of audio cassettes in teaching and learning, a habit of utilizing the course based audio cassette will be common among the students and teachers. The fourth constraint *i.e.*, "Preparing relevant and interesting course contents for audio-cassette is a very difficult task" ranked 11th and 13th in case of teachers and students, respectively as 60.00 per cent teachers and 62.96 per cent students agreed to this. Not by teachers alone but with the help of media experts and communication specialists, effective audio cassettes for agricultural courses can be prepared hence, it might not be a major constraint.

The fifth constraint *i.e.,* "Audio-cassette and its equipments are very costly in comparison to books and printed materials" ranked 10th and 12th in case of teachers and students, respectively as 63.33 per cent teachers and 68.89 per cent students agreed this. The government

Table 2: Perceived constraints and their ranking

Constraint	Teachers (n = 30)		Students (n = 135)	
No.	Frequency	Rank	Frequency	Rank
C_1	28 (93.33)	**1**	122 (90.37)	**3**
C_2	13 (43.33)	14	68 (50.37)	15
C_3	12 (40.00)	15	72 (53.33)	14
C_4	18 (60.00)	11	85 (62.96)	13
C_5	19 (63.33)	10	93 (68.89)	12
C_6	11 (36.67)	16	59 (43.70)	16
C_7	24 (80.00)	**5**	104 (77.04)	8
C_8	24 (80.00)	**5**	101 (74.81)	9
C_9	22 (73.33)	7	123 (91.11)	**2**
C_{10}	21 (70.00)	8	111 (82.22)	6
C_{11}	17 (56.67)	12	113 (83.70)	**5**
C_{12}	11 (36.67)	16	41 (30.37)	18
C_{13}	23 (76.67)	6	99 (73.33)	10
C_{14}	25 (83.33)	**4**	118 (87.41)	**4**
C_{15}	09 (30.00)	17	31 (22.96)	19
C_{16}	27 (90.00)	**2**	96 (71.11)	11
C_{17}	12 (40.00)	15	48 (35.56)	17
C_{18}	14 (46.67)	13	59 (43.70)	16
C_{19}	20 (66.00)	9	106 (78.52)	7
C_{20}	26 (86.67)	**3**	131 (97.04)	**1**

Figures in the parentheses indicate percentages

provides subsidy on educational papers and books likewise, the educational audio-cassettes may be available to students on subsidized rates. Moreover, bulk production of audio cassettes would be relatively cheaper than books or printed matters.

The sixth constraints *i.e.,* "It cannot be introduced due to a lot of technical difficulties" was agreed by 36.67 per cent teachers and 43.70 per cent students. It is not a major constraint because recording and playing of audio-cassettes and handling of its equipment is very simple. Moreover, the production will certainly be cared by the experts and technical staff. The seventh constraint *i.e.,* "It will be difficult to make such cassettes easily available" ranked 5th and 8th among teachers and students, respectively and 80.00 per cent teachers and 77.04 per cent students had agreed with it. In the beginning availability of such cassettes might be difficult but after constant use in teaching and learning the demand will increase and increased demand of such cassettes would be easily available in due course of time as the books are available in the market.

The eight constraint *i.e.,* "It will be difficult to get cassette of our own choice" ranked 5th and 9th among teachers and students, respectively and 80.00 per cent teachers and 74.81 per cent students were agreed with it. This is true that there is limited choice in case of educational audio cassette, but when use of audio-cassette will be common among the students and teachers the availability of desired cassettes may not be constraint. However, the audio cassette libraries can be established as the book-libraries, where cassettes of all choice can be stocked.

The ninth constraint *i.e.,* "Audio cassette and its equipments require repair and maintenance" ranked 7th and 2nd among teachers and students, respectively and 73.33 per cent teachers and 91.11 per cent students were agreed with this. The maintenance of audio-cassettes and its equipments is very simple and hence, it may not be a major constraint. The tenth constraint *i.e.,* "It will change our teaching system" was agreed by 70.00 per cent teachers and 82.22 per cent students. The change is a gradual phenomenon and desirable change is necessary for the present educational system and needs, therefore, it is not a constraint at all. The eleventh constraint *i.e.,* "It will change life style of students" was agreed by 56.67 per cent teachers and 83.70 per cent students. ACT is nothing to do with life style of students. It will simply motivate attentive listening habit of students and hence it may not be a constraint at all. Moreover, the use of audio cassettes for entertainment is the part of life of people today. The twelfth constraint *i.e.*, "it will create noise pollution" was agreed by only 37.67 per cent and 30.37 per cent teacher and student respondents, respectively. The constraint was ranked 16th and 18th, respectively. The 13th constraint i.e., "Introduction of ACT in higher agricultural education will drop the student attendance" was agreed by 76.67 per cent teachers and 73.33 per cent students. In most of the agricultural institutions attendance is compulsory and the purpose of ACT is not to replace teachers but to supplement agricultural teaching as the books are available, therefore, it may not be a constraint. The fourteenth constraint *i.e.,* "Checking of contents of audio-cassette will require more time in comparison to books at the time of purchase" was ranked 4th and agreed by 83.33 per cent teachers and 87.41 per cent students. In books, simply written contents are seen but in audio cassette checking

the contents would also give the idea about tone, stress and style of presentation of the contents in the audio-cassette and time is not a limiting factor in this case.

The fifteenth constraint i.e., "It will not stimulate thinking" was ranked 17th and 19th by 30.00 per cent teachers and 22.96 per cent student – respondents who had agreed with it. Several studies have proved that retention through listening is more than simply reading and also listening would quickly stimulate thinking regarding contents of the audio cassette. Hence, this may not be a constraint.

The sixteenth constraint i.e., "personal appearance is absent in audio cassette in comparison to lecture or video" was ranked 2nd and 11th by 90.00 per cent teachers and 71.11 per cent student – respondents, respectively. It is true but ACT will substantiate in learning process like book and liked material. However, ACT never advocates the replacement of teachers. In the similar fashion, as far as the constraint (C_{20}) *i.e.* "It will be a costly affair in view of recurring cost of battery" was perceived by 86.67 per cent teachers and 90.04 per cent students. Their reported ranks were 3rd and 1st, respectively. It is agreed that the ACT will add to expenses of students. However, in view of number of advantages, ACT may be accepted.

The Table 2 also highlights that 80.00 per cent of teachers had agreement with C_7 and C_8 where, these two constraints got equal rank. Similarly, the state of ranks for C_3, C_{17} and C_6, C_{12} were also equally reported by 40.00 per cent and 36.67 per cent teachers, respectively. In case of constraints experienced by the student respondents, the constraints number 6 and 8 had ranked 16th by 43.70 per cent respondents. The rank correlation of the constraints was highly significant which refers that the level of perception regarding the constraints of ACT introduction were almost the same among the teachers and students.

Table 3 reveals the association of independent variables with constraints of audio cassette technology introduction in higher agricultural education among students. The table reveals that all the independent variables were non-significantly and negatively associated with constraints of ACT introduction in higher agricultural education. This points out that in case of students constraints of audio cassette technology introduction in higher agricultural education were not significantly affected by age, education, income, academic contact and media exposure.

Table 3: Relationship of selected independent variables with constraints among students

Independent variable	Zero order Correlation "r" value
Age	– 0.063
Income	– 0.032
Academic contact	– 0.047
Media exposure	– 0.016

Table 4: Relationship between selected independent variables with constraints among teachers

Independent variable	Zero order Correlation "r" value
Age	0.43*
Teaching experience	0.19
Income	0.18
Academic contact	0.09
Media exposure	0.16

*Significant at 0.05 level of probability.

Table 4 reveals that in case of teachers, except age, all the independent variables were not significantly associated with constraints of ACT introduction in higher agricultural education. Age was positive and significantly associated with constraints of ACT introduction in higher agricultural education. It means that older age teachers were able to identify more constraints of ACT introduction in higher agricultural education than the young age teachers.

CONCLUSION

ACT can overcome all those limitations and barriers which radio has. Moreover, induction of ACT in educational system may bring exciting results from the pedagogical points of view in terms of knowledge, cognitive aspects and retention rates. If, ACT is fully exploited for educational system in our country, it may fulfill all the challenges and demand of educational needs of ever growing population. However, it was found that 93.33 per cent teachers reported the major constraint as to use ACT for practical and field work whereas 97.04 per cent students reported 1st rank to the constraint "Extra-financial obligation required for ACT". Further, the rank correlation of the constraints was highly significant which refers that the level of perception regarding the constraints of ACT introduction were almost the same among the teachers and students. Such study may be conducted in future in other parts of the country to support the existing educational policy of Government of India.

REFERENCES

Barrick, R.K. 1987. Agricultural Education: Building upon our roots. Jr. of Agril. Education, USA, Wiuler 1989, pp. 24-29.

Kumar, S.; Sangeetha, V.; Singh, Premlata; Burman, R.R.; Bhowmik, A. and Venkatesh, P. 2017. Factors influencing stakeholders to use Rice Knowledge Management Portal (RKMP). *Journal of Community Mobilization and Sustainable Development*, 12(2): 179-187.

Malik, C.P. and H.L. Patel. 1990. Factors related with job satisfaction in university teachers. *Maharashtra Journal of Extension Education,* 7: 42-45.

McCracken, J.D. 1983. A profession in need of academicians. *The Journal of the American Association of Teacher Educators in Agriculture,* 24(1): 2-12.

Mohan, B.M., Tripathi, J.D. and Sujan D.K. 1991. Audio Cassette Technology for the flow of agricultural information. *Indian Journal of Extension Education*, 27(1&2): 130-132.

Sawant, G.K. and Khuspe. 1986. Teaching methods and aids used by the teachers of Mahatma Phule Agriculture University, Rahuri : A case study. *Indian Journal of Extension Education*, 17(1&2): 90-94.

Shenoy N. Sandhya. 2012. Farm women empowerment through ICTs interaction: A lead paper presented in the 6th National Seminar on Emerging Challenges and Paradigm for Sustainable Agril. Development held during Dec. 18-20, 2012 & published in the special issue (Souvenir and Compendium) of the *Journal of Community Mobilization and Sustainable Development*, pp. 34-45.

Zhao, Y. and R. Zhang. 2009. Perceived information needs and availability: results of a survey of small dairy farmers in Inner Mongolia. *Inf. Research,* 14(3): 14-18.

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Access and Use of Information and Communication Technologies by the Farmers: A Case Study of Punjab

Mohammad Farooq Sahar[1]* and Dharminder Singh[2]

[1]M.Sc. Student, [2]Senior Scientist, Department of Extension Education, Punjab Agricultural University, Ludhiana-141004, Punjab

ABSTRACT

Information and communication technology (ICT) is an emerging way of disseminating farm information. The present study was conducted to evaluate accessibility and usage pattern of ICTs among members of progressive farmers association. Data were collected from randomly selected 120 respondents with the help of structured interview schedule. All the respondents owned mobile phones and internet connections. Study revealed that WhatsApp was most preferably adopted ICT and accessed by 93.40 per cent respondents followed by use of YouTube (76.16%), Facebook (59.16%) and PAU farmer portal (29.17%) for acquiring farm information. ICT tools helped the respondents accessing information regarding availability of inputs, crop production, quality of inputs and marketing of produce. Each respondent were usually found to receive 94 WhatsApp messages, linked to 356 farmers through Facebook and farmers' mean usage time for ICTs was also calculated. Age and farming experience of the respondents found to be negatively correlated to the ICT use, however education of the respondents exhibited significantly positive correlation. Study suggests strengthening of ICT based extension services and foster competency skills of stakeholders and extension personnel in use of ICT tools.

Keywords: ICT, Usage, WhatsApp, Facebook, YouTube, Farmer Portal, Problems

INTRODUCTION

Agriculture contributes around 17 per cent to GDP and continues to be among the most important sectors in India. Around 58 per cent of the Indian population depends on agriculture for their livelihood. The changing scenario demands people to adapt new ways for updating their skill and knowledge by using information communication technology. Information plays an important role in advancement of all societies. It increases the value and productivity of land, labor and capital to meet people's needs and wants. It is one of the key inputs in agriculture and information deficits constrain agricultural productivity. Relevant, reliable, useful and timely available information can augment the agricultural productivity (Arendt, 2007). Indeed, agriculture is becoming increasingly knowledge-intensive. Small-scale farmers make up about 70 per cent of India's farming community, but experience deep economic and social inequities in comparison to large land-holding farmers. Indeed, recent studies have revealed that most small-scale farmers no longer view farming as a sustainable livelihood source (Gandhi, 2015). Farmers are using ICT because it has ability to connect with farmers, agribusiness and agri experts over a geographical distance. Up to certain extent ICT in agricultural marketing provides solutions to the agricultural marketing problems. The main purpose of ICT is sharing information and creating awareness. The most popular ICT tools among farmers is Facebook, Twitter, YouTube, LinkedIn, WhatsApp etc., which facilitates sending images, pictures, links, videos etc. This sharing of information facilitates the marketing of farmers produce and formation of network. There are many blogs covering agricultural marketing related information (Raj and Bhattacharya, 2017). Similarly, BSNL, Reuters Market Light (RML), Nokia Life Tools, Fisher Friend Project, Rubber Board and Department of Agriculture, Haryana State provide services through SMS and Voice messages containing agriculture related information like market price, weather updates, news on agricultural policies and best agricultural practices (Fafchamps and Minten, 2011 and Saravanan, 2010). ICT is now a mainstream form of communication around the world, and continues to grow in popularity with the increase in the number of smart phones. However, it has not been widely accepted in agriculture in India (Panda *et*

*Corresponding author email id: farooqsahar.swabi@gmail.com

al., 2019). Information and Communication Technology (ICT) has great potential to improve the present agricultural extension. Survey showed that 60 per cent of farm households did not access any information on modern technology (Agha *et al.,* 2018). India has more than 1026.37 million smartphone users (Anonymous, 2019). In the state of Punjab have around 30.92 million mobile phones users (Anonymous, 2019a). Farmers are using ICT to access information regarding weather, different varieties, and cultural operations etc. in minimal time. The present paper attempts to evaluate accessibility and usage pattern of ICT among progressive farmers in Punjab.

MATERIAL AND METHODS

The study was conducted among the progressive farmers of Punjab state. PAU *kisan club* was started in 1966 by progressive farmers of Punjab with the objective to acquire and share scientific information among farming community. A list of active members of PAU *Kisan* club was obtained from the Directorate of Extension Education, PAU Ludhiana and 120 active members of PAU *Kisan* Club was selected randomly for the present study. The farmer who has attended at least 75 per cent of the meetings of PAU *Kisan* Club in last one year was considered as an active member. The most commonly used information communication technologies (ICTs) like WhatsApp, Facebook, Websites (PAU farmer portal), YouTube was taken for the present study. Access and usage of ICTs were included as dependent variables in the study. The indicators used in measuring the dependent variables were accessibility, availability, frequency of usage, time of use, subscription or membership and purpose of usage. Data was collected from the selected respondents with the help of structured interview schedule by providing them necessary instructions after explaining the objectives of study. The data was tabulated on master sheet using MS-Excel for further processing and analyzed with the help of statistical tools, i.e. frequencies, percentage, range methods.

RESULTS AND DISCUSSION

Results observed from Table 1 indicate that, all of the respondents has accessibility to smart phone, 98.34 per cent of them owned Television, 31.66 per cent of them had radio, 37.70 per cent of them owned computers, and 24.17 per cent of them owned (feature phone) mobile. All the respondents have mobile internet connection while they have also used some others ways for internet connectivity like 5.00 per cent of the respondent had used Wi-Fi internet connection, 10.84 per cent of the respondent had used internet with wireless dongle and very less numbers 6.70 per cent of the framers had used internet connection through landline phones, respectively. These findings of the study are in line with those of Ramaraju *et al.* (2011); Singh *et al.* (2009); Mohammad and Salleh (2011); Ansari and Pandey (2011) and Sharma *et al.* (2012).

Data in Table 2 also revealed that farmers were using different ICT tools (Facebook, WhatsApp, Twitter, YouTube, PAU farmer portal) for various reasons or

Table 1: Accessibility of ICT tools to respondents (n=120)

ICT tools	Frequency	Percentage
Mobile (feature phone) mobile	29	24.17
Smart Phone	120	100.00
Computer	43	37.70
Radio	38	31.66
TV	118	98.34
Internet		
Land Line	8	6.70
Wireless/Dongle	13	10.84
Wi-Fi	18	15.00
Mobile internet connection	120	100.00

Table 2: Reasons expressed by the respondents for use of different ICT tools (n=120)

S.No	ICT*	Agricultural	Entertainment	Shopping	Networking	News	Mean overall score	Rank
1	WhatsApp	112(93.4)	105(87.5)	19(15.84)	26(21.66)	71(59.17)	2.78	I
2	Facebook	71(59.16)	60(50.00)	33(27.50)	47(39.16)	55(45.83)	2.22	II
3	YouTube	92(76.16)	85(70.84)	15(12.50)	_	42(35.00)	1.94	III
5	PAU Farmers Portal	35(29.17)	-	-	-	-	0.29	IV
4	Twitter	_	5(4.33)	_	_	4(3.33)	0.075	V

*multiple response; *figures in parentheses are the percentages to total

purposes like agriculture, news, entertainment, shopping and social networking. WhatsApp was found to emerge as an important source of farm information and it was used by 93.40 per cent respondents for acquiring farm information. WhatsApp was also used as a source of entertainment by 87.50 per cent of respondents followed by News (59.17%), social networking (21.66%) and shopping (15.84%). Most of the respondents have used Facebook (59.16%) to get farm information followed by entertainment (50%), social networking (39.16%), news (45.83%) and shopping (27.80%).

Similarly, YouTube was used by 76.16 per cent of farmers for getting farm information. Other purposes of its use were entertainment (70.84%), news (35.00%) and shopping (12.50%). PAU farmer portal served the information needs of 29.17 per cent of respondents for agricultural purposes. Only few of respondents were using Twitter for entertainment (4.33%) and news (3.33%), however none of the respondent were found to be using Twitter for getting farm information. On the basis of calculated mean overall scores, WhatsApp emerged as most frequently used ICT tool with overall mean score of 2.78 (Rank 1st), measured by Facebook with overall mean mark of 2.22 (Rank 2nd). However, Twitter was the least used ICT tool with overall mean score of 0.075 and ranked fifth. These findings are supported to the study of conducted by Kothilhane (2003) and Mooventhan and Philip (2012).

Crop Production: Table 3 reveal information of respondents on ICT platforms like Facebook, WhatsApp, YouTube and PAU farmer portal for accessing information on different crop production aspects. Majority of the farmers had used WhatsApp to acquire information on plant protection (61.67%), agricultural machinery (58.33%) and crop varieties (59.20%). To access Information related to vegetable cultivation, soil testing and weather, it was found that the usage of WhatsApp is very low and only 18.33 percent, 21.67 per cent and 21.67 percent of respondents had used for these aspects, respectively. Majority of the farmers expressed that they had used Facebook for accessing information related to agricultural machinery (46.67%) and agro-processing (46.67%). Usage of Facebook by farmers was lesser for accessing information related to plant protection (20.83%) and water management (21.60%) aspects.

YouTube which is useful in acquiring information both in audio and video form was also found to be popular among respondents. Most of the respondents reveal that they had used YouTube to acquire information on organic farming (56.67%), vegetable cultivation (53.98%) and soil testing (51.72%). Respondents have also used YouTube for acquiring information related to agricultural machinery. PAU farmer portal maintained by Punjab Agricultural University was introduced recently during the years 2016-17 and therefore it can be observed that the usage of this platform for acquiring information by sampled farmers is low. About one-fourth of farmers had used this platform for acquiring information on soil testing and plant protection related aspects. These findings are in line with research studies conducted by Kothilhane (2003); Phand (2008) and Kailash *et al* (2017).

Table 3: Distribution of the respondents on the basis extent of ICT usage for accessing information on crop production (n=120)

Aspects	WhatsApp	Facebook	YouTube	PAU farmer portal
Crop varieties	71(59.2)	33(27.50)	40(33.33)	23(19.16)
Soil testing	26(21.67)	36(30.00)	60(51.72)	30(25.03)
Weather forecasting	26(21.67)	42(36.21)	_	19(15.84)
Water management	40(33.33)	26(21.6)	43(35.83)	26(23.01)
Plant protection	74(61.67)	25(20.83)	47(39.17)	32(26.67)
Organic farming	40(33.33)	36(30.00)	68(56.67)	25(20.83)
Agro Processing	33(27.50)	56(46.67)	47(39.17)	25(20.83)
Vegetable cultivation	22(18.33)	40(33.33)	61(53.98)	18(15.00)
Fruit production	63(52.50)	40(33.33)	29(24.17)	21(18.10)
Agricultural machinery	70(58.33)	56(46.67)	25(20.83)	15(12.50)

*figures in parentheses are the percentages to total

Marketing of Produce: Data in Table 4 revealed that respondents were using different ICT tools like Facebook, WhatsApp, YouTube and PAU farmer portal for accessing information related to marketing of their produce. It can be found that Facebook was used by 76.67 per cent of the respondents for getting price related information and 41.67 per cent of the respondents was using it for getting information regarding nearest market.

Similarly, WhatsApp was accessed by 70.80 per cent of the respondents for getting price related information. Nearly half of the respondent (55.0%) used it for getting nearest market related information whereas, 23.33 per cent of the respondents used it for getting information regarding international market. YouTube was used by 59.20 per cent of the farmers for getting information regarding international market and 54.20 per cent of the respondents used it to know nearest market. PAU farmer portal was used by 26.67 and 12.82 per cent of the respondents for information related to price and post-harvest management, respectively. Findings confirm the observation of Mwakaje (2010) and Khan *et al.* (2018).

Farm Input Supply: Data in Table 5 revealed that majority (59.2%) of the respondents used WhatsApp for getting farm information related to purchase of seed and fertilizers. Also 45.00 per cent of the farmers used it for getting information related to availability and purchase of pesticides.

Similarly, 45.00 per cent of the farmers had used Facebook for getting information regarding seeds and fertilizers, whereas 35.83 per cent of the farmers used it for getting information related to purchase of pesticides. As many as 41.67 per cent of the farmers took help of YouTube regarding purchase of pesticides whereas, 17.50 per cent of the farmers used it for getting awareness related to seeds and fertilizers. PAU farmer portal was used by 27.50 per cent of the respondents for getting farm information related to pesticides followed by 24.17 per cent of the farmers who used it for getting farm information regarding seeds and fertilizers. It can be concluded that farmers were using WhatsApp preferably for getting information related to supply of farm inputs for their crops. These finding are in line with those of Kailash *et al.* (2017).

Agriculture support services: Respondents were also using different ICT tools like Facebook, WhatsApp, YouTube, PAU Website, PAU Farmer portal for various agricultural support services like trainings, subsidiary occupations, land records, subsidy and animal husbandry aspects.

Data in Table 6 reveals that PAU farmer portal was accessed by 24.17 per cent of the farmers for getting training courses information whereas 21.67 per cent of respondents used WhatsApp for getting similar information. YouTube was watchfully used for acquiring information related to subsidiary occupations and 40.83 per cent of the farmers used it for this purpose, besides use of Facebook, WhatsApp and farmer portal. It is evident from the data that WhatsApp was the most frequently used ICT and it served the information related to animal husbandry, subsidy and land record to 50.00, 40.83 and 18.33 per cent of respondents respectively. None of the respondents has used PAU farmer portal for accessing information on subsidy and land record due its

Table 4: Distribution of the respondents according to use of ICT for accessing market information (n=120)

Aspect	WhatsApp	Facebook	YouTube	PAU farmer portal
Market rates	85(70.80)	92(76.67)	47(39.1)	32(26.67)
Nearest market	66(55.00)	50(41.67)	65(54.2)	_
International market scenario	28(23.33)	35(29.17)	71(59.2)	—
Post- harvest Information	21(17.50)	29(24.17)	35(29.17)	15(12.82)

*Figures in parentheses are the percentages to total

Table 5: Distribution of the respondents on the basis use of ICT for accessing supply information (n=120)

Aspect	WhatsApp	Facebook	YouTube	PAU farmer portal
Seeds & Fertilizers	71(59.2)	54(45.00)	21(17.50)	29(24.17)
Pesticides	54(45.00)	43(35.83)	50(41.67)	33(27.50)

*Figures in parentheses are the percentages to total

Table 6: Use of ICT by the respondents for accessing information related to agriculture support services (n=120)

Aspect	WhatsApp	Facebook	YouTube	PAU farmer portal
Training courses	26(21.67)	11(9.17)	19(15.84)	29(24.17)
Subsidiary Occupation	32(26.67)	36(30.00)	49(40.83)	25(20.83)
Animal husbandry	60(50.00)	39(32.50)	26(21.67)	18(15.00)
Subsidy information	49(40.83)	43(35.83)	36(31.03)	-
Land record	22(18.33)	—	15(12.50)	-

*Figures in parentheses are the percentages to total

non-availability on the portal. These finding of the study supported by study of Barau and Afrad (2017) and Agha *et al.* (2018).

ICT usage time: Data regarding ICT usage time by the respondents for agricultural and others purposes is presented in the Table 7. It is evident from the data that nearly half of the respondents (54.17%) used Facebook for 30 to 60 min, whereas 13.33 per cent of the respondents spent more than 60 minute per day on Facebook. Also 32.50 per cent of the respondents used Facebook for less than 30 minutes. About one-fourth (24.17%) of the respondents used WhatsApp for more than 60 minutes per day, while 52.50 per cent of the respondents used WhatsApp about 30 to 60 minutes per day and only 23.33 per cent used WhatsApp for less than 30 min. It was also found that Twitter as used by 6.67 per cent of the respondents for less than 30 minutes per day for accessing farm and other information. It was clear from the data that YouTube was accessed by 11.67 per cent of the respondent for more than 60 minutes per day and 56.67 per cent of the respondents used YouTube for 30 to 60 minutes per day and only 31.67 per cent of the respondents used YouTube less than 30 minutes per day. It can be concluded from the data that farmers spent more time on WhatsApp (45.05 min/day), Facebook (38.22 min/day) and YouTube (35.48 min/day) while Twitter was the least accessed ICT tool by the respondents.

Data regarding various aspects of WhatsApp use is presented in the Table 8. It is evident from the data that majority of farmers (59.17%) were the members of less than four WhatsApp groups while 30 per cent of the respondents had membership in the range of 5 to 8 and only 10.83 per cent of the respondents had membership of more than eight groups. In the case of daily messages, 45.83 per cent of the respondent received 50-100 messages per day, while 29.16 per cent of them received 100-150 messages per day. However, 14.16 per cent of them have received less than 50 messages per day and only 10.83 per cent has received more than 150 messages per day for

Table 8: Distribution of the respondents on the basis various aspects of WhatsApp use (n=120)

Aspects	Category	Frequency	Percentage
Membership of	< 4	71	59.17
WhatsApp groups	5-8	36	30.00
	>8	13	10.83
Number of messages	<50	17	14.16
received per day	50-100	55	45.83
	100-150	35	29.16
	>150	13	10.83
Admin of WhatsApp	0	88	73.33
groups	1-2	23	19.16
	> 2	9	7.5

Table 7: Distribution of the respondents according to their ICT usage time (n=120)

ICT	ICT usage time (min/day)			Mean usage
	< 30	30 to 60	> 60	time(min/day)
Facebook	39(32.50)	65(54.17)	16(13.33)	38.22
WhatsApp	28(23.33)	63(52.5)	29(24.17)	45.05
Twitter	8(6.67)	0	0	1.20
YouTube	38(31.67)	68(56.67)	14(11.67)	35.48
PAU farmer portal	33(27.50)	0	0	2.95

getting farm information. On an average respondents were found to be receiving 94 WhatsApp messages daily. It is also seen that 19.16 per cent of the farmers acted as administrator of different WhatsApp groups.

The data revealed in Table 9 that the majority of the farmers (51.80%) followed 5-10 Facebook pages, whereas 36.60 per cent of the farmers were found to be following more than 10 pages at Facebook. None of the respondents had developed own page on Facebook. Majority of the respondents (60.84%) were friend with 101-500 persons on Facebook, while 23.33 per cent have more than 500 friends on Facebook. Remaining 15.83 per cent of the respondents has less than 100 numbers of friends on Facebook. On an average, each respondent was found to be connected to 356 persons through Facebook.

The data in Table 10 showed that more than half of the respondents (67.50%) had subscribed to less than five YouTube channels followed by slight more than one third of the farmers (32.50%) had subscribed 5-10 channels and no one had subscribed more than 10 channels. None of the respondents had developed their own YouTube channel.

Socio-economic variables of the respondents were correlated with use of ICT and data were presented in

Table 9: Distribution of the respondents on the basis of various aspects of Facebook usage (n=120)

Aspects	Category	Frequency	Percentage
Facebook pages followed	<5	14	11.7
	5-10	62	51.8
	>10	44	36.6
Developed own pages on Facebook	0	120	100.00
Numbers of Facebook	<100	19	15.83
friends	101-500	73	60.84
	>500	28	23.33

Table 10: Distribution of the respondents on the basis of various aspects of YouTube use (n=120)

Aspects	Category	Frequency	Percentage
Subscribing of	<5	81	67.5
YouTube channels	5-10	39	32.5
	>10	00	00
Developed own YouTube channels	0	120	100.00

Table 11: Association between satisfaction levels regarding ICT with independent variables

Variables	Pearson Correlation Use of ICT
Age	-0.311**
Education	0.246**
Number of family members	-0.027
Operational land holding area (acres)	-0.100
Experience in farming	-0.265**

**Significant at the 0.01 level

Table 11. ICT usage time for each respondent was worked out and summed up to get the overall ICT use time score for each respondent. It is evident that age and farming experience exhibited negative significant relationship with ICT usage time by the farmers at one per cent level of significance. It could be inferred that elder and more experienced farmers will likely to spend lesser time on ICT usage. Results also show that education of respondents were found to be positively and significantly correlated to ICT usage time by the farmers at one per cent level of significance. It implies that more educated the farmer is, more likely he may use the ICT for getting farm information.

CONCLUSION

ICT are the important tools for dissemination of farm information. Study analysed the level of accessibility and usage pattern of ICT among progressive farmers of Punjab. Farmers were found to access ICT to seek information services on availability of inputs, crop production, quality of inputs and marketing of produce. WhatsApp were assessed as most preferred tool for getting farm information, followed by Facebook and YouTube. Age, education and experience of farmers exhibited effect on use of ICT by them. Findings of the study suggest strengthening of ICT based extension services to reach large number of farmers. Furthermore, stakeholders and extension personnel should be provided required technical support in development and use of ICT tools.

REFERENCES

Agha, N.; B.S. Ghanghas and P.K. Chahal. 2018. Use of Information and Communication Technologies by Extension Personnel to Disseminate Agricultural Information. *Int. J. Curr. Microbiol. Appl. Sci.,* 7: 1369-1377.

Anonymous. 2019. The Indian telecom services performance indicators: October -December, 2014. Retrieved from https:/

/trai.gov.in/release-publication/reports/performance-indicators-reports? on 15.5.2019.

Anonymous. 2019a. Highlights of telecom subscription data. Retrieved from http://www.trai.gov.in on 22.5.2019.

Ansari, M.A. and N. Pandey. 2011 *Assessing the potential and use of mobile phones by the farmers in Uttarakhand (India): A Special Project Report*. G.B. Pant University of Agriculture and Technology, Pantnagar, India.

Arendt, L. 2007. Barrier to ICT adoption in SMEs-How to bridge digital divide. *Proc IADIS International Conference e-Commerce*. pp. 67-80. Institute of Labour and Social Studies, Poland.

Barau, A.A. and S.I. Afrad. 2017. An overview of social media use in agricultural extension service delivery. *J. Agric. Inform.,* 8(3): 50-61.

Fafchamps, M. and B. Minten. 2011. Impact of SMS-Based Agricultural Information on Indian Farmers. *The World Bank Econ. Rev., 26*: 383-414.

Gandhi, R. 2015 Case study 1: digital green: leveraging social networks for agricultural extension. In: Gerard Sylvester (ed) *Success Stories on information and communication technologies for agriculture and rural development.* Pp1-8. Food and Agricultural Organization, United Nations, Regional office for Asia and Pacific, Bangkok.

Kailash, O.P.; L. Kumar and S.K. Singh. 2017. Utilization Pattern of Mobile Phone Technology (Smart Phone) Among the Farmers of Nagaur District in Rajasthan. *Indian Res. J. Ext. Edu.,* 17: 117-121.

Khan, G.; A.K. Dixit; A. Saxena and D.S. Tomar. 2018. Adoption and impact of kisan mobile advisory - an ICT tool on agriculture progress in Malwa Region of Madhya Pradesh. *Journal of Community Mobilization and Sustainable Development,* 13(1): 7-12.

Kothikhane, R.R. 2003. Use of Mass Media for Effective Dissemination and Adoption of Agricultural Technology. *Maharashtra J. Extn. Edn.,* 22(2): 5-9.

Mohammad, R.N. and B.H.H. Salleh. 2011. The role of television in the enhancement of farmers' agricultural knowledge. *African J. Agric. Res., 6*: 931-936.

Mooventhan, P. and H. Philip. 2012. Impact of Web-Education on Knowledge and Symbolic Adoption of Farmers - An Experimental Study. *Indian Res. J. Ext. Edu., 12*(2): 43-47.

Mwakaje, A.G. 2010. Information and communication technology for rural farmers market access in Tanzania. *J. Inform. Technol. Imp., 10*(2): 111-128.

Panda, S.; S. Modak; Y.L. Devi; L. Das; P.K. Pal and M.S. Nain. 2019. Access and Usage of Information and Communication Technology (ICT) to Accelerate Farmers' Income. *Journal of Community Mobilization and Sustainable Development,* 14(1): 200-205.

Phand, S.S. 2008. *Development of need based animal health information system (AHIS) for dairy owners of Maharashtra*. Ph. D. Thesis, IVRI, India.

Raj, S. and S. Bhattacharya. 2017. Social Media for Agricultural Extension. *Ext. Next,* 1: 20-26.

Ramaraju, G.V.; T.S. Anurag; H.K. Singh and S. Kumar. 2011. ICT in Agriculture: Gaps and Way Forward. *Info. Technol. Dev. Countries,* 21(2).

Sanjay, G.; M. Surabhi and T. Gaurav. 2009. The impact of mobiles on agricultural productivity. Moving the debate forward, the policy paper series.

Saravanan, R. 2010. India. In: *Saravanan R (ed) ICTs for Agricultural Extension: Global*

Experiments, Innovations and Experiences. pp 115-168. New India Publishing Agency, New Delhi.

Sharma, A. and S. Hasan. 2012. Information and communication technologies usage by undergraduate students in Pantnagar University. *J. Comm. Stud., 30*: 132-138.

Singh, R.K.J.; T.M. Devi and Raychaudhury. 2009. Use of Internet based e-resources at Manipur University: A Survey. *Ann. Lib. Inform. Stud., 56*: 52-57.

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Lentil Production Economics and Constraints: An Empirical Study in Mokama Taal of Bihar

Chandan Kumar Panda[1]*, Randhir Kumar[2] and Lokesh Kumar Meena[3]

[1,2]Department of Extension Education; [3]Department of Agricultural Economics, Bihar Agricultural University, Sabour, Bhagalpur–813210, Bihar

ABSTRACT

Lentil is an important source of protein, high in fibre content and provides ample quantity of vitamins and minerals. Lentil is performing well in Bihar and its area under cultivation is gradually increasing. This research work is carried out in Mokama Taal area of Bihar. Mokama Taal area is considered pulse bowl of Bihar. The objectives of the study were to assess the economics of lentil production and its constraints. The result revealed that total cost of lentil production was least for the small farmers with high B:C ratio. Lentil growers are facing the major constraints of marketing facilities, resource support, inputs availability and its cost.

Keywords: B:C ratio, Farmer, Marketing, Inputs availability

INTRODUCTION

India is agriculture based economy with more than 60 percent population of country is dependent on agriculture. Amongst rural population more than 70 per cent of rural household depend on agriculture as their primary means of livelihood (Sharma and Sharma, 2019). Pulses in India are basic to the diet as well as cropping system across the country. These crops primarily occupy marginalized land in rainfed conditions (Sah *et al.,* 2019). Lentil crop immensely contribute in maintaining soil health and increase in productivity of subsequent crop. Lentil is important source of protein, high in fibre content and provide ample quantity of vitamins and minerals. Bihar ranks 9th in terms of pulses production with a contribution of 0.52 million tons to the national pulse pool. Lentil is only crop which has performed well in Bihar, whereas area and production of most of the major pulses have gone down (Singh *et al.,* 2017). In Bihar, a number of pulses are grown *viz.* gram, lentil, khesari, pea, summer moong (*rabi* pulse); tur, moong, urad, ghaghra, kulthi (*kharif* pulse). Mokama Taal of Bihar is well known in India for its pulse production. All categories of farmers grow pulses in Bihar. The economics of pulse cultivation is varied according to the categories of farmers. Farmers also faced number of problems in pulses cultivation. The constraints of pulse cultivation were low price to produce, labour shortage and high transportation charges (Rajput *et al.,* 2000), cultivation in rainfed condition, low adoption of high yielding varieties (Ramaswamy, 2002), adoption gap in use of micronutrients (Sharma *et al.*, 2003), lack of improved varieties, infestation of pest and diseases (Burman *et al.*, 2008), lack of knowledge regarding weed control (Kumar *et al.,* 2010). Patidar (2012) reported that the constraints confronted by pulse growing farmers were broadly related to economic, natural, technological, social cause, institutional and infrastructure. Under this backdrop this research work was carried out with the objectives to study the economics and constraints of lentil production in Mokama Taal of Bihar.

MATERIAL AND METHODS

Mokama Taal is not just one single Tal but a group of seven Taals covering an area of 1,062 square kilometres and the width varying from 6.5 to 17.6 kilometres within the districts of Patna and Lakhisarai of Bihar state between latitudes 24°10' N and 25°30' N and longitudes 84°40' E and 86°30'E. It is a saucer shaped depression running along the right bank of the river Ganga. The two blocks i.e. Mokama and Barahiya were purposively selected from Patna and Lakhisari districts respectively. From each block two villages were selected randomly. From each village 30 lentil growers were selected randomly, hence the sample size was 120. The data collection schedule was pretested over 10 non-respondents farmers and pertinent changes

*Corresponding author email id: dr.ckpanda@gmail.com

were made. The data was collected from the lentil growers during the period of February 2017 to April 2017.

RESULTS AND DISCUSSION

Economics of lentil production: The perusal of Table 1 shows the variable cost, fixed cost and total cost of lentil cultivation of different categories of farmers *viz.* marginal, small, semi-medium, medium and large. It is noted from the table that highest variable cost (Rs. 11941.52/ha) was observed in medium category of farmers followed by large farmer, semi medium, marginal and small farmer were Rs. 11221.41/ha, Rs. 10564.94/ha, Rs.10488.57/ha and Rs. 9757.14/ha respectively. Variable cost of medium and large farmer was greater than average variable cost (Rs. 10794.72/ha).

Table 1: Cost of lentil cultivation (n=120)

Categories of farmers	Variable cost (Rs/ha)	Fixed cost (Rs/ha)	Total cost (Rs/ha)
Marginal	10488.57	2369.71	12858.29
Small	9757.14	1720.46	11477.61
Semi-Medium	10564.94	1389.04	11953.97
Medium	11941.52	1416.49	13358.01
Large	11221.41	1555.13	12776.53
Average	10794.72	1690.17	12484.88

From the above table it is also observed that average fixed cost of the lentil cultivation (Rs./ha) was Rs. 1690.17/ ha. Fixed cost on cultivation of lentil was found maximum in case of marginal farmer and it was Rs. 2369.71/ha, followed by small farmer, large farmer, medium farmer and semi-medium farmer were Rs. 1720.46/ha, Rs. 1555.13/ha, Rs. 1416.49/ha and Rs. 1389.04/ha respectively. The fixed cost of lentil production of marginal and small farmers were more than average fixed cost (Rs.1690.17/ha).

The average total cost of the lentil cultivation was Rs. 12484.88/ha. Total cost of lentil cultivation was found maximum with medium category farmer (Rs.13358.01/ ha) followed by marginal farmer, large farmer, semi-medium and small farmer were Rs. 12858.29/ha, Rs. 12776.53/ha, Rs. 11953.97/ha and Rs. 11477.61/ha respectively. Total cost of lentil cultivation of small farmer and semi-medium farmer was lesser than average total cost (Rs. 12484.88/ha).

Table 2 shows the output, returns and B:C ratio of lentil cultivation. The average returns (Rs./ha) of the main product was Rs. 24487.37. The maximum returns from main product was found Rs. 30771.43/ha with marginal farmer followed by small farmer, large farmer, medium and semi-medium farmer were Rs. 26898.21/ha, Rs. 23727.81/ha, Rs. 20543.27/ha and Rs. 20496.10/ha respectively. The returns from the main product of marginal and small farmer were greater than average returns (Rs. 24487.37/ha).

Average returns of byproduct from lentil cultivation was Rs.6704.12/ha. Maximum by product of output was noted for the marginal category farmer (Rs.7260.00/ha) and minimum return was noted for semi-medium farmer (Rs.6029.35/ha). Above table also revealed that average gross return of lentil cultivation was Rs. 31191.49/ha. Highest gross return was found in category of marginal farmer (Rs 38031.43/ha) followed by small farmer, large farmer, medium farmer and semi-medium farmer were Rs 33289.46/ha, Rs 30517.24/ha, Rs 27593.86/ha and Rs 26525.45/ha respectively. Gross return of marginal farmer and small farmer was greater than average gross return cost (Rs.31191.49/ha). The average net return of lentil (Rs/ ha) was Rs 110460.21. Maximum net return (Rs 25173.14) was found in marginal farmer followed by small farmer, large farmer, semi-medium farmer and medium farmer Rs 21811.86, Rs 17740.71, Rs 14571.48 and Rs 14235.85

Table 2: Output and returns in lentil production (n=120)

Categories of farmers	Output (Rs./ha)		Returns (Rs./ha)		B:C
	Main product	By product	Gross Returns	Net Returns	Ratio
Marginal	30771.43	7260.00	38031.43	25173.14	2.90
Small	26898.21	6391.25	33289.46	21811.86	2.95
Semi-Medium	20496.10	6029.35	26525.45	14571.48	2.21
Medium	20543.27	7050.58	27593.86	14235.85	2.06
Large	23727.81	6789.43	30517.24	17740.71	2.38
Average	24487.37	6704.12	31191.49	15859.21	2.49

respectively. Net return of semi-medium and medium farmers was less than average net return (Rs.15859.21/ ha).

Lastly, the average Benefit-Cost ratio of lentil cultivation was 2.49. While maximum B:C ratio (2.95) was found in small farmer followed by marginal farmer, large farmer, semi-medium farmer and medium farmer 2.90, 2.38, 2.21, 2.06 respectively. Benefit cost ratio of marginal and small farmer was greater than average benefit cost ratio.

Constraints in lentil cultivation: Farmers face a number of constraints in crop cultivation in Mokama Taal of Bihar, as it is geographically in a disadvantage position. The respondents reported number of constraints in lentil cultivation. These constraints were broadly categories into abiotic constraints, bio-physical constraints, marketing constraints, crop management and growth related constraints, resource constraints, cost of input constraints and availability of input constraints. In the following tables these constraints are separately elaborate.

Table 3: Farmers' perception on abiotic constraints in lentil cultivation (n=120)

S. No.	Abiotic constraints	Weighted mean	Rank
1.	Soil hardiness after seed sowing	4.36	I
2.	Terminal drought problem of soil (i.e. drought during reproductive phase)	4.32	II
3.	Soil cracking	4.28	III
4.	Low water table	4.05	IV
5.	Low organic matter content in soil	3.18	V
6.	Low residual moisture in soil	2.14	VI

From the above, it is noted that soil hardness after seed sowing was the most important abiotic constraint as perceived by the respondents and it was rank *first*. Amongst the other abiotic constraints, it is noted that terminal drought problem is second most important constraint as perceived by respondent, followed by soil cracking (Rank III), low water table (Rank IV). Least perceived constraint was low residual moisture in soil as reported by respondents and it was ranked *sixth*.

The farmers' perception on crop management and growth related constraints in lentil cultivation were also studied. The result shows that short sowing period was the most important perceived constraint under this category and it was ranked *first*. Lack of short duration variety of lentil and poor seed germination were the another two important crops management and growth related constraint as shown in Table 5.

Table 4: Farmers' perception on crop management and growth related constraints in lentil cultivation (n=120)

S. No.	Crop management and growth related constraints	Weighted mean	Rank
1.	Short sowing period	4.30	I
2.	Lack of short duration variety	4.00	II
3.	Poor seed germination	3.83	III

Table 5: Farmers' perception on resource constraints in lentil cultivation (n=120)

S. No.	Resource constraints	Weighted mean	Rank
1.	Non availability of credits in time	4.16	I
2.	Scarcity of human labour during sowing of seed	4.00	II
3.	Lack of subsidy for inputs	3.92	III
4.	Lack of human labour during harvesting	3.88	IV
5.	Lack of funds to purchase inputs	3.64	V
6.	Lack of draught power at the time of sowing	2.16	VI

It is noted that non-availability of credit in time for lentil cultivation is the most important perceived constraint to the respondent accordingly it is rank *first*. Amongst the other constraints as reported by the farmer's were scarcity of human labour during sowing of seed (Rank II) and lack of subsidy for inputs (Rank III) were other major constraints as perceived by respondents. However, least perceived constraints were lack of draught power at the time of sowing (Rank VI).

Lentil growers are also facing a number of bio-physical constraints and the respondents had reported twenty bio-physical constraints (Table 6). From these twenty bio-physical constraint it is noted that the most important constraint is farmers lack of knowledge on seed treatment and it is ranked *first*, the other major constraints where post harvest losses (Rank II), non-availability of bio-fertilizer (Rank III), lack of irrigation facility (Rank IV), lack of soil testing facility (Rank V), non-application of herbicide at proper time (Rank VI). However, the least

Table 6: Farmers' perception on bio-physical constraints in lentil production (n=120)

S. No.	Bio-physical constraints	Weighted mean	Rank
1.	Lack of knowledge on seed treatment	4.400	I
2.	Extent of post-harvest losses	4.366	II
3.	Non availability of bio-fertilizer	4.350	III
4.	Lack of irrigation facilities	4.350	IV
5.	Lack of soil-testing facilities	4.341	V
6.	Less or no application of herbicide at proper time	4.191	VI
7.	Lack of proper storage facilities at harvesting time	4.160	VII
8.	Use of locally available seed	4.141	VIII
9.	Difficult to control wild lentil (*Vicia sativa*)	3.966	IX
10.	Lack of improved varieties	3.916	X
11.	Timely non availability of bio-fertilizer	3.833	XI
12.	Lack of resistant varieties against pests and disease	3.391	XII
13.	Lack of soil-testing facilities	3.225	XIII
14.	Lack of knowledge on adoption of DAP spraying	3.091	XIV
15.	Pesticide application not being cost effective	3.033	XV
16.	Timely non availability of herbicide	2.525	XVI
17.	Timely non availability of fungicide	2.325	XVII
18.	Excessive weed growth	2.150	XVIII
19.	High infestation of pest and diseases	2.041	XIX
20.	Timely non availability of insecticide	1.908	XX

Table 7: Farmers' perception on lentil marketing related constraints (n=120)

S. No.	Marketing constraints	Weighted mean	Rank
1.	Fluctuating prices	4.208	I
2.	Collusion among traders in reducing prices	3.633	II
3.	Lack of regulated market	3.60	III
4.	High Transport cost	3.55	IV
5.	Lack of knowledge on MSP (Minimum Support Price)	3.05	V
6.	Distress selling	2.383	VI
7.	Large number of middleman	2.283	VII

perceived constraints were non-availability of insecticide in time (Rank XX), followed by high infestation of pest and diseases (Rank XIX) and excess weed growth (Rank XVIII).

Lentil growers' perception on marketing related constraint were also studied. The result shows that fluctuating prices was the most important perceived constraint under this category (Table 7). The other major constraints were collusion among traders in reducing prices (Rank II), lack of regulated market (Rank III), high transport cost (Rank IV), lack of knowledge on MSP (Rank V), distress selling (Rank VI). However, the least perceived constraint was large number of middlemen (Rank VII).

Table 8: Farmers' perception on cost of inputs constraint in lentil cultivation (n=120)

S. No.	Cost of inputs constraints	Weighted mean	Rank
1.	Increase in cost of labour	4.308	I
2.	Increase in cost of insecticide	3.808	II
3.	Increase in cost of fungicide	3.658	III
4.	Increase in price of chemical fertiliser (DAP)	3.008	IV
5.	Increase in cost of weedicide	2.858	V
6.	Increase in price of bio fertiliser	2.208	VI
7.	Increase in price of chemical fertiliser (Nitrogen)	2.041	VII
8.	Increase in cost of seed	1.183	VIII

The perusal of the table reveals the farmers' perception on constraints related to cost of inputs (Table 8). The result shows that increase in cost of labour is the most important perceived constraint under this category. The other major constraints where increase in cost of insecticide (Rank II), increase in cost of fungicide (Rank III), increase in price of chemical fertiliser DAP (Rank IV), increase in cost of weedicide (Rank V). However, the least perceived constraint was increase in cost of seed (Rank VIII).

From the study it is noted that timely non availability of labour was the most important constraints as perceived by the respondents and it is rank first, amongst the inputs availability constraints, it is noted that timely non availability of chemical fertiliser (Phosphorus) is second most important constraint as perceived by respondent. Followed by timely non availability of DAP fertiliser (Rank III), non availability of irrigation water (Rank IV) and remaining constraints were as shown in the Table 9.

Table 9: Farmers' perception on availability of inputs for lentil cultivation (n=120)

S. No.	Availability of inputs constraints	Weighted mean	Rank
1.	Timely non availability of labour	4.275	I
2.	Timely non availability of chemical fertiliser (Phosphorus)	4.125	II
3.	Timely non availability of DAP fertiliser (DAP)	4.116	III
4.	Non availability of irrigation water	4.108	IV
5.	Timely non availability of desired seed	4.066	V
6.	Timely non availability of insecticide	4.058	VI
7.	Timely non availability of fungicide	4.033	VII
8.	Timely non availability of bio fertiliser	4.000	VIII
9.	Timely non availability of chemical fertiliser (Nitrogen)	3.991	IX

Table 10: Constraints of lentil cultivation (n=120)

S. No.	Constraints	Weighted mean	Rank
1.	Marketing related constraints	0.581117	I
2.	Resource constraints	0.306433	II
3.	Availability of inputs constraints	0.192267	III
4.	Cost of Inputs constraints	0.189225	IV
5.	Abiotic constraints	0.186083	V
6.	Bio-physical constraints of pulses production	0.181333	VI
7.	Crop management and growth related constraints	0.101083	VII

Amongst the seven broad constraint categories on lentil production, it is noted that marketing constraint was the most important perceived constraint in lentil production and it was ranked *first*. The other major constraints were resource constraint (Rank II) availability of input constraint (Rank III) and other constraint as shown in Table 10.

CONCLUSION

From the study it can be concluded that the total cost of lentil cultivation was least for the small farmers and maximum for medium category of farmers. This result implied that small category of farmers gave maximum emphasis for reducing the cost of cultivation through more use of family labour and precise use of other inputs. It was also noted that B:C ratio in lentil cultivation was maximum for small category of farmer. Lentil growers are facing the major constraints of marketing, resource support, inputs availability and its cost. So, for ensuring lentil cultivation more remunerative these constraints should be solved.

REFERENCES

Burman, R.R.; S.K. Singh; L. Singh and A.K. Singh. 2008. Extension Strategies for increasing Pulses Production for Evergreen Revolution. *Indian Research Journal of Extension Education*, 8(1): 79-82.

Kumar, P.; R. Peshin; M.S. Nain and J.S. Manhas. 2009 & 2010. Constraints in Pulses Cultivation as Perceived by the Farmers. *Rajasthan Journal of Extension Education,* 17&18*:* 33-6.

Patidar, V. 2012. *An Economic Analysis of Production Constraints of Major Rabi Crops in Tribal Area in Badnawar Block of Dhar District in Madhya Pradesh*. M.Sc. (Ag.) Thesis submitted to the Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior.

Rajput, A.M.; R. Porwal and S.L. Deshpande. 2000. Crop Productivity and its Constraints on Tribal Farms of Dhar District of Madhya Pradesh. *Crop Research (Hisar),* 19(2): 350-352.

Ramaswamy, C. 2004. Constraints to Growth in Indian Agriculture: Needed Technology, Resource Management and Trade Strategies. *Indian Journal of Agricultural Economics*, 59(1): 1-34.

Sah, U.; S.K. Dubey; H. Saxena and M. Kumar. 2019. Scientific Rationality of Indigenous Technical Knowledge related to Pulse Production: Researchers' Perception. *Journal of Community Mobilization and Sustainable Development*, 14(1): 20-24.

Sharma, H.O., R.P. Singh and M. Patidar. 2003. Production Constraints in Adoption of Improved Chickpea Technology in Madhya Pradesh. *Indian Journal of Pulses Research*, 16(2): 125-127.

Sharma, S. and S. Sharma. 2019 Agri-entrepreneurial Innovations for Rural Prosperity and Sustainable Development. *Journal of Community Mobilization and Sustainable Development,* 14(1): 206-211.

Singh, P.; B. Shahi and K.M. Singh. 2017. Enhancing Pulses Production in Bihar: Constraints and Strategies for Sustainable Growth. *Journal of Agri Search,* 3(3): 178-184.

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Nutri-gardens: Key to Address Nutritional Needs of Hill Community

Renu Jethi[1]*, Pratibha Joshi[2], Asmita Jalal[3], Pankaj Nautiyal[4], Nirmal Chandra[5] and Manisha Arya[6]
[1]Scientist, [3]Junior Research Fellow, [5]Principal Scientist, ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora, Uttarakhand
[2]Scientist, CATAT, ICAR-Indian Agricultural Research Institute, New Delhi
[4,6]SMS, KVK, Chinyalisaur, Uttarakhand

ABSTRACT

Prevailing malnutrition in rural areas of Uttarakhand and particularly in hill districts is a serious issue. The crop productivity in the hilly areas of Uttarakhand is low due to scattered land holdings, low soil fertility and mostly rainfed agriculture. farmers are still practicing traditional subsistence farming comprising of mainly cereal crops which cannot sustain farm families for more than three to four months in a year. There is a large-scale migration of men towards plains, due to which the rural areas contain significantly higher female population and has led to demographic imbalance in the region. The strenuous physical task allocated to women combined with limited food intake, exacerbate malnutrition. Majority of rural women in Uttarakhand are suffering from Chronic Energy Deficiencies (CED) and their intake of micronutrients is lower than Recommended Dietary Allowances. Therefore, women require high quality nutrients as their work load and energy expenditure is more. One of the solutions to this prevailing problem in Uttarakhand hills can be "Local need meet locally". Climatic conditions of hill region are suitable for seasonal and off seasonal vegetable and fruit production which are rich in micronutrients. As landholding size in the region is small and fragmented, establishment of nutri-garden is easy and remunerative way to address prevailing malnutrition among hill community. Local nutritional need of people can be met out locally by reviving traditional practices along with amalgamation of science and technological knowledge. Nutri-garden will have a positive impact on food security in rural areas as consuming such micronutrient rich food and improving dietary diversity will substantially reduce micronutrient deficiencies. Several studies reported that daily and frequent intake of fruits and vegetables is effective to check stomach, oesophagal, pancreatic, bladder and cervical cancers as they are rich sources of micro-nutrients.

Keywords: Nutri-garden, Malnutrition, Hill community, Fruits and vegetables

INTRODUCTION

This paper deals with prevailing malnutrition and nutrition transition in rural areas of Uttarakhand with special emphasis on hill region and ways to address the issue. The Uttarakhand state comprising of the Central Himalayas is spread over 53.48 lakh hectare and inhabits 101.1 lakh population (Census, 2011). Uttarakhand is basically an agricultural state but its share in the country's total area and production is very small. Although 75-85 per cent population is dependent on agriculture but it contributes only 23.4 per cent in state domestic product. Out of the total reported area of 53.48 lakh hectare, only 7.44 lakh hectare (14%) is under cultivation (Uttarakhand at a Glance, 2016). In Uttarakhand more than 70 per cent of regional population lives in rural areas and is solely dependent on this traditional agro-ecosystem even though the availability of arable land is severely limited and the productivity is considerably poor. The remaining 30 per cent regional population lives in urban areas (Census, 2011).

Crop productivity in the hilly areas of Uttarakhand is getting reduced because of scattered land, low soil fertility and higher incidences of pest and disease occurrences. The persistent changes in weather conditions have resulted in overall decrease in the quantity of water in almost all the water sources of the region. The area under irrigation is gradually decreasing due to drying of many water bodies for irrigation resulting in low productivity of crops. Rising temperature has led to the shift in forest biodiversity. Mountain people have learned to live and survive with hazards for thousands of years, but the present rate of climate change is very rapid and therefore demands attention for the socio-economic concerns in the area. Urbanisation in hill region is because of the rapid growth of road linkages, rural service centres and increased access to market.

*Corresponding author email id: renujethi2009@gmail.com

Urban growth and changes in land use pattern has led to depletion and destruction of nature. In hill region farmers are practicing traditional subsistence farming which cannot sustain the farm families for more than three to four months in a year, therefore one or more family members are migrating to outside the state in search of job. Earlier farming communities in hills were mainly dependent on agri-products, horticulture but significant part of their food used to come from wild edible fruits. Due to agricultural policies adopted during green revolution, traditional agriculture with diverse crops and cropping pattern is under threat. These policies very much favoured production of wheat and rice but neglected traditional food crops. In India one of the consequences of the green revolution was that it brought in mono-cropping leading to a drastic reduction of crop diversity of farm lands. This shift in agriculture focusing on a market-driven economy where cash crops took precedent, had its toll; household needs for a range of cereals, pulses and vegetables are not met from the farm but purchased from the market (Vijayalakshmi and Thooyavathy, 2012).

The dietary and nutrition transition, characterized by improved agricultural practices, food supplies and advances in food processing techniques, while making more food available to people, has also resulted in imbalanced nutrient intakes changing health profiles (Dharmalingam *et al.,* 2009). Despite economic advantages, India is home to the highest number of malnourished children in the world, largest number of stunted children in the world, with a worse child stunting prevalence (Spears, 2013). Prevalence of clinical and sub clinical vitamin A deficiency in India is among the highest in the world. Although India is booming, economically, in many parts, nutrition among adolescent girls, women, and children remains a significant development challenge. Despite impressive gains in child nutrition in recent years as seen in the Rapid Survey on Children from the Ministry of Women and Child Development in India, several states still carry a high burden of undernutrition, with over a third of children stunted, and about half of the adolescent girl population chronically energy deficient. Anaemia has remained high in India for at least three decades. Evidence on what works to improve nutrition points to the role of important drivers, such as improvements in household assets, food security, women's status, sanitation, and provision of health care, in addition to targeted nutrition interventions. Yet, because undernutrition is complex and driven by several determinants at multiple levels, it cannot be attacked with single-shot interventions (Kimberly Keeton, 2016; IFPRI, 2016). The major cause seems to be under- nutrition; the condition refers to inadequate intake of protein and calories for a long time that also leads to the deficiency of micronutrients such as minerals and vitamins. Body becomes more prone to diseases when adequate amount of nutrient is not provided through diet. The negative effects of malnutrition are compounded by many factors like heavy work demands, poverty, non-fulfillment of special nutritional needs, resulting in increased susceptibility to illness and consequently higher morbidity. In India nearly 70 per cent of women are estimated to be iron deficient (Rammohan *et al.,* 2012). Iron deficiency can exist without anaemia also. Anaemia has been the most common parameter employed to determine iron deficiency. Iron Deficiency Anaemia (IDA) is very late manifestation of iron deficiency because iron deficiency can be very well tolerated. Maternal anaemia during pregnancy increases the risk of prenatal and maternal mortality and contributes to low birth weight. Iodine deficiency during pregnancy can impair motor, physical and mental development of the foetus and increase the risk of miscarriage (Zimmermann, 2009). Anaemia does not develop till storage iron is exhausted (Shah 2004). The NNMB (2006) survey revealed that the intake of dietary iron is grossly inadequate in most of the states, meeting less than 50 per cent of RDA of males (28 mg) or females (30 mg). Micronutrient deficiencies afflict more than two billion individuals, or one in three people, globally (FAO, 2015). Such deficiencies occur when intake and absorption of vitamins and minerals are too low to sustain good health and development.

In hill region contribution of pulses, vegetables and fruits has drastically gone down in present food scenario. Changing food habits particularly after invasion of other crops there has been a sharp fall in health and nutritional status of rural mountain community and particularly women who are backbone of hill agriculture. Women are responsible for almost all the agricultural operations ranging from field preparation, sowing, weeding, harvesting and supporting men in ploughing the fields.

Health and nutritional status of hill community

In Uttarakhand 74.4 per cent population lives in villages and out of this 50.2 per cent are women. Here women are the active workforce in agriculture, due to their increased involvement with agriculture, animal husbandry, fodder and fuel-wood collection and household activities. In the state, 43.75 per cent families are below poverty line

(Uttarakhand at a Glance, 2016). The large scale out-migration of men in search of employment in the plains has led to a demographic imbalance in the region. While men predominate in urban areas, the rural areas contain significantly high female population (Census, 2011; Rawat, 2004). Because of male migration and thus reduced workforce, women who already do a disproportionate share of work are now doing an ever-increasing portion of the work towards agriculture and earning livelihoods. Women spent maximum time in transplanting, transportation of manure, weeding, harvesting and other agricultural practices. Most of the women in hills suffer from lower back pain due to carrying heavy loads over long distances; they also suffer from various skin problems due to long exposure to sun. Due to use of agro-chemicals women are exposed to several health hazards and gynecological infection. In case of rice transplantation, arthritis, intestinal and parasitic infections may take place due to long hours of work in mud and water (Pandey, 2001). Backache and joints pain are common and in extreme cases curved spines and pelvic deformities can result creating complications in child birth. Women are particularly vulnerable to diseases during dry season. During this time the journey times to collect water are the longest, food stocks are lowest, the workload is highest and diseases most common. Women everywhere work for longer hours, the plight of poor rural women in hills is rather worse. It does not matter if the women are old, young or pregnant, crucial household needs have to be met every day. The agricultural and household workload in hill area is nightmarish to them in terms of drudgery involved in these activities. The strenuous physical tasks allocated to women, combined with limited food intake, exacerbate malnutrition. An imbalance diet and inadequate nutrient uptake could result in malnutrition. Malnourished women are prone to infection and the rate of morbidity and mortality also increases.

As per National Family Health Survey 2015-16, 42 per cent of women in Uttarakhand have anaemia including 31 per cent with mild anaemia, 10 per cent with moderate anaemia and 1 per cent with severe anaemia. Low nutritional status makes women more prone to certain ailments. Among children between the ages of 6 and 59 months, more than half (55%) are anaemic.

Low health status manifest itself in lower life expectancy, higher rates of morbidity and mortality, lower levels of productivity and a decreased ability to earn and

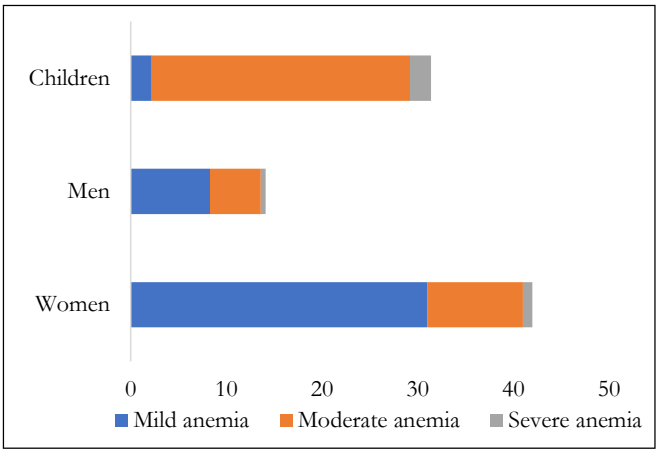


Figure 1: Prevalence of anaemia among women, men and children in Uttarakhand, NFHS-4

support. According to some studies majority of rural women in Uttarakhand works for 16-20 hours per day. Out of average 16 hours, 10 hours are utilised for highly time and energy consuming outdoor works (Pant, 2016). Therefore, Women require high-quality nutrients as their work load and energy expenditure is more; however, in some areas of rural Uttarakhand, women typically eat last and least. Some studies showed that majority of rural women in Uttarakhand were suffering from various degree of Chronic Energy Deficiency (Pant, 2016; Kukreti *et al.,* 2013). Studies also reported low intake of micro-nutrients by women in hills of Uttarakhand which is lower than Recommended Dietary Allowance (Upadhyay *et al.,* 2011; Jethi *et al.,* 2018). Cereals are the main staple food in women's diet which lack in various minerals and vitamins. Fruits and vegetables are rich source of vitamins, minerals, protein and carbohydrates which are essential in human nutrition. These are referred to as protective food and assume a great importance as nutritional security of the people. It was also reported in NFHS-4 that in Uttarakhand only 56.3, 44.1 and 17.6 per cent women were consuming pulses, vegetables and fruits daily, respectively which are good source of micro-nutrients.

Nutritional transition from traditional and nutritionally rich food habits to the present lifestyle has already resulted in rapid increase in the risks of non-communicable diseases like hypertension, diabetes etc. one of the solutions to this prevailing problem of nutrition transition in Uttarakhand hills can be "Local need meet locally". Local nutritional needs can be met out locally by reviving traditional practices along with amalgamation of science and technology knowledge. A perfect model encompassing health and

Table 1: Percent distribution of women and men by intake of specific foods in Uttarakhand

Type of food	Daily		Weekly		Occasionally		Never	
	Women	Men	Women	Men	Women	Men	Women	Men
Milk or curd	49.9	52.2	22.0	35.0	22.5	11.3	5.6	1.4
Pulses or beans	56.3	52.0	36.9	42.1	6.7	5.8	0.2	0.1
Dark green leafy vegetables	44.1	31.2	40.0	59.7	15.6	8.7	0.3	0.3
Fruits	17.6	12.9	32.3	54.3	48.9	32.5	1.2	0.3
Eggs	2.9	2.9	24.6	35.3	46.8	48.3	25.8	13.5
Fish	0.5	1.2	10.9	17.7	48.1	48.3	40.4	32.9
Chicken or meat	0.5	0.8	12.5	23.7	53.6	55.4	33.3	20.1

Source: National Family Health Survey (NFHS-4), 2015-16

nutritional issues, local resources and income prospects will be more suitable for hills of Uttarakhand which can be replicated. High household production and dietary diversity in traditional farming landscape of Uttarakhand hills has the potential of combating malnutrition and food related non-communicable diseases. In hill areas of Uttarakhand, climatic conditions are conducive for production of seasonal and off-seasonal fruits and vegetables. As average landholding is very small and fragmented in Uttarakhand, establishment of nutri-garden in rural areas are easy and remunerative.

Nutri-gardens to address nutritional needs

Concept of nutri-garden can be introduced in hill areas to encourage women to cultivate healthy food crops in their backyards. A well planned nutri-garden ensures regular supply of fresh vegetables rich in nutrients. The expert committee of Indian Council of Medical Research (ICMR) recommends that every individual should consume at least 300 g vegetables and 100 g fresh fruits/day. Nutri-garden/ home gardens earlier used to be a cornerstone of traditional farming, but over the years, they have slowly begun to loose their importance. But now, their importance is once again being recognised. Home gardens are a part of agriculture and food production system in many developing countries and are widely used as a remedy to alleviate hunger and malnutrition in the face of a global food crisis (Johnson *et al.,* 2000). Mitchell and Hanstad (2004) reported that home garden provided multiple social benefits such as enhancing food and nutritional security, empowering women, promoting social justice and equity, and preserving indigenous knowledge and culture and so on. There are variety of vegetables that can be grown in a plot of 100 m^2 to 200 m^2 in hilly areas vegetables are rich source of nutritional bio-active compounds. They are important sources of protective nutrients like vitamins, minerals, antioxidants, folic acid and dietary fibres. The unique advantages of a nutri-garden are:

- Supply fresh fruits and vegetables high in nutritive value
- Supply fruits and vegetables free from toxic chemicals
- Save expenditure on purchase of vegetables
- Vegetables harvested from home garden taste better than those purchased from market.

Usually a nutri-garden can be established in the backyard of house where there is enough water availability. In hills nutri-gardens should be maintained near house so that it can be protected from animal damage which is havoc in the region. A rectangular garden is preferred to a square plot. Nearly 200 m^2 land is sufficient to provide vegetables through out year for a family consisting of five members. Layout and crop allotment in nutri-garden can be modified depending on climatic and seasonal changes.

- Perennial vegetables should be allotted to one side of the garden so that they may neither shade remaining plot nor they interfere with intercultural operations. Shade loving vegetables may be planted in perennial plots. Compost pits can be provided on the corner of nutri-garden for effective utilisation of kitchen waste.
- After allotting areas for perennial crops, remaining portions can be divided into 6-8 equal plots for growing annual vegetable crops.
- By following scientific practices and crop rotation, two to three annual crops can be raised in the same plot. For effective utilisation of plot accession cropping, inter cropping and mixed cropping can be followed.

- Walking path should be provided at the centre as well as along four sides. Since fresh vegetables from garden are directly utilised for consumption, organic manure should be used which is abundant in villages. however, in order to harvest good crop free from pest and diseases, chemicals can be utilised in limited amount.
- It is important that preference should be given to long duration and steady yielding crop varieties than high yielding ones.
- A bee-hive may be provided for a plot of 200 m^2 for ensuring adequate pollination in crops besides obtaining honey.

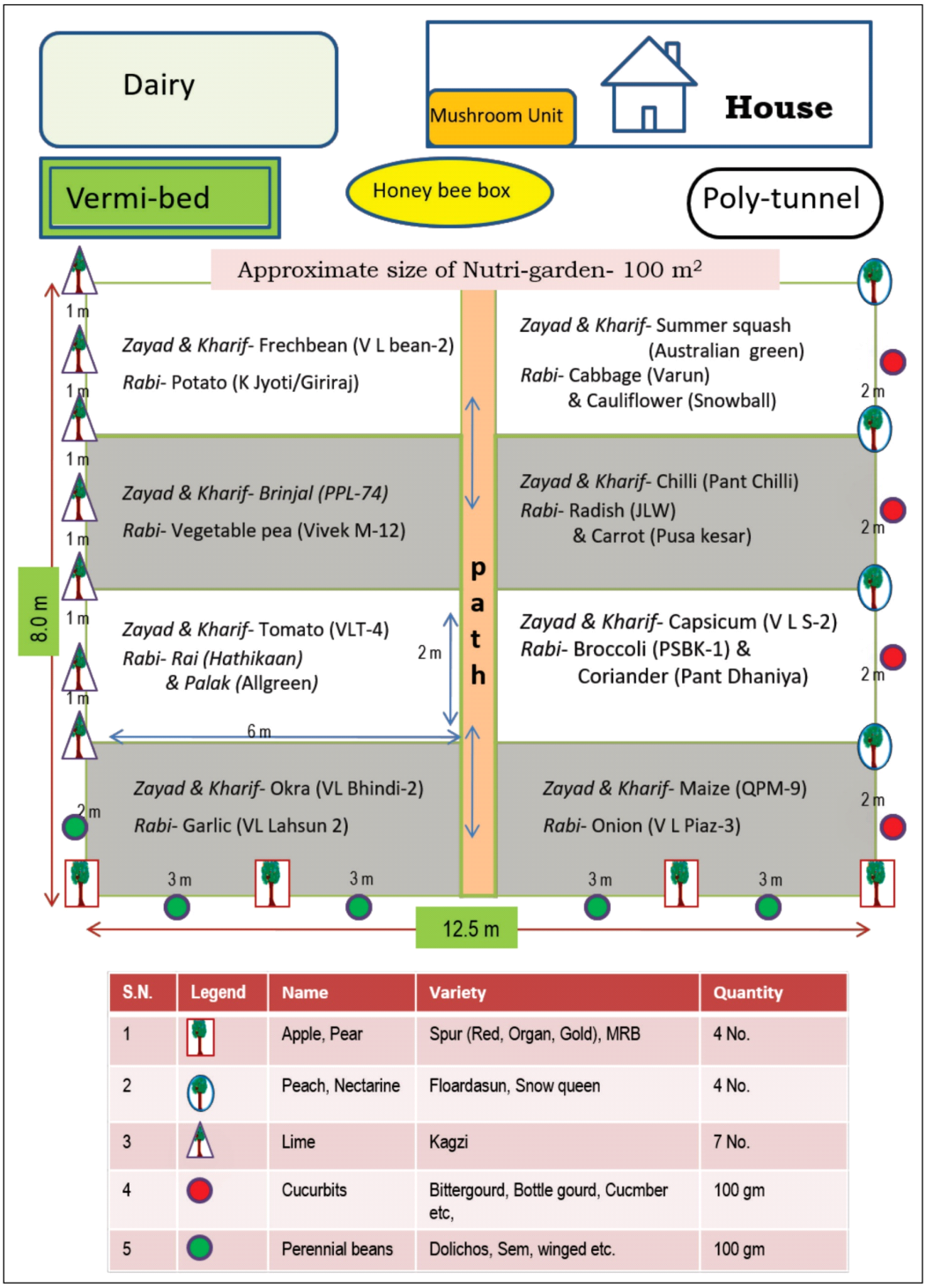
A well planned and maintained nutri-garden can provide enough nutritious food, including some staple foods for all the family members round the year. It may supply households with nearly all the non-staple foods they need such as fruits, vegetables, legumes, roots and tubers and spices. Sometimes sale from the nutri-garden can make a substantial contribution to a family's income. Nutritional well being require regular access to enough nutritious and safe food to meet the dietary needs of family members throughout the year. Poor diet and inadequate food intake are not always the result of lack of food or money to buy food. People must have some basic knowledge of nutrition such as crops to be grown in backyard, kind of food to eat and method of preparing food in the right quantity. Nutri-gardens are also very much required in places and villages which are isolated and far from the local market. In hills, usually fruits, vegetables and other food stuff are transported from far away therefore it is expensive and mostly stale. These are some of the factors that make it difficult to ensure adequate household food supply. Nutri-garden indeed has a positive impact in ensuring the food security among rural populations. It nearly doubled the intake of vegetables and facilitated improved availability and access; which forms two of the most important aspects of the food security concept (Ranawat, 2017).

Various agriculture research institutes has identified and released various target crops as cereals, pulses and vegetable crops that are rich in iron, vitamins and minerals as in rice addition of Fe, Zn, ProA & protein; Wheat (Fe & Zn); maize (Fe, Zn, ProA & protein), Pearl Millet (Fe & Zn), Sorghum (Fe & Zn), Small Millets (Fe & Zn), Vitamin A enriched carrots, spinach, pumpkin, vitamin C enriched bitter grourd, bathua, mustard , tomato, iron and calcium enriched spinach and bathua, protein enriched beans and garden pea. These staple crops, when consumed regularly, will generate measurable improvements in human health and nutrition. In the long-term, increasing the production of micronutrient-rich foods and improving dietary diversity will substantially reduce micronutrient deficiencies. In the near term, consuming such crops can help address micronutrient deficiencies by increasing the daily adequacy of micronutrient intakes among individuals throughout the lifecycle (Bouis *et al.,* 2011).

Health benefits of fresh vegetables grown in nutri-gardens

There are different groups of vegetable crops which have some specific type of nutrients factors that can be grown in nutri-gardens. Onion, garlic, shallots are bulb vegetables rich in sulphur containing compounds thiosulphide which have been linked to reducing various chronic diseases (Kubec *et al*., 2000). Onion is also an excellent source of the growth of beneficial bacteria and promote the absorption of calcium that is useful in the prevention of osteoporosis (Scholz-Ahren *et al.,* 2001). Onion and garlic are excellent source of calcium, manganese and potassium and can also accumulate selenium in the form of selenocysteine and seleno-protein. Vegetables like potato, tomato, brinjal, chilli etc are grouped as solanaceous vegetables. Potato have protein of very high quality as they are rich in essential amino acids such as lysin. Potato also contain moderate amount of vitamin C. Chilli have high levels of vitamins and minerals. Phytochemicals present in chilli can be very helpful in cure of gastric ulcer, toothaches, osteo and rheumatoid arthritis (Noda *et al.,* 2000). Egg plants is effective in the treatment of high blood cholesterol (Brennan *et al.,* 2005).

Cruciferous like broccoli, cabbage, brussels sprouts, radish are rich source of glucosinolates that protects against lung, prostate cancer, breast cancer (McNaughton *et al.,* 2003). When crucifers are chopped, chewed and digested glucosinolates are converted into compounds that acts to prevent normal cells from becoming cancerous cells. Chinopodiaceae vegetables like spinach, *Chenopodium album* have succulent leaves and stem that are used as green vegetables. *Chenopodium album* is rich in most important nutrients like iron, folic acid and fibre. These vegetables also have essential medicinal values as anti-viral, anti-fungal, anti-inflammatory, anti-allergic and anti-septic. Several researches indicate that daily or frequent intake of vegetable



S.N.	Legend	Name	Variety	Quantity
1		Apple, Pear	Spur (Red, Organ, Gold), MRB	4 No.
2		Peach, Nectarine	Floardasun, Snow queen	4 No.
3		Lime	Kagzi	7 No.
4		Cucurbits	Bittergourd, Bottle gourd, Cucmber etc,	100 gm
5		Perennial beans	Dolichos, Sem, winged etc.	100 gm

Figure 2: A well planned layout of nutri-garden for higher and mid hills (1200-2000 m AMSL)

and fruits is effective to check stomach, oesophagal, pancreatic, bladder and cervical cancers and 20% of most common type of cancer could be prevented by adopting a diet full of fruit and vegetables (Crawford *et al.*, 1994). Fruit and vegetables are dense with several vital nutrients but some components present in them (phytochemicals) are strong antioxidants which are responsible to modifying metabolic activity and detoxification of carcinogens and even capable to influence the process that may change the abnormality of tumour cell (Wargovich, 2000). Their consumption has been given positive results regarding obesity prevention (Tohill *et al.*, 2004).

Fruits are rich source of micronutrients, which includes vitamins and minerals. It was reported that more fruits and vegetables intake was related to prevention of several non-communicable diseases like, cardiovascular, type-2

Table 2: Nutritional composition of vegetables appropriate for nutri-gardens

Vegetables	Protein (g)	CHO (g)	Calcium (g)	Iron (mg)	β-Carotene (µg)	Thiamine (mg)	Niacin (mg)	Riboflavin (mg)	Ascorbic acid (mg)
French bean (*Phaseolus vulgaris*)	2.12	2.63	49.9	0.98	388	0.05	0.77	0.05	1.38
Brinjal (*Solanum melongena*)	1.48	3.52	16.59	0.37	146	0.06	0.53	0.11	2.09
Chilli (*Capsicum fruitescens*)	2.36	5.86	18.45	1.2	125	0.09	0.89	0.11	94.07
Tomato (*Solanum lycopersicum*)	0.76	3.2	8.9	0.22	1513	0.04	0.5	0.02	25.2
Ladyfinger (*Abelmoschus esculentus*)	2.08	3.62	86.1	0.84	69.1	0.04	0.6	0.07	22.5
Maize (*Zea mays*)	3.57	22.69	6.35	0.71	36.27	1.13	0.7	0.12	4.26
Potato (*Solanum tuberosum*)	1.54	14.89	8.53	0.53	_	0.06	1.04	0.01	23.1
Cabbage (*Brassica oleracea var. capitata*)	1.36	3.25	51.76	0.35	20.48	0.03	0.24	0.05	33.25
Cauliflower (*Brassica oleracea var. botrytis*)	3.9	3.39	96.7	2.42	146	0.05	0.21	0.05	52.8
Vegetable Pea (*Pisum sativum*)	7.2	11.8	41.06	0.71	121	0.27	1.28	0.03	38.4
Radish (*Raphanus sativus*)	0.7	6.5	30.2	0.36	-	0.02	0.3	0.02	19.9
Carrot (*Daucus carota*)	1.04	6.7	41.06	0.71	2706	0.04	0.25	0.03	6.76
Coriander (*Coriandrum sativum*)	3.52	1.93	146	5.3	3808	0.09	0.73	0.05	23.87
Mustard leaves (*Brassica juncea*)	3.52	2.41	191	2.84	2619	0.08	0.58	0.1	60.3
Garlic (*Allium sativum*)	6.75	21.8	17.63	0.88	-	0.2	0.36	0.23	13.57
Spinach (*Spinacia oleracea*)	2.14	2.05	82.29	2.95	2605	0.16	0.33	0.1	30.28
Onion (*Allium cepa*)	1.5	9.56	19.92	0.53	1.10	0.04	0.34	0.01	6.69
Bitter gourd (*Momordica charantia*)	1.6	2.29	17.6	1.28	130	0.06	0.3	0.04	54.3
Bottle gourd (*Lagenaria siceraria*)	0.53	1.68	15.4	0.26	44.05	0.03	0.14	0.01	4.33
Cucumber (*Cucumis sativus*)	0.83	2.83	16.39	0.46	5.3	0.02	0.35	0.01	6.2
Ridge gourd (*Luffa acutangula*)	0.9	1.72	13.7	0.42	348	0.02	0.2	0.01	5.42
Pumpkin (*Cucurbita maxima*)	0.8	4.22	24	0.29	363	0.03	0.44	0.02	7.29
Colocasia (*Colocasia antiquorum*)	3.3	17.8	30.18	0.66	6.5	0.06	0.51	0.03	1.83
Amaranth (*Amaranthus tricolor*)	3.29	2.28	330	4.64	8553	0.01	0.7	0.19	83.5
Agathi (*Sesbania grandiflora*)	8.0	5.2	901	4.36	12582	0.26	1.18	0.33	121
Fenugreek (*Trigonella foenum-graceum*)	3.68	2.17	274	5.69	9245	0.11	0.7	0.22	58.2

Source: Indian food composition tables, 2017

Table 3: Nutritional composition of fruits appropriate for nutri-gardens in hills

Fruits	Protein (g)	CHO (g)	Calcium (g)	Iron (mg)	β-Carotene (µg)	Thiamine (mg)	Niacin (mg)	Riboflavin (mg)	Ascorbic acid (mg)
Apple (*Malus domestica*)	0.3	13.9	5.39	0.25	2.08	0.01	0.09	0.01	4.0
Grapes (*Vitis vinifera*)	0.6	11.8	14.22	0.24	25.46	0.04	0.12	0.03	16.47
Guava (*Psidium guajava*)	1.44	5.13	18.52	0.32	298	0.05	0.6	0.04	214
Lemon (*Citrus limon*)	0.41	6.9	22.68	0.12	2.62	0.04	0.1	0.01	48.16
Pear (*Pyrus communis*)	0.36	8.09	6.55	0.28	13.16	0.02	0.13	0.02	3.31
Plum (*Prunus domestica*)	0.64	12.1	7.6	0.25	1.32	0.02	0.44	0.02	2.26
Pomegranate (*Punica granatum*)	1.33	11.6	10.65	0.31	2.05	0.06	0.2	0.1	12.69
Orange (*Citrus aurantium*)	0.7	7.9	19.52	0.81	31.94	0.07	0.28	0.02	42.72

Source: Indian food composition tables, 2017

diabetes and cancer (Ganry, 2006). Different fruits like mango, papaya, citrus, guava, grapes etc. are rich in vitamin A, B and C. They also loaded with Ca, Mg, Fe and K. Citrus group contains ample quantity of vitamin C (Kazi *et al.* 2015).

The stone fruits, including peach, apricot, cherry and plum are rich in antioxidants, vitamin A and C. Antioxidant property of plum, prevent damage to our neuron cells. It has anti-cancerous agents and effective in preventing human influenza A (Prajapati *et al.*, 2012). Apricot and peaches are rich in vitamin A and carotenoids- β-carotene, α-carotene and β-cryptoxanthin (Campbell *et al.,* 2011). β-carotene strengthens immunity system and act against skin problems. Apricots also provide relief in sunburn (Anand, 2009). Apple contains fibres and rich in phytochemicals, they are alkaline in nature and effective in liver cleansing (Tahseen 2015).

CONCLUSION

The issue of increasing malnutrition among people and particularly women is not always due to poor living status or lack of sufficient food but can be due to lack of awareness about the right kind of diet required for the proper growth and functioning of the body. Therefore, creating awareness about the nutrition and health is an important task especially in the rural areas of hills. Awareness campaign regarding the proper nutrition, nutri-gardening, dietary habits, should be demonstrated in the rural and remote areas. Nutri-gardening is one of the advantageous ways to improve nutrition level in women with minimum investment. In these nutri-gardens horticultural crops can be grown which covers a wider range of crops such as fruits, vegetables, root and tuber crops, aromatic and medicinal plants, spices and plantation crops, which enhances diversity in nutrition. The geographical and climatic attributes in the hill region are suitable for production of temperate and subtropical fruit crops like apple, pear, peach, plum, citrus, apricot and walnut. Micronutrient malnutrition can be overcome by including a variety of fruits and vegetables in daily food basket. Increasing variability in diet and improving fruits and vegetable consumption is one of the few dietary strategies that can help in improving both situations of undernourished and overweight. "There is a horticultural remedy for every nutritional malady' says Prof. M.S. Swaminathan, the Father of Green Revolution in India. Thus, through nutri-gardening, fresh and safe to eat vegetables will be available for domestic consumption all the year round and improved consumption of vegetables will help to address nutrient deficiency disorders like anemia, goiter, night blindness and so on

REFERENCES

Anand R. 2009. Fruits for your skin. *Pune Mirror,* 11: 24.

Anonymous. 2016. Uttarakhand at a glance: 2015-16. Directorate of Economics and Statistics, Department of Planning, Dehradun.

Bouis, H.E.; C. Hotz; B. McClafferty; J.V. Meenakshi and W.H. Pfeiffer. 2011. Biofortification: a new tool to reduce micronutrient malnutrition. *Food Nutrition Bulletin,* 32(1): 31-40.

Brennan, P.; C.C. Hsu; N. Moullan; N. Szeszenia-Dabrowska; J. Lissowska; D. Zaridze; P. Rudnai; E. Fabianova; D. Mates and V. Benckoet. 2005. *Lancet,* 366(9496): 1558-1560.

Campbell, E.; I.A. Merwin and O.I. Padilla-Zakour. 2011. Nutritional quality of New York peaches and apricots. *New Yotk State Horticulture Society,* 19(4).

Census. 2011. Primary Census Abstracts, Registrar General of India, Ministry of Home Affairs, Government of India.

Crawford, P.B.; E. Obarzanek; J. Morrison and Z.I. Sabry. 1994. Comparative advantage of 3 days food records over 24 recall and 5 days food frequency validated by observation of 9 and 10 year girls. *Journal of the American Dietetic Association,* 94(6): 626-630.

Dharmalingam, A.; K. Navanethan and C.S. Krishna Kumar. 2009. Nutritional status of mothers and low birth weight in India. *Maternal and Child Health Journal,* 7: 38-42.

FAO. 2015. The State of Food Insecurity in the World 2015 FAO, Rome.

Ganry, J. 2006. The nutritional value of fruits and vegetables. *Fruits,* 61: 223-224.

ICMR. 2010. Nutrient requirements and recommended dietary allowances for Indians. A report of the Expert Group of the Indian Council of Medical Research, NIN, Hyderabad, pp 85-86.

IFPRI. 2016. Improving Nutrition in Uttarakhand**:** Insights from Examining Trends in Outcomes, Determinants and Interventions between 2006 and 2016. *Policy Note*.

Jethi, R.; P. Joshi; N. Chandra; M.L. Roy and K. Joshi. 2018. Investigation of nutritional and health status of Indian Rural Hill Farm Women. *Journal of Community Mobilization and Sustainable Development,* 13(1): 169-176.

Johnson, W.C.; B. Alemu and T.P. Msaki. 2000. Improving household food security: institutions, gender and integrated approaches: Paper prepared for the broadening access and strengthening input market systems (BASIS) collaborative research support project (CRSP), USA.

Kazi, N.; J.P. Ayadav and M.G. Agale. 2015. Nutritional value of fruits. *Scholarly Research Journal for Interdisciplinary Studies,* 3(16).

Kimberly, K. 2016. Improving Nutrition in India: Taking Flight with Women Improving Nutrition through Group-based Strategies (WINGS). *International Food Policy Research Institute.* http://www.ifpri.org/blog/improving-nutrition-india-taking-flight-wings.

Kubec, R.; M. Svobodovaand and J. Velisek. 2000. *Journal of Agriculture and Food Chemistry* 48(2): 428-433.

Kukreti, V.T. and A.T. Bisht 2013. Stress and nutritional status of individuals in Uttarakhand, Northern India: Differential effect of gender. *Health Promotion Perspectives,* 3(2): 255-260.

Longvah, T.; R. Ananthan; K. Bhaskarachary and K. Venkaiah. 2017. Indian Food Composition Tables, National Institute of Nutrition, Hyderabad, Telangana, India.

Mitchell, R. and T. Hanstad. 2004. Small home garden plots and sustainable livelihoods for the poor, Rome, Italy: LSP Working Paper 11.

National Family Health Survey. 2015. State fact sheets: *report*. International Institute for Population Sciences, Mumbai.

NNMB. 2006. Diet and nutritional status of population and prevalence of hypertension among adults in rural areas: *Technical Report*, No. 24.

Noda, Y.; T. Kneyuki and K. Igarashi. 2000. *Toxicology,* 148(2): 119-123.

Pandey, H. 2001. Understanding farm women, National Research Centre for Women in Agriculture. Bhubneshwar, pp. 15.

Pant, B.R. 2016. Demographic profile and nutrition status of women in Uttarakhand. *ENVIS Bulletin Himalayan Ecology,* 24: 101-108.

Prajapati, P.M.; A.S. Solanki and D.J. Sen. 2012. Nutritional value of Plum tree for health- review article. *International Research Journal of Pharmacy,* 3(5).

Rammohan, A.; N. Awofeso and M.C. Robitaille. 2012. Addressing female iron-deficiency anemia in India: is vegetarianism the major obstacle. *ISRN Public Health,* 1: 87-94.

Ranawat, R. 2017. Impact of Nutri-Garden on food security of rural families in Udaipur district. *Annals of Agri-Bio Research,* 22(2): 278-280.

Rawat Rajiv. 2004. Chipko's Quiet Legacy: Forest Rights, Women's Empowerment, Peoples' Institutions, and New Urban Struggles in Uttarakhand, India' York University, Ontario, Canada (mimeo).

Scholz-Ahrens, K.E.; G. Schaafsma; E.G.H.M. Van Den Hauvel and J. Schrezenmeir. 2001. *The American Journal of Clinical Nutrition,* 73(2): 459-464.

Shah, A. 2004. Iron Deficiency Anemia - Part-I. *Indian Journal of Medical Science,* 58(2): 79-81.

Spears, D. 2013. How much international variation in child height can sanitation explain? *Policy Research Working Paper No. 6351*. World Bank.

Tahseen, I. 2015. Juice parties are becomimg popular. *Pune Time*, *Times of India*, pp. 24.

Tohil, B.C.; J. Seymour; M. Serdula; L. Kettel Khan and B.J. Rolls. 2004. What epidemiological studies tell us about the relationship between fruits and vegetables consumption and body weight. *Nutritional Review,* 62: 365-374.

Upadhyay, S.K.; A.R. Raghuvanshi and B.B. Singh. 2011. Nutritional status and knowledge of hill women on anemia: Effect of various socio-demographic factors. *Journal of Human Ecology,* 33(1): 29-34.

Vijayalakshmi, K. and R.A. Thooyavathy. 2012. Nutritional and Health security through integrated gardens: The CIKS experience. *Universiras Forum,* 3(1).

Wargovich, M.J. 2000. Anticancer properties of fruits and vegetables. *Hort Science,* 35: 573-575.

Zimmermann, M.B. 2009. Iodine deficiency in pregnancy and the effects of maternal iodine supplementation on the offspring: A Review. *American Journal of Clinical Nutrition,* 89: 668–672.

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Covid-19 Triggered Tobacco New Normal: Need for Crop Diversification

B. Hema[1]*, D. Damodar Reddy[2] and S. Kasturi Krishna[3]

[1]Scientist, (Agricultural Extension), [3]Principal Scientist & Head I/C, Division of Crop Production, [2]Director, ICAR-Central Tobacco Research Institute, Rajahmundry-533105, Andhra Pradesh

ABSTRACT

The present paper is an attempt to analyze the post Covid-19 tobacco sector and need for crop diversification in tobacco growing areas of India. The study was primarily based on the time series secondary data on area, production, exports and government anti-tobacco initiatives and progress in implementation of crop diversification in tobacco growing zones of India. Tobacco sector is at crossroads today due to social stigma attached to the crop from many years and the national and international policies relating to tobacco are becoming increasingly stringent in the recent years. The current declining demand is expected to reduce the tobacco production in future. Presently, with the advent of Covid-19 pandemic and emergence of new normal situation in tobacco, it will result further in decline of tobacco consumption, drop in funds to tobacco research support, farmers unable to get fair price due to decrease in demand for tobacco exports leads to fall in net returns to the growers. All these changes point to the fact that the tobacco sector is fraught with a great degree of uncertainty posing serious challenges to cultivation by farmers in future. In view of this, the future of people dependent on tobacco needs to be realigned in line with crop diversification with demand driven commercial crops so that the emerging and unforeseen socio-economic and environmental issues of tobacco sector can be addressed effectively.

Keywords: Commercial crops, Covid -19, Diversification, FCTC and Tobacco

INTRODUCTION

Tobacco, a plant with global presence is grown in more than 100 countries with a worldwide production of 6.1 million tons of tobacco cultivated in 3.3 million hectares of land. India holding its dominance position as third largest producer (750 M kg) of tobacco cultivated in an area of 0.42 M ha after China (2242 M kg) and Brazil (762 M kg) in the World. (FAOSTAT 2018). Flue-Cured Virginia (FCV), *bidi,* hookah, chewing, cigar wrapper, cheroot, burley, oriental, HDBRG, *lanka, pikka, natu* etc. are the main types of tobacco grown in the country, with FCV and Burley tobacco being the main exportable types. Tobacco production in India is mainly concentrated in the states of Andhra Pradesh, Karnataka, Gujarat, Bihar, Uttar Pradesh, West Bengal and Tamil Nadu. Tobacco leaf is used for making smoke and smokeless products including cigarettes, *bidis, hookah, cigar, cheroot, khaini, zarda, kiwam, gutka, mishri, mawa, snuff* etc. The returns from tobacco is contributing substantially to the national exchequer by way of excise duty (227.4 billion) and foreign exchange earnings (60 billion) (Tobacco Board 2019).

*Corresponding author email id: hema.baliwada@gmail.com

At present, the perception of people towards tobacco is slowly changing. Although tobacco is profitable from farmers point of view, but due to social stigma attached to this crop coupled with anti-tobacco policy measures and present Covid-19 pandemic hitting pressure to identify the viable alternative livelihood for tobacco farmers. Around the world, some countries have tried small programs to introduce new crops. Still, there is no panacea for this transition. Few farmers switch to and from tobacco, based on hopes for high leaf prices. Taking into account the ongoing and forthcoming challenges in tobacco sector, the present study aims to evaluate the post Covid-19 tobacco sector and pressing need for crop diversification in tobacco growing zones of India.

MATERIALS AND METHODS

The study was primarily based on the time series secondary data obtained from various authentic sources and records. Data on area, production, consumption and exports were collected from Food and Agricultural Organization (FAO) statistics; reports of WHO (World Health Organization),

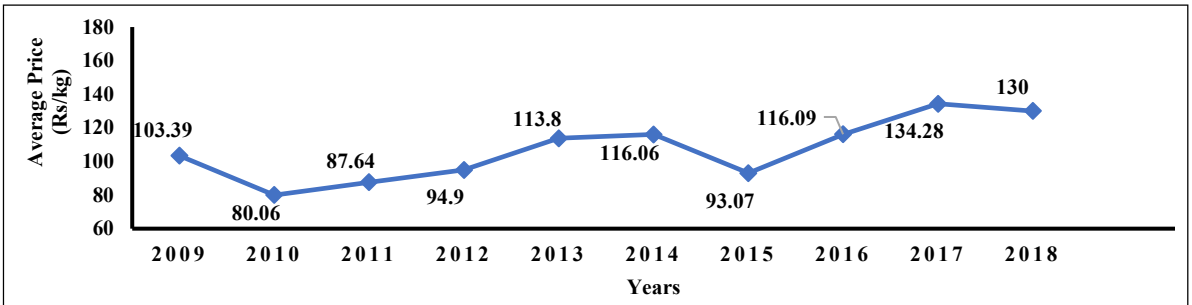
Tobacco Atlas, Statista (The Statistics portal), DAC&FW, Ministry of Agriculture reports, Tobacco Board and Spice Board statistics. Graphical analysis is used in analyzing the FCV tobacco, ginger, chillies and turmeric crops prices and export value over the years. Production, exports and smoking prevalence of tobacco was analyzed for the recent years and inferred accordingly the future of tobacco sector. Further, progress in implementation of policies, interventions and budget allocation for crop diversification in tobacco growing areas are interpreted with the data available from the authenticated sources. In addition, next best crop options for different FCV and non-FCV tobacco growing regions are identified for future implementation measures.

RESULTS AND DISCUSSION

Among different types of tobacco grown in India, FCV tobacco ensures fair and consistent price to the growers. It is also one of the main exportable tobacco types and it is cultivated in Andhra Pradesh and Karnataka. Average prices realized by FCV tobacco farmers in Andhra Pradesh and Karnataka auctions since 2009 are given below (Figure 1&2).

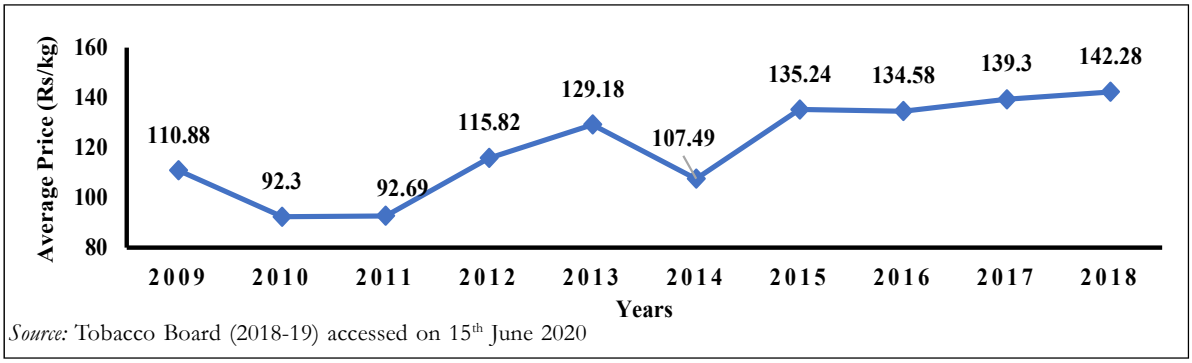
Although tobacco particularly FCV is profitable from farmers view, in future there is every likelihood for alternative crops due to serious alleged association of tobacco with health risks. According to WHO (2020) reports, tobacco kills more than 8 million people globally every year. In response to the globalization of the tobacco epidemic and to protect present and future generations from the devastating health, social, environmental and economic consequences of tobacco use, the World Health Organization's Framework Convention on Tobacco Control (WHO-FCTC), which came into effect in 2005, provided a framework for tobacco control measures to prevent the global burden of tobacco related death and disability. Due to continuous and raising anti-tobacco campaigns, Article 17 of the WHO-FCTC compelled parties to promote viable alternative livelihoods for tobacco farmers. Many countries, including the world's largest tobacco producers like China and Brazil are taking steps to find alternatives to tobacco growing.

The perception on tobacco is further intensified to disgrace after emergence of Covid-19 pandemic (Corona virus) which originated in China in late 2019. The Covid-19 infection continued to surge in different countries and turned into a pandemic that has affected almost 213 countries and territories around the world till date (Worldometers 2020). Experts are in the opinion that it



Source: Tobacco Board (2018-19) accessed on 15th June 2020

Figure 1: Average prices realized by FCV tobacco farmers in Andhra Pradesh since 2009



Source: Tobacco Board (2018-19) accessed on 15th June 2020

Figure 2: Average prices realized by FCV tobacco farmers in Karnataka since 2009

has significant impacts for many years. The magnitude of the threat has forced both governments and businesses to urgently elevate public health above economic principles. In connection to this, a recent review of studies by public health experts convened by World Health Organization (WHO) on 29 April, 2020 found that smokers are more likely to develop severe disease with COVID-19, compared to non-smokers. Besides, reports from Tobacco Institute of India (2020) opined that "The generalized advice to quit smoking as a measure to improve health risk remains valid, but no recommendation can currently be made concerning the effects of smoking on the risk of hospitalization for Covid-19".

Although intensive research is needed to prove the facts, but reports says that phasing out cigarette sales would be an enormous long-term gain for public health. The new corona virus spreads through droplets from the mouth and nose, so the spitting that often accompanies chewing tobacco may also pose a risk by spreading the new corona virus. In connection to this many countries around the world have taken necessary preventive measures under the appropriate law to prohibit the use of tobacco in public places. Accordingly, government of India also banned the spitting of chewing smokeless tobacco products in public places and it is made a strict punishable offence during Covid-19 situation. The Covid-19 pandemic has triggered emergence of "Tobacco New Normal" situation.

The Covid-19 pandemic has led to emergence of Tobacco New Normal characterized by:

- Hightend health consciousness and awareness about tobacco related health hazards
- Reduced demand and supply for tobacco
- Stringent enforcement of tobacco control and regulation laws
- Exasperated social stigma/disgrace attached to tobacco
- Shift in funding support from tobacco production to tobacco control

Due to this ongoing crisis, it results in decline of tobacco consumption among the public. This translates directly into the production system which affects the top tobacco producing and exporting countries. The world's most prolific and top three tobacco producers *i.e.* China, Brazil, and India are already facing alarming rates of corona virus infection. Countries around the world are increasingly adopting sweeping measures, including full lockdowns, shutting down airports, imposing travel restrictions and completely sealing their borders, to contain the new coronavirus which also hits tobacco exports and imports. At the other side, FCV tobacco farmers in the country are staring at shrinkage in their earnings this year due to severe disruptions in auctions in the wake of lockdowns imposed by the Government to combat the spread of COVID-19 pandemic in India. Some of the immediate shocks of Covid-19 on FCV tobacco farmers are given below.

- The Tobacco Board, under the Ministry of Commerce and Industry, Government of India, initially suspended ongoing auctions in both the FCV tobacco growing states of Andhra Pradesh and Karnataka in the third week of March 2020 and allowed gradual resumption of auctions only towards the end of April 2020. In Andhra Pradesh, only around 17 million kgs of the authorized FCV tobacco crop out of 136 million kgs valued at around Rs 2,000 crores was sold till end of May 2020, due to lockdown and delayed resumption of auctions. Similarly, in Karnataka, which had reached the last leg of auctioning in March 2020, the auction floors were shut due to Covid-19 lockdown with around 3 million kgs of the FCV tobacco left to be marketed (Tobacco Institute of India 2020; FAIFA 2020). This left the farmers with huge unsold stocks amidst fears of crop damage owing to prolonged storage in open fields and crash in prices due to the delayed auctioning of the perishable crop.
- Further, the Tobacco Board has announced a reduced crop size for the next Karnataka crop, downsizing it from earlier planned 99 million kgs to 88 million kgs. The Board may have to reduce the crop size for Andhra Pradesh also considering uncertainties in global market caused by the Covid-19 pandemic outbreak (Tobacco Institute of India 2020, FAIFA 2020).

Besides, farmers grapple with rising costs due to high labour charges emerged in this pandemic situation. In these aforesaid conditions, the future path of tobacco sector is gradually falling in uncertain zone. But, to secure future of tobacco sector and to improve livelihood of 45.7 million people dependent on tobacco sector, adequate attention needs to be given to improve the welfare of tobacco farmers and raise their farm income through alternative options.

As India is blessed with a wealth of crop diversity, crop diversification in tobacco growing areas is an

appropriate promising option. At the conceptual plane, diversification of agriculture may fall in the categories of shift of resources from farm to non-farm activities or shift of resources within agriculture from less profitable to more profitable crop/enterprise or use of resources in diverse but with complementary activities. Crop diversification provides the farmers with a wider choice in the production of a variety of crops in a given area so as to expand production related activities on various crops and also brings down the possible risk. Crop diversification in India is generally viewed as a shift from traditionally grown less remunerative to more remunerative crops. The determinants/drivers of crop diversification are given below.

- Social needs *i.e.* specific crop gaining momentum due to raising demand. For instance, ginger cultivation in Mysore district of Karnataka
- Higher profitability and also the resilience/stability in production also induce crop diversification, for example, area increased under potato (7.29%) and vegetables (5.75%) cultivation showed the progress towards diversification from food grains to more remunerative crops in Paschim Medinipur district of West Bengal (Debkumar *et al.,* 2016).
- Risk aversion, as agriculture is prone with all types of risks shifting to essential commodities having sustainable demand *i.e.* chillies, turmeric and ginger.
- Governmental policies and thrust on some crops over a given time, for example a) creation of the Technology Mission on Oilseeds (TMO) to give thrust on oilseeds production as a national need for the country's requirement for less dependency on imports. b) Tobacco Board policy driven crop regulation on Flue-Cured Virginia tobacco in Andhra Pradesh and Karnataka
- To increase system productivity, ensure food security and national importance. For Example, implementation of Pulses Seed Hub to promote food and nutritional security.
- Market infrastructure development and certain other price related supports also induce crop shift. Often low volume high-value crops like spices and other commercial crops aid in crop diversification. For example, area under rice cultivation in Baghpat district of Uttar Pradesh increased up to 15.85% and 84.21% during 1992-93 to 2002-03 and 2002-03 to 2012-13 respectively because of popularization of basmati varieties with charming market price (Surendra *et al.,* 2015).
- Crop diversification practiced in rainfed lands to reduce the risk factor of crop failures due to drought or less rains.
- Crop substitution and shift are also taking place in the areas with distinct soil problems. For example, growing of rice in high water table areas and promotion of legume crops
- Promoting crops due to other factors like price stabilization over the years, demand driven and export potential.

Although aforesaid factors that influence the area allocation decision of farmers are all important, but they obviously differ in terms of the relative importance both across farm groups and resource regions. In case of commercial crop like tobacco, crop diversification is slowly gaining momentum. Serious attempts are being made from many years in promoting crop diversification resulting in reduction of tobacco production, exports and ultimately consumption due to raising taxes. The policies relating to tobacco are becoming increasingly stringent around the world is given below.

WHO-Framework Convention on Tobacco Control

In the measures taken to protect from environmental tobacco smoke during 2018, overall 91% (165) of all parties had implemented measures to protect their citizens from exposure to tobacco smoke by applying a ban – either complete or partial – on tobacco smoking in indoor workplaces, public transport, indoor public places and, as appropriate, other public places. It resulted in decline of tobacco consumption. According to WHO global report on trends in prevalence of tobacco use for the period 2000-2025, In 2000, around a third (33.3%) of the global population (both genders combined) and aged 15 years and older, were current users of some form of tobacco. By 2015, this rate had declined to about a quarter (24.9%) of the global population. Assuming that current efforts in tobacco control are maintained in all countries, the rate is projected to decline further to around a fifth (20.9%) of the global population by 2025 (WHO, 2019) is given in Figure 3.

Besides, WHO observes the 31st May every year as World No-Tobacco Day (WNTD) to enhance public

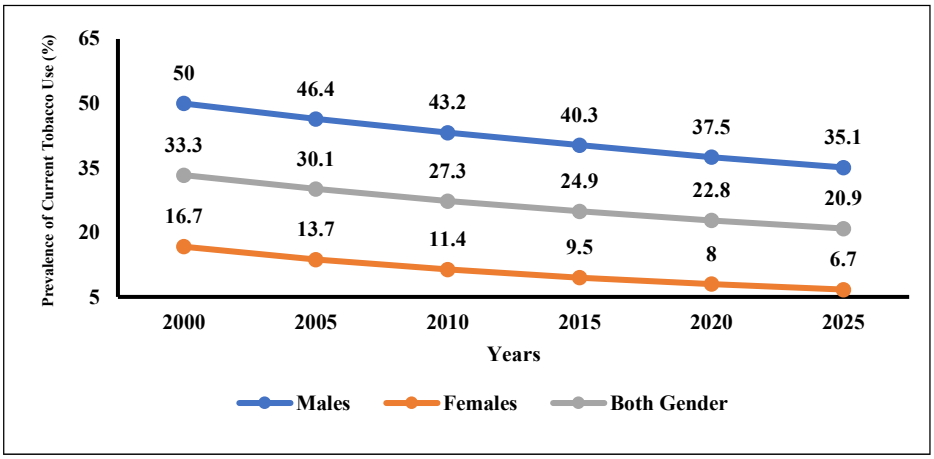


Figure 3: Global Trends in Prevalence of Tobacco Use by Gender

Source: WHO (2019) global report on trends in prevalence of tobacco use 2000-2025 accessed on 15th June 2020

awareness about tobacco-related health hazards and discourage all forms of tobacco consumption. From policy perspective, India enacted 'The Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) Act or COPTA' in 2003 to prohibit advertisement of, and to provide for the regulation of trade and commerce in, and production, supply and distribution of cigarettes and other tobacco products in India. Besides, the measures for crop diversification are being implemented in India are mentioned below.

Initiatives for Crop Diversification in Tobacco Growing Areas of India

I. Crop Diversification Programme of Ministry of Agriculture: The Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW) had made budgetary allocations from 2015-16 onwards as Central share under Crop Diversification Programme (CDP), an ongoing sub-scheme of Rashtriya Krishi Vikas Yojana (RKVY) to encourage tobacco growing farmers to shift to alternative crops/cropping system in tobacco growing states. Under CDP, tobacco growing States have given flexibility to take suitable activities/interventions for replacing the tobacco to alternative crops/cropping system as per the cost norms approved under any Centrally Sponsored Scheme/State Scheme. The States may also organize study tours/ exposure visits and campaigns etc. for highlighting harmful effects of tobacco and long-term benefits of alternative crops under CDP. State and year-wise budgetary allocations (Central share) made under CDP from 2015-16 to 2019-20 to diversify tobacco farming in the tobacco producing States is given in Table 1.

From the Table 1, data revealed that the per cent share for tobacco growing areas in the total 'Crop Diversification Programme' budget is increasing from 2015-16 onwards which shows the success in implementation of the programme. According to DAC&FW (2020) reports, the budget earmarked for CDP in tobacco growing areas for the year 2020-21 is Rs 1000 lakhs.

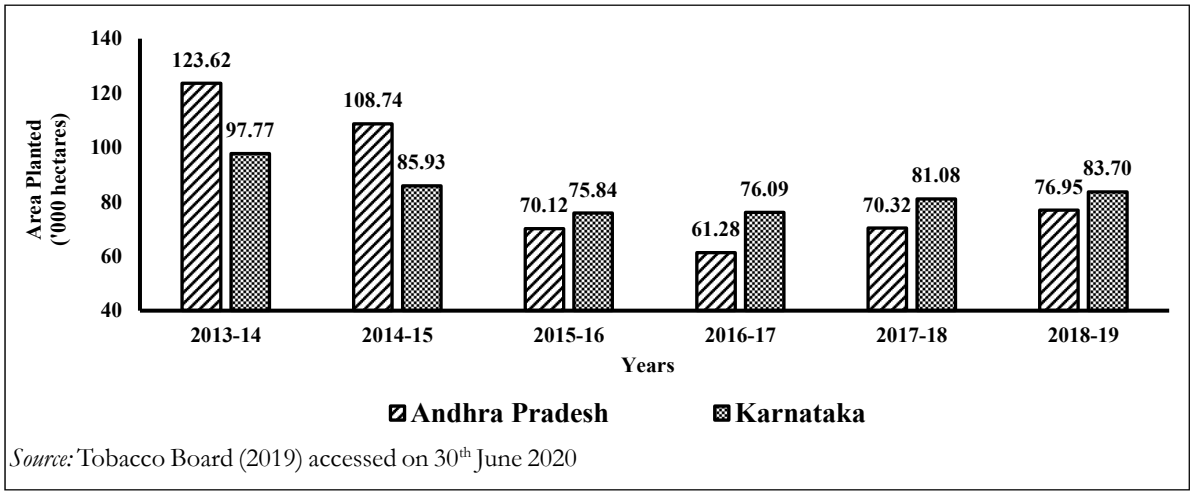
II. Crop size fixation by Tobacco Board under Ministry of Commerce: Crop regulation by Tobacco Board is demand driven and as per the demand and supply of FCV tobacco in domestic and international markets. Moreover, the Government of India had freezed the upper ceilings limits of crop size and Tobacco Board is regulating the FCV tobacco cultivation in and around the recommended limits. The Board had undertaken a focused Production Regulation Campaign during 2015-16 crop season especially in Andhra Pradesh to prevent excess/ unauthorized production of FCV tobacco through personal contacts, group meetings in the villages and mass contact programmes. A total of 70,122 ha. was planted in Andhra Pradesh under FCV tobacco as against 1,08,737 ha. planted during 2014-15 crop season. The decline in area is about 36% which is a breakthrough in crop regulation (Tobacco Board 2015). Trends in area planted and production of FCV tobacco in A.P. and Karnataka are given below in Figure 4 & 5.

Moreover, anticipating drop in global demand, Tobacco Board in India has recently reduced FCV tobacco crop size by 12% i.e., from 100 M kg to 88 M kg for ensuing crop season (2020-21) in the state of Karnataka. The Board may reduce the crop size for next season crop in Andhra Pradesh also in view of the massive disruptions in trade. The trend in tobacco exports fluctuates due to production policy measures.

Table 1: Year wise budget allocation (central share) for CDP in Tobacco Growing Areas (Rs. in Lakhs)

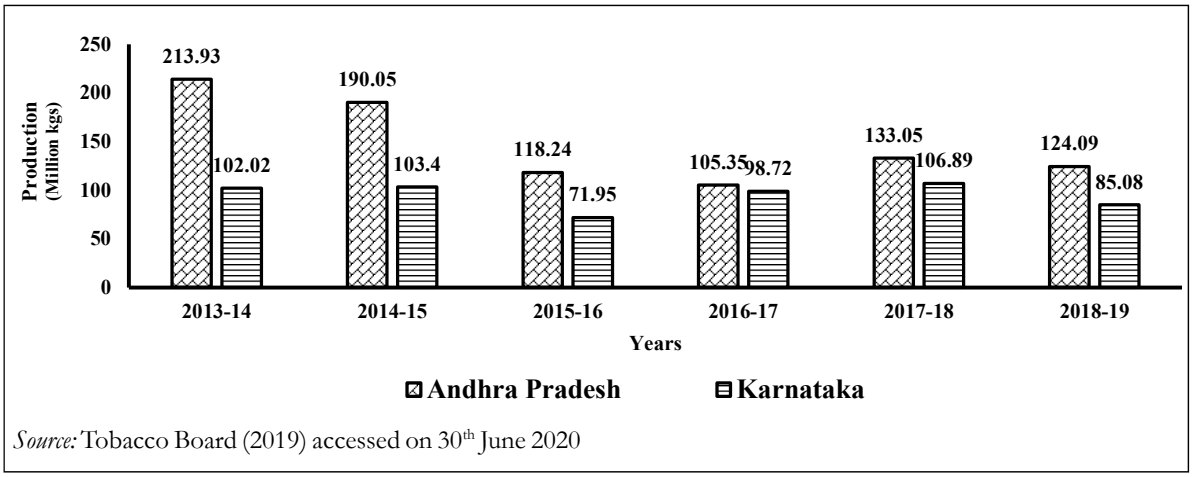
State	2015-16	2016-17	2017-18	2018-19	2019-20
Andhra Pradesh	787	945	210.1	210.1	212.96
Bihar	67	80	17.8	17.8	17.80
Gujarat	754	905	201.23	201.23	201.23
Karnataka	600	720	160.08	160.08	160.08
Maharashtra	11	13	2.86	2.86	0.00
Odisha	9	11	2.45	2.45	2.45
Tamil Nadu	20.5	24	5.33	5.33	5.33
Telangana	38.5	47	10.47	10.47	10.47
Uttar Pradesh	143	172	38.21	38.21	38.21
West Bengal	70	83	18.47	18.47	18.47
Budget allocated for CDP in Tobacco growing areas	**2500**	**3000**	**667**	**667**	**667**
Total Budget allocated for CDP (central share)	**15000**	**18000**	**4000**	**2000**	**2000**
Per cent share for tobacco growing areas in total budget for CDP (%)	**16.67**	**16.67**	**16.675**	**33.35**	**33.35**

Source: DAC&FW (2020), Press Information Bureau (2019)



Source: Tobacco Board (2019) accessed on 30th June 2020

Figure 4: Trends in Area Planted under FCV Tobacco in AP and Karnataka

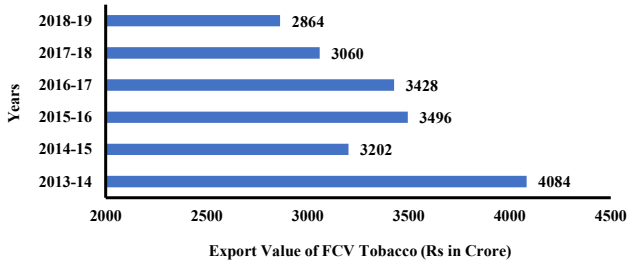


Source: Tobacco Board (2019) accessed on 30th June 2020

Figure 5: Trends in FCV Tobacco Production in AP and Karnataka

Tobacco Exports

Indian total tobacco exports have crossed Rs 6,000 crore during 2018-19. Tobacco exports during 2018-19 have gone up by 4% in terms of quantity and 8% in terms of value in rupees as compared to the exports made during the 2017-18 (Tobacco Board 2019). But, declining trend was observed in FCV tobacco exports (fig 6) across the years (2013-19). Overall, the decline in FCV tobacco exports was compensated by the growth in Non-FCV segment to the total tobacco exports.



Source: Tobacco Board (2018-19) accessed on 15th June 2020

Figure 6: Export value of FCV tobacco for the period 2013-19

As FCV tobacco exports also started downfall due to stringent anti-tobacco campaigns, further Indian tobacco consumption and exports may dip by 20 per cent due to Covid-19 lockdown (The Economic Times 2020; The Hindu 2020).

Possible candidate crops/next best crops in tobacco growing regions

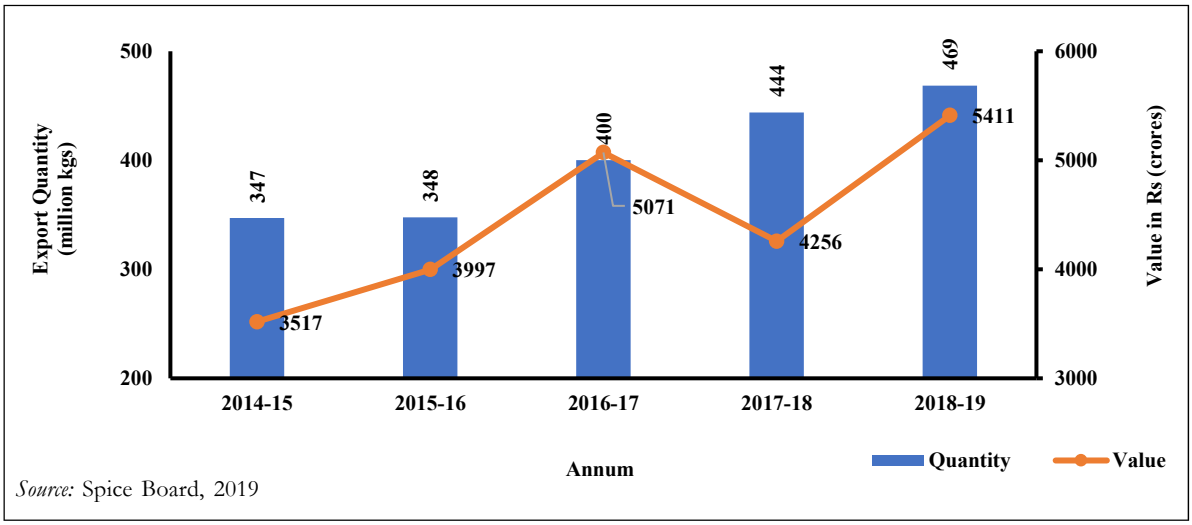
Since tobacco itself is a commercial crop, the other crops already having substantial area and sustainable local demand can be the next best crops to tobacco. In future, high value medicinal and commercial crops change the future of agriculture. High value commercial crops and commercial agriculture assume a greater significance in the efforts to increase farm incomes. Commercial agriculture not only caters to the domestic market but has also been one of the major earners of foreign exchange for the country. The research conducted at ICAR-CTRI has identified some high value commercial crops based cropping systems in tobacco zones. The details are furnished below in Table 2.

In tune with identifying crop diversification options, besides other possible crops, studies are also being conducted with medicinal plants at ICAR-Central Tobacco Research Institute *i.e.* on *Gloriasa Superba*, in chewing tobacco growing areas of Tamil Nadu.

At present the commercial crops like chillies, ginger and turmeric are grown extensively and these crops suits well to the bio-physical environment of tobacco growing regions. Crop diversification with these commercial crops further adds value in terms of creating diverse income sources, price stability and high net returns to the farmers. Beside boosting immunity levels, these crops have huge export potential in the world. Item wise export in terms

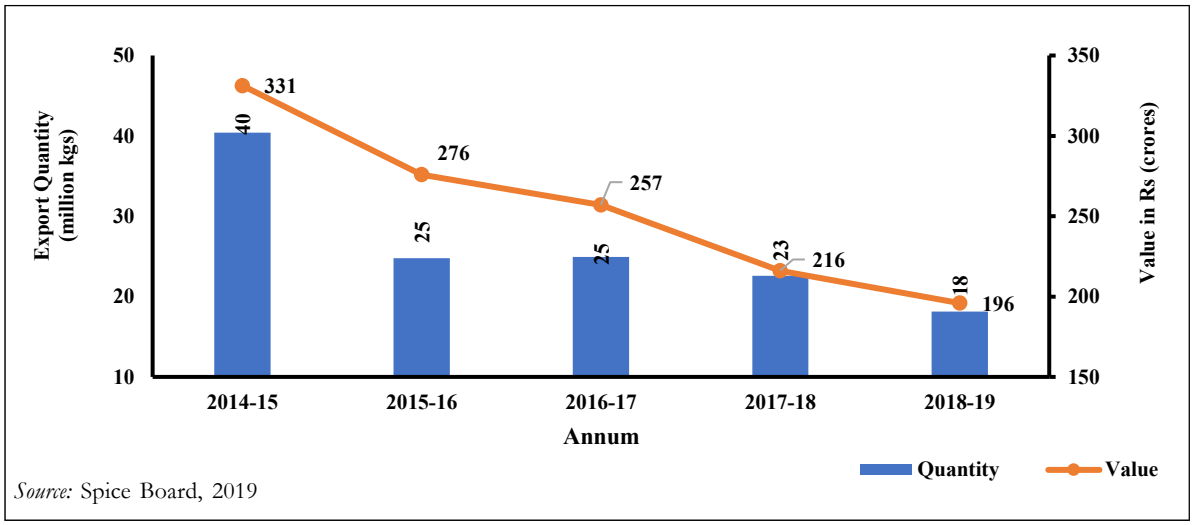
Table 2: High value commercial crops based cropping systems in tobacco zones

Tobacco growing district/Research Station	Existing System	Possible New Cropping Systems	
		Tobacco Based	High Value Commercial Crops based
East Godavari, A.PICAR-CTRI, HQ, Rajahmundry (Vertisols)	Fallow-Tobacco	Minor Millet-Tobacco	Minor Millet – Chilli /Turmeric + Red gram
West Godavari, A.P.ICAR- CTRI RS, Jeelugumilli(Irrigated Alfisols)	Fallow-Tobacco	Minor Millet-Tobacco-Ground nut as relay crop in tobacco	Turmeric - Pulses
Prakasam, A.P, ICAR-CTRI RS, Kandukur (Rainfed Vertisols/Alfisols)	Fallow-Tobacco	Minor Millet-Tobacco	Castor - Pulses/Minor Millet - Castor
Guntur, A.P, ICAR-CTRI RS, Guntur (Rainfed Vertisols)	Fallow-Tobacco	Pulses-Tobacco	Chilli - Chick pea/Castor - Chick pea/Turmeric - Pulses
Dindigal, TN, ICAR-CTRI RS, Vedasandur (Sandy loams, Inceptisols)	Fallow-Tobacco	Millet-Tobacco/ Tobacco+Annual Moringa	Turmeric + Annual Moringa
Cooch Behar, WB, ICAR-CTRI RS, Dinhata (Alluvial soils, Entisols)	Aman Rice-Tobacco	Aman Rice-Tobacco	Turmeric - Pulses



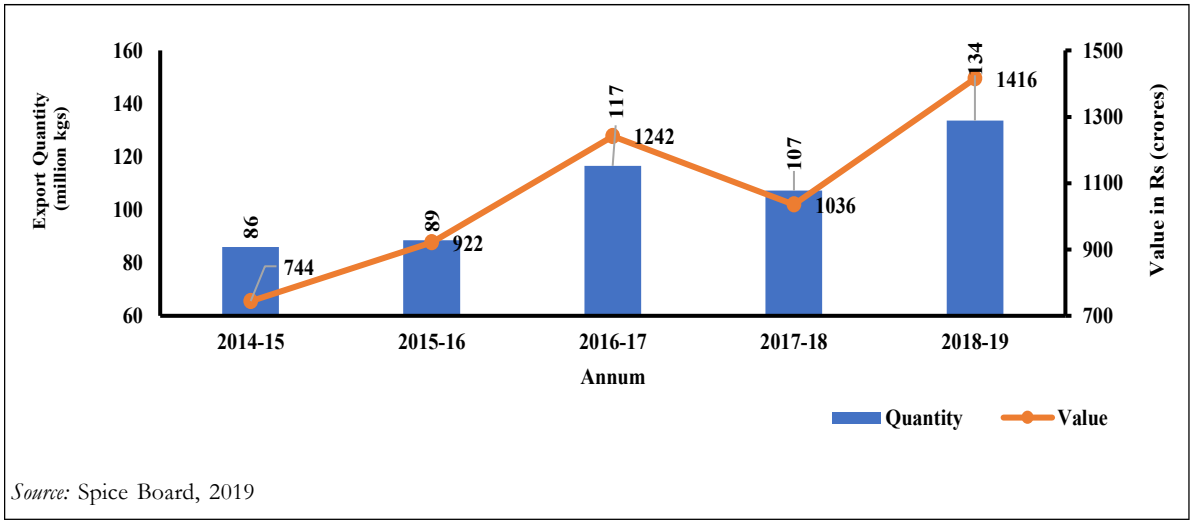
Source: Spice Board, 2019

Figure 7: Export quantity and value of Chillies for the period 2014-19



Source: Spice Board, 2019

Figure 8: Export quantity and value of Ginger for the period 2014-19



Source: Spice Board, 2019

Figure 9: Export quantity and value of Turmeric for the period 2014-19

of quantity and value for chillies, ginger and turmeric from India for the period of last 5 years is given below in Figure 7, 8 & 9.

Future thrust areas

- Due to stringent international policies, government of India earlier started initiatives in this line by implementing crop diversification programme in tobacco growing areas since 2015 and crop area size fixation policy by Tobacco Board. Hence, these programmes and policies should be further intensified by allocating more budget, rigorous measures, for gradual phase out of tobacco size area.
- With the advent of Covid-19 pandemic, tobacco consumption is expected to decline further as tobacco consumers are generally reported to be more vulnerable to health risks in terms of infection, severity of symptoms and mortality. The declining demand is expected to reduce the tobacco production in future. It is already evident from the fact that the Tobacco Board in India has recently reduced FCV tobacco crop size by 12% i.e., from 100 M kg to 88 M kg for ensuing crop season (2020-21) in the state of Karnataka. The Covid-19 pandemic has triggered emergence of "Tobacco New Normal" characterized by increased public awareness of tobacco hazards, strict enforcement of tobacco control policies and decreased tobacco demand and supply. In response to building New Normal, tobacco crop would experience a gradual phase out and preference to commercial crops like ginger, turmeric and chillies as components of the crop diversification.
- As perception of farmers don't change immediately to shift from tobacco to other crops, incentives in the form of free seed distribution and highly subsidized chemical inputs for certain period of time should be given to those wish to shift from tobacco to other crops as a token of motivation
- One thing that demarcates tobacco cultivation from other crops is timely loan facility extended to the growers. The same type of financial assurance could be extended to those shifting to commercial crops.
- In the recent times, the Government of India has been laying more emphasis on sustainable increase in farmers' income (with a specific objective of doubling it by 2022) to ensure the overall well-being of the agrarian community. Crop diversification, value addition and export promotion are some key areas that help augment the farm returns. Crop diversification is generally considered as an overarching gateway for sustaining farm production and farmers' income. Therefore, shifting tobacco to other commercial crops can be one of the excellent strategies to meet this goal
- COVID-19 has emphasized the need for ensuring hygienic surroundings. Government of India implemented strict ban on spitting of chewing tobacco products in public places and there is likelihood of restriction on ban in post Covid-19 period as well. Therefore, shifting from tobacco to other crops can maintain hygiene in public places which is also in line with Swachh Bharat Abhiyan.

CONCLUSION

Although tobacco is commercial crop and farmers are immensely benefitting from net returns, but the effect of past and current enacted policies on tobacco control coupled with the current assumption that smokers are more vulnerable to Covid-19 has serious implications on future tobacco sector. From the findings, downward trend is observed especially in value of FCV exports due to continuous tobacco cultivation area reduction and freezing of production size policies of Tobacco Board. At present, as there are cross boarder closures by different countries around the world, there will be serious impact on future tobacco exports which further hits the returns to the government and to the tobacco growers. The study concluded that, presently with the advent of Covid-19 pandemic and emergence of new normal situation in tobacco, it will result further in decline of tobacco consumption, drop in funds to tobacco research support, farmers unable to get fair price due to decrease in demand for tobacco exports leads to fall in net returns to the growers. Therefore, India needs to turn Covid-19 into an opportunity to shift from tobacco to other high value commercial crops having export potential to secure the future and to provide the assured pathway to farmers dependent on tobacco sector.

REFERENCES

DAC&FW (Department of Agriculture, Cooperation and Farmers Welfare). 2020. Implementation of Crop Diversification Programme during 2020-21. Available at https://rkvy.nic.in/static//download/cirlular_notifications/Allocation_CDP_2020-21.pdf

Debkumar Kisku and Souvik Ghosh. 2016. Spatio-temporal Variation in Status of Crop Diversification and Its Impact on Farming in West Bengal. *Journal of Community Mobilization and Sustainable Development*, 11(1): 29-38.

FAIFA. 2020. https://www.protectourlivelihood.in/farmer-issues/covid-19-impact/

FAOSTAT. 2018. Available at http://www.fao.org/faostat/en/#data/QC

https://rkvy.nic.in/static//download/cirlular_notifications/Allocation_CDP_2019-20.pdf

Marita Hefler ÿþÿþand Coral E Gartner. 2020. The tobacco industry in the time of COVID-19: time to shut it down? Tobacco Control Journal. Vol 29 No 3. Available online at https://tobaccocontrol.bmj.com/content/tobaccocontrol/early/2020/04/06/tobaccocontrol-2020-055807.full.pdf

Press Information Bureau (PIB). 2019. Tobacco Farming report. Available online at https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1558256

Spices Board India. 2019. https://www.indianspices.com/export/major-itemwise-export.html, https://www.indianspices.com/sites/default/files/Major%20Item%20wise%20Export%202019.pdf

Surendar Kumar, G. Pal and Sarita Joshi. 2015. Extent and Scope of Agriculture Diversification in Baghpat district of Uttar Pradesh. *Journal of Community Mobilization and Sustainable Development,* 10(2): 212-216

The Economic Times. 2020. Indian tobacco consumption, exports may dip by 20% due to lockdown. Available online at https://economictimes.indiatimes.com/industry/cons-products/tobacco/indian-tobacco-consumption-exports-may-dip-by-20-due-to-lockdown/articleshow/75200241.cms?from= mdr

The Hindu. 2020. After fall in tobacco prices in A.P., farmers in Karnataka cautioned to limit produce. Available online at https://www.thehindu.com/news/national/karnataka/after-fall-in-tobacco-prices-in-ap-farmers-in-karnataka-cautioned-to-limit produce/article31682928.ece

Tobacco Board. 2015. Annual Report (2015-16). Available online at https://tobaccoboard.com/tbdata/publicationsfiles/AR_2015_16_1.pdf

Tobacco Board. 2019. Annual Report (2018-19). Available online at https://tobaccoboard.com/tbdata/publicationsfiles/AR-18-19.pdf

Tobacco Institute of India. 2020. TII Tobacco News. The COVID-19 Challenge for Tobacco Industry. Volume -11, Issue – 2&3. RNI NO. DELENG/2009/29775.

WHO. 2019. WHO global report on trends in prevalence of tobacco smoking 2000–2025, 3rd edition. ISBN 978-92-4-000003-2.

Worldometers. 2020. https://www.worldometers.info/coronavirus/#countries

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SWOT Analysis of Entrepreneurial Activities Run by Rural Women of Kangra District of Himachal Pradesh

Bindia Dutt[1]* and Asha Singhal[2]

[1]Assistant Professor, Department of Home Extension and Communication Management, College of Home Science, CSKHPKV, Palampur, Himachal Pradesh

[2]Professor, Department of Home Extension and Communication Management, College of Home Science, MPUAT, Udaipur, Rajasthan

ABSTRACT

The Present study assessed the strengths, weaknesses, opportunities and threats of selected agro based and craft related entrepreneurial activities being carried out by 180 women entrepreneurs in the Kangra district of Himachal Pradesh. The major strengths reported in almost all the enterprises by women entrepreneurs were low investments, compatibility to the background, feminine nature of the activities and high rate of return. Weak selling effort, low product shelf life (in case of agro based activities), high labour and time demanding nature of the activities were the weaknesses reported by entrepreneurial women. Major threats reported by women entrepreneurs were high competition in the market and danger to sustain. High demand of the product and favourable government policies were the major opportunities for the women engaged in these entrepreneurial activities.

Keywords: Opportunities, Strengths, Threats, Weaknesses, Women entrepreneurs

INTRODUCTION

In rural areas women's day starts early in the morning with the responsibilities of fetching water, fodder, feed, fuel and cooking food. She takes care of children and family members, their health and education. She manages all the family affairs and works for almost 14-16 hours a day. But the fate is that if anybody asks from their family member that what your mother or wife does then they say nothing. There is no recognition for their hard work, just because her work is not evaluated in terms of money. Women are ignored of matters, which are of concern to them as well. As a result today women are the worst sufferers in the society due to drudgery, ill health illiteracy, deprivation and humiliation. Backwardness of women is a sign of poverty. India hosts over one- third of the poor in the world, as lack of empowerment of women is a significant cause of poverty.

Empowering women is the solution to many problems. Societies that take efforts to empower women show better development indices, are better governed more stable and are less prone to violence. Rural women are key agents for development. They play a catalytic role towards achievement of transformational economic, environmental and social changes required for sustainable development. Economic empowerment of women plays an important role in upliftment of the women and her family because women have good managerial skills. It also offers mental satisfaction and provides diversion to women from routine work. It profiles a sense of achievement and a separate identity to women in the society (Kaur, 2006). Hence, Women should be motivated and guided to start their own economic ventures which leads to women's independence and getting rid of the extreme poverty. Rural women generally wants to undertake those entrepreneurial activities in which they have prior experience and skills (Ghosh *et al.*, 1998) like sericulture, mushroom activities, vegetable cultivation, dairy, food processing and preservation, knitting, weaving, tailoring, embroidery etc. Since rural women are adopting different micro enterprises at their own level, it is must to analyze strengths, weaknesses, opportunities and threats.

SWOT analysis is a technique for assessing the performance, competition, risk and potential of an enterprise. It helps in providing information for strategic planning, builds organizations strengths, reverse its weaknesses, maximize its response to opportunities,

*Corresponding author email id: duttbindia@gmail.com

overcome organizations threats, help in identifying core competencies of the firm. A SWOT analysis can help gain insights into the past and think of possible solutions to existing or potential problems, either for an existing business or for a new venture (USDA, 2008; Nouri *et al.*, 2008). The method of SWOT analysis is to take the information from an environmental analysis and separate it into internal (strengths and weaknesses) and external issues (opportunities and threats). Once this is completed, SWOT analysis determines what may assist the firm in accomplishing its objectives, and what obstacles must be overcome or minimized to achieve the desired results (Singh, 2010). In applying SWOT, it is necessary to build a TOWS matrix means threats should be converted into opportunities and weaknesses should be converted into strengths. In order to know experiences of the women run enterprises, efforts were made to do SWOT analysis of selected agro and craft based entrepreneurial activities.

MATERIALS AND METHODS

The present study was conducted purposively in Kangra District of Himachal Pradesh. Five agro based activities i.e. sericulture, mushroom activities, vegetable cultivation dairy and food processing and preservation and five craft related enterprises viz., knitting, weaving, tailoring, embroidery and bamboo articles manufacturing were identified. Five Panchayat samities namely Rait, Bhawarna, Dehra, Indora and Kangra were selected purposively for the present study. Sample of the present study was drawn using proportionate random sampling technique i.e. 50 percent of women entrepreneurs from each enterprise were drawn through lottery method. In total 180 women entrepreneurs from 37 villages of said panchayat samities were studied. Interview technique was used for data collection. Responses on different items were recorded on four point continuum viz. strongly applicable, applicable, partially applicable and not applicable assigning 3, 2, 1 and 0 scores respectively and mean weighted scores (MWS) was used for statistical analysis.

RESULTS AND DISCUSSION

Background information: Table 1 clearly shows that majority of the respondents (84.4%) were in the age group of 31-45 years, were married (94.4%) and had nuclear families (62.8%). About educational status it was found that less than half of the respondents (42.8%) had passed middle school. More than half of the respondents (56.7%) were member and only 2.2 per cent were the office bearer

Table 1: Distribution of respondents by their age, marital status, family structure, organizational membership, education, caste, Family occupation, housing and socio economic status (N=180)

Items	Frequency	Percentage
Age		
31-45 years	152	84.4
36-60 years	25	13.9
Above 60 years	3	1.7
Marital status		
Unmarried	1	0.6
Married	170	94.4
Widow	6	3.3
Divorced	3	1.7
Family type		
Nuclear	113	62.8
Joint	67	37.2
Organizational membership		
No membership	74	41.1
Member of a formal organization	102	56.7
Office bearer of formal organization	4	2.2
Education		
Can read and write	42	23.3
Primary school	36	20.0
Middle school	77	42.8
High school	25	13.9
Caste		
Scheduled tribe	22	12.2
Backward caste	38	21.1
Upper caste	120	66.7
Family Occupation		
Main occupation	115	63.9
Agriculture Service	59	32.8
Artisan/craftsman	6	3.3
Subsidiary occupation	180	100
Business Service	100	55.5
Housing		
Katcha	12	6.7
Mixed	136	75.6
Pucca	32	17.8
Socio Economic status		
Low	38	21.1
Medium	142	78.9
High	0	0

of formal organization i.e. ATMA . Majority of the respondents had farming as their main occupation, owned kutcha houses (88.3%), lie in medium socio economic group (78.5%) and belonged to upper caste (66.7%).

Sericulture: Table 2 reveals that the strongest point of running this enterprise as reported by all the respondents was low investment due to availability of raw material within their premises (MWS 3.0). No marketing tension, due to selling of the product through government officials (77.8%) was perceived as second strongest point of this enterprise with MWS 2.3. The weakest point reported by the respondents was labour intensivity with MWS-3.0. Favourable government policies like providing loans for room construction, distribution of mulberry plants and silk worms at subsidized rates were considered as the major opportunity by women entrepreneurs (MWS-3.0, rank-I). Increased market demand in and outside the local market was another opportunity for running this activity in future too (MWS1.9). Major threat reported by silk worm readers was increased competition in the market due to better economic return (MWS 2.1).

Bharathi, 2016 reported that low investment, short gestation period and higher returns were the strongest points in running sericulture units. Liberalization policies of Govt. of India in line with WTO Agreements were the opportunities for the sericulture industry.

Mushroom cultivation: Indoor cropping, high nutritional value, great preference by vegetarian population and easy manageability at household level were the strongest points (MWS-3.0) as reported by all the 27 respondents engaged in this enterprise. Suitable climatic conditions and higher profitability (MWS-2.6 and 2.2) were the other two strengths. Weakest point of mushroom cultivation as reported by all the respondents was low shelf life of the product (MWS-3) which results in selling of crops at lower rates (95.6%). All the respondents also considered highly scientific nature of the crop in terms of proper knowledge and maintenance of heat, humidity and light for its growth as the major weakness (MWS-2.3). Lack of packing machines for mushrooms was also a weak point, with MWS 2.0. Great demand of mushrooms was the major opportunity as reported by all the respondents (MWS-3.0). Regular support from the government for purchasing the raw material was also perceived as second biggest opportunity for this enterprise. Stiff competition was the major threat to this enterprise with MWS-3.0 (Table 2).

Raut (2019) in a review article on mushroom industry in Nepal reported that congenial agro-climate, low-cost labour, plentiful cheap supply of a wide variety of raw (substrates, building materials, spawns, and other inputs were the strengths of mushroom industry. However, lack of proper technical advice on mushroom enterprise and diseases and pests damage on product quality and supply were the identified weaknesses and threats, respectively.

Vegetable cultivation: Perusal of Table 2 reveals that experience of the women in vegetable cultivation (MWS-3.0), uniqueness of the produce due to its freshness, taste and texture, easy availability of the raw material (MWS-2.1), existence of natural irrigation facilities (MWS-2.3) and low investment (MWS2.7) were the strong points for running of this enterprise. Major weaknesses experienced by all women entrepreneurs were low rate of return (MWS-3), semi perishable nature of the product (MWS-2.6) and selling through middle man (MWS-2.4). Greater demand (MWS-3.0) and favourable government policies (MWS 2.1) were the major opportunities of this enterprise. The major threats reported by all the respondents were sustainability due to emphasis on value added vegetable produce in the market (MWS-2.5) and increased competition among the vegetable growers (MWS-1.6).

Dairy: Table 2 very clearly shows that the strongest points behind running this entrepreneurial activity were compatibility to their agricultural background (MWS-3.0), getting good returns (MWS-2.6), manageability at household level (MWS-2.0) and dual benefits perceived with mean weighted scores 1.5. Low shelf life / perishable nature of the product (MWS-3.0) leading to selling of the product in the nearby market (MWS-2.5) were the major weaknesses of the enterprise. Regarding opportunities getting quality product at any cost and favourable government policies like relaxation of tax on the earnings from agro based activities were mentioned by women. Existence of various milk processing units affects the market of small milk producers. This was perceived as the major stumbling block by all the dairy entrepreneurs (MWS-3.0). Increased competition was another threat reported by all the respondents.

Food Processing and Preservation: According to women respondents, being skilled in the art of chopping, cutting and cooking from childhood acts as the major [t] strongest point holding first rank with MWS of 2.5 in this activity. Uniqueness of the product in terms of taste and

Table 2: SWOT analysis of agro based entrepreneurial activities

S. No.	Enterprises	Strengths	F (%)MWS (Rank)	Weakness	F (%) MWS	Opportunities	F (%) MWS	Threats	F (%) MWS
1.	Sericulture (n= 36)	Low investment	36 (100) 3.0 (I)	Difficulty in handling worms	36 (100) 1.8 (II)	Increased demand in the market	30 (83.3) 1.9 (II)	Lack of timely technical assistance	36 (100) 1.9 (II)
		High Profit	36 (100) 3.0 (I)	Quite labour intensive	36 100) 3.0 (I)	Favourable Govt. policies	36 (100) 3.0 (I)	Too much terms and conditions for expansion	20 (55.6) 1.6 (III)
		Feminine nature	32 (88.9) 1.2 (IV)	Requires good infrastructural facilities	18 (50) 1.1 (III)			Increased Competition	28 (77.8) 2.1 (I)
		Short span activity	36 (100) 3.0 (I)	Lack of popularity	10(27.8) 0.83 (IV)				
		Compatibility to their background	29 (80.6) 1.9 (III)						
		No Marketing tension	28 (77.8) 2.3 (II)						
2.	Mushroom cultivators (n= 27)	Indoor Crop	27 (100) 3.0 (I)	Low shelf life of the product	27 (100) 3.0 (I)	High demand in the market	27 (100) 3.0 (I)	High competition	27 (100) 3.0 (I)
		High Profit	27 (100) 2.2 (III)	Highly scientific in nature	27 (100) 2.3 (III)	Financial assistance by government	18 (66.7) 1.4 (II)	Lack of timely technical assistance	10 (37) 0.9 (III)
		Can be managed at household level	27 (100) 3.0 (I)	Can catch diseases easily	27 (100) 1.6 (V)			Sustainability due to lack of spawn units	27(100) 2.1 (II)
		Less time and labour required	20 (74.1) 2.0 (IV)	Lack of quality packaging	20(74.1) 2.0 (IV)				
		Better suited to the climate conditions of of the area	27 (100) 2.6 (II)	Weak selling effort	25 (95.6) 2.7 (II)				
		Preferred by vegetarian	27 (100) 3.0 (I)						
		Profitable enterprise as per short span period	27 (100) 3.0 (1)						
3.	Vegetable Cultivation (n= 18)	Experience of vegetable cultivation	18 (100) 3.0 (I)	Low rate of return	12 (66.7) 3.0 (I)	High demand	18 (100) 3.0 (I)	Increased competition	18 (100) 1.6 (II)
		Compatibility to the background	18 (100) 2.1 (IV)	Low shelf life of the product	18 (100) 2.6 (II)	Favorable Govt. policies	12 (66.7) 2.1 (II)	Sustainability due to increased organic farm produce in the market	18 (100) 2.5 (I)
		Dual benefit	10 (55.6) 0.6 (VI)	Lack of popularity	18 (100) 1.6 (IV)				

Table 2 contd....

S. No.	Enterprises	Strengths	F (%)MWS (Rank)	Weakness	F (%) MWS	Opportunities	F (%) MWS	Threats	F (%) MWS
		Uniqueness (fresh vegetables)	18 (100) 2.6 (III)	Weak selling effort	18 (100) 2.4(III)				
		Existence of natural facilities	18 (100) 2.8(II)						
		Low investment	18 (100) 1.27(V)						
		Manageable at household	8 (44.4) 0.44 (VII)						
4.	Dairy (n= 21)	High profit earned	21 (100) 2.6 (II)	Low product shelf life	21 (100) 3.0 (I)	High demand of the product	21 (100) 2.7 (I)	Increased competition	48 (85.7) 1.3 (II)
		Dual benefits perceived	21 (100) 1.5 (IV)	Somewhat labor intensive	18 (85.7) 1.3 (III)	Favorable Govt. policies	21 (100) 1.5 (II)	Sustainability due to existence of milk processing units	21(100) 3.0 (I)
		Compatibility to their occupation	21 (100) 3.0 (I)	Weak selling effort	21 (100) 2.5 (II)				
		Easy raw material availability	10 (47.6) 1.4 (V)						
		Manageable at household level	21 (100) 2.0 (III)						
5.	Food processing (n= 12)	High rate of return	8 (66.7) 1.0 (IV)	Selling effort	10 (83.3) 2.0 (II)	High demand	12 (100) 1.5 (I)	Increased competition	12 (100) 2.0 (II)
		Feminine nature	10 (83.3) 2.5 (I)	Lack of popularity	10 (83.3) 2.0 (II)			Unfavorable government policies	8 (66.7) 2.7 (I)
		Possession of skills	12 (100) 2.3 (II)	Labor and time intensive	12 (100) (III)				
		Manageable at household level	12 (100) 0.9 (V)	Untidiness created by semi processing	12 (100) 3.0 (I)				
		Uniqueness in terms of taste and texture	10 (63.3) 2.0 (III)						

texture were other strong points of this venture (MWS-2.0). Besides this high rate of return and easy manageability at household level were other strong points (MWS 1 and 0.9) as perceived by 66.7 and 100 per cent of the respondents, respectively. About weaknesses untidiness created due to waste product left out of semi-processing was the weakest point (MWS-3.0). Weak selling effort and too much labour and time consuming nature of the activity were the other two weak points of this enterprise as their MWS were 2.0 and 1.0, respectively. The only opportunity in this enterprise mentioned by respondents was high demand of the processed and preserved foods due to increase in the population of working women (MWS 1.5). This statement gets decisive support from the findings of Joglekar and Kundle,2013 who reported that 48 percent of working women go for convenience and tertiary processed food. All the respondents reported that multiplicity of Government laws and regulations was the major threats in running these units (MWS 2.7). Maruthi and Venkata Reddy supports this as in a document they mentioned that about 13percent of the food-processing units have reported difficulty in the operation of units due to multiplicity of laws, procedures and periodical interference of bureaucracy in the name of inspection. More than half of the respondents (66.7%) also reported that increased competition in the market was also a threat. (MWS-2.0) (Table 2).

Tailoring and embroidery: Visualization of Table 3 depicts that the strongest points reported by all the 30 respondents of this enterprise were high rate of return and feminity in the nature of activity as perceived by women entrepreneurs (MWS-3.0). Possession of this skill was another strong point reported by all the respondents (MWS-2.5). Easy manageability at household level and low investment required for running the enterprise were some other strong points as reported by 66.1 per cent of the respondents. The weakest point of this enterprise experienced by all the respondents was requirement of too much concentration (MWS-2.7) thus leading to health hazards. Majority of the respondents (73.3%) also reported that location of their unit and weak selling effort were other weaknesses of this enterprise. Opportunities reported by respondents in this enterprise were favoruable government policies in terms of financial assistance and arranging training programs right at their door steps (MWS-2.7). All the respondents perceived stiff competition as the major threat of this enterprise (MWS-3.0).

Knitting and weaving: Indoor activity along with high proficiency of Himachali women in the art of knitiing and weaving right from their childhood were the strongest points reported for this enterprise by all the respondents (MWS 3.0). Another strongest points reported were the climate of the area and easy manageability at household level with MWS-2.9 and MWS-2.5, respectively. The weakest point reported by all the women engaged in this enterprise was that it is highly labour oriented activity (MWS-3.0). Followed to this high concentration and weak selling effort were another weak points of this enterprise with MWS-2.5 and 2.4, respectively. Due to the lack of fineness the product is not liked by the customers (MWS-2.1). Regarding opportunity, it was reported by all the respondents that increased demand for woolen articles due to availability of wide variety of designs (57.1%) was a major opportunity with MWS 2.4. Favourable government policies in terms of finance and technical assistance were opening new waves for entrepreneurs. Major threats reported were fear of sustainability (MWS-3.0), especially in case of knitting due to mechanization which results in fine quality product as well as less time to prepare a product as compared to those knitted by knitting needles. Followed to this, increased competition by getting more women involved in this enterprise results in varied options for the customers thus affecting these women entrepreneurs business was also a major threat reported by all the respondents, with MWS 2.4 (Table 3).

Bamboo: Low investment and availability of raw material (MWS-2) were the strongest points, followed by creativity and preparation of different types of products (MWS-2.5). 40 per cent respondents reported that past experience and skills available with them due to this as their traditional occupation was also a strong point (MWS 1.2). The major weakness reported by all the respondents was weak selling effort (MWS-3.0). Lack of fineness in the prepared products due to not making changes in their work patterns and lack of awareness were also a major stumbling block for this enterprise, with MWS-2.0. Liking of bamboo articles and favourable Government policies were perceived as great opportunities for getting engaged and continuing with this work (MWS-1.4 and 1.0, respectively). Highly proficient and skilled manufacturers who prepare fine quality product due to much exposure and better training were a great threat for the sustainability of this enterprise with MWS-3 (Table 3).

Table 3: SWOT analysis of craft based entrepreneurial activities

S. No.	Enterprises	Strengths	F (%)MWS (Rank)	Weakness	F (%) MWS	Opportunities	F (%) MWS	Threats	F (%) MWS
1	Tailoring & Embroidery (n= 30)	Dual benefit perceived	28 (93.3) 1.3 (V)	Requires much attention	30 (100) 2.7 (I)	Increased demand of the product	30 (100) 2.7 (I)	Increased competition	30 (100) 3.0 (I)
		Possess creativity	20 (66.7) 2.0 (IV)	Location	22 (73.3) 1.2 (II)	Favorable Govt. policies	30 (100) 2.7(I)	Sustainability due to existence of machine made units	10 (33) 1.0 (II)
		Possess skill	30 (100) 2.5 (II)	Selling effort is weak	19 (63.3) 0.6 (IV)				
		Feminine in character	30 (100) 3.0 (I)						
		Manageable at household level	30 (100) 2.2 (III)						
		High rate of return	30 (100) 3.0(I)						
		Product durability	12 (40.0) 0.9 (V)						
		Low investment	20 (66.7) 2.0 (IV)						
2.	Knitting & Weaving (n= 21)	Feminine in character	21 (100) 1.5 (IV)	High concentration	21 (100) 2.5 (II)	High demand	21 (100) 2.4 (I)	Increased competition	21 (100) 2.4 (II)
		Low investment	12 (57.1) 1.3 (VI)	Labor intensive	21 (100) 3.0 (I)	Favorable technical assistance	12 (57.1) 0.9 (III)	Replacement with machinery products	21 (100) 3.0 (I)
		Possess skill and creativity	21 (100) 3.0 (I)	Low rate of return	21 (100) 2.5 (II)	Favorable Financial assistance	18 (85.7) 1.1 (II)		
		Manageable at household level	21 (100) 2.5 (III)	Lack of business background	12 (57.1) 0.6 (VI)				
		Indoor activity	21 (100) 3.0 (I)	Poor product feature i.e. fineness	18 (85.7) 21.1 (IV)				
		Location as per climate is suitable for running the activity	21 (100) 2.9 (II)	Time consuming	10 (47.6) 1.4 (V)				
		Durability of product and easy to wash	18 (85.7) 2.3 (IV)	Weak selling effort	21 (100) 2.4 (III)				

Table 3 contd....

S. No.	Enterprises	Strengths	F (%)MWS (Rank)	Weakness	F (%) MWS	Opportunities	F (%) MWS	Threats	F (%) MWS
3.	Manufacturing of bamboo (n= 15)	Possess creativity	15 (100) 2.5 (II)	Lack of past experience	9 (60) 1.8 (III)	High demand	15 (100) 1.4 (I)	Increased competition	15 (100) 3.0 (I)
		Possess skill	6 (40) 1.2 (IV)	Lack of skill	9 (60) 1.6 (IV)	Favorable Govt. policies	15 (100) 1.0 (II)	Expansion of units	6 (40) 1.3 (II)
		Compatibility to their caste	6 (40) 0.6 (VI)	Not compatible to their caste	9 (60) 1.8 (III)				
		Low investment	15 (100) 3.0 (I)	Poor product quality/ fineness	15 (100) (II)				
		Past experience	6 (40) 1.2 (IV)	Weak selling effort	15 (100) 3.0 (I)				
				Low rate return	15 (100) 1.5 (V)				

Abrol *et al.* (2016) reported that to save traditional artisans it is necessary to upgrade craft skills and increase artisans level of awareness so that they can compete in the global market. Rural women mostly stepped in those entrepreneurial activities which are related to their traditional occupation, in which they have past experience, prior skills and which do not require special training. On the basis of this the two categories identified in this study where rural women had engaged themselves were agro based and craft related enterprises. Some internal factors (strengths and weaknesses) and external factors (opportunities and threats) play a vital role in motivating and continuing the activities. Strengths reported by women entrepreneur engaged in these enterprises were low investment, high return over, availability of raw material and easy manageability at household level. Low rate of return, weak selling efforts, low shelf life of product in case of mushroom and vegetable cultivation and dairying and requirement of too much concentration in craft related enterprises were the major weaknesses reported by the women entrepreneurs. Regarding opportunities women respondents mentioned high demand of the product and favourable government policies (except in case food processing) forecasts better economic future. As in rural areas women are mostly restricted to move out of the house poses a great threat to marketing as the number of producers are more and customers are limited, thus resulting in stiff competition.

On the basis of above findings it can be concluded that although the women are good managers, producers and manufacturers but they lack in marketing skills. Hence efforts should be made and had already been done by government to solve this problem by focusing on e-commerce. However, there is a dire need to impart awareness through various extension agencies among the target group. In case of craft related enterprises (knitting and weaving and manufacturing of bamboo articles) there is a need to provide skill enhancement trainings to get updated with the latest technologies & product refinements so that they can compete in the competitive world.

REFERENCES

Abrol, P.; V. Gupta and N. Gupta. 2016. Impact of Globalization on Traditional Rural Artisans of Jammu Region of J&K State. *Journal of Community Mobilization and Sustainable Development*, 11(1): 113-121.

Bharathi, D. 2016. Sericulture Industry in India- A Source of Employment Generation in India. *International Journal of Advanced Engineering Research and Science*, 3(10): 144-147.

Ghosh, R.; M. Gupta and S.N. Das. 1998. Women and Entrepreneur in India. In Kanungo (eds.). entrepreneurship Innovation. Kanishka Publishers, New Delhi: pp. 156-175.

Joglekar, A. and S. Kundle. 2013. A Study of Inclination towards Convenience Food among Working and Non-Working Women. *International Interdisciplinary Research Journal,* 3(5): 198-202.

Maruthi, I. and B.G. Venkata Reddy. Documentation of Success Stories of Food Processing units in Karnataka. www.isec.ca.in

Negi, T. and R. Upadhyay. 2012. SWOT analysis of Selected Entrepreneurial Activities Performed by Rural Women. *Rajasthan Journal of Extension Education,* 20: 215-220.

Ommani, A.R. 2011. Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis for Farming System Businesses Management: Case of Wheat farmers of Shadervan District, Shoushtar Township, Iran. African. *Journal of Business Management,* 5(22): 9448-9454.

Raut, J.K. 2019. Current Status, Challenges and Prospects of Mushroom Industry in Nepal. *International Journal of Agricultural Economics,* 4(14): 154-160.

Singh, N. 2010. SWOT Analysis – A Useful Tool for Community Vision. A concept Paper of Central Himalayan Village. *Research,* 2(9): 16-18.

USDA. 2008. SWOT Analysis a Tool for Making Better Business Decisions. United States Department of Agriculture Risk Management Agency.

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