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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 1100 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

Society for Community Mobilization for Sustainable Development (MOBILIZATION) has organized 8th National Seminar on "Potential, Prospects and Strategies for Doubling Farmers' Income: Multi- stakeholder Convergence" from November 9-11, 2017 in association with Assam Agricultural University and ICAR- ATARI, Guwahati at College of Veterinary Sciences, Guwahati. The seminar was inaugurated on 9-11-17 by Dr. H. S. Gupta, Former DG, BISA, Chief Guest; Dr. K. M. Bujarbaruah, Vice Chancellor, AAU; Chairperson of Inaugural Session and Guests of Honour - Dr. M. Premjit Singh, Vice Chancellor, CAU; Dr. M. C. Sharma, Former Director, IVRI; Dr. V. V. Sadamate, Former Advisor, Planning Commission; Dr. J. P. Sharma, Joint Director (Extension), ICAR-IARI and President of Society for Community Mobilization for Sustainable Development. There were a total of seven Technical Sessions held during two days on different themes.

The major recommendations of the Seminar have been documented. Bridging the gender gap between male and female farmers' accessibility of technologies, inputs and services to enhance the farm household's income, rain water harvesting and micro-irrigation technologies have been suggested for increasing cropping intensity and water use efficiency. Diversification and intensification of rice-fallow land through inclusion of oilseeds and pulses following residual soil moisture utilization and zero-tillage, promotion of location specific IFS model, documentation, validation and promotion of farmer-led innovations, rural entrepreneurship promotion, digital empowerment through development, application and uses of mobile apps for fulfilling the information needs of farmers on various aspects of their farming were some other recommendations. Innovative approaches requiring attention are sea-water farming, rice bio-park, plant doctor programme, genetic gardening with bio-fortified crops, up-scaling of community-led and market-led extension models, value addition, storage and processing of the produce would provide the farmers an increased income and create employment opportunities and engagements of farm youth.

We are happy to place before you the January-April, 2018 issue of the journal. Some of the pertinent research domains contained in the issue are Construction and Standardization of Knowledge Test, Adoption and Impact of ICT applications, Farmer-led innovations, Cropping and Irrigation Dynamics, Changing Behaviour of Self Help Groups, Farm Size and Productivity Relationship in Smallholder Farms, Marketing Behaviour of Vegetable Growers, Migration Pattern, Experiential Learning, Diversification of Agriculture, Perceived Constraints in Production of Bt cotton, Agricultural Subsidies, health and nutrition etc.

I extend my heartfelt thanks to the members of the editorial team - Drs. Souvik Ghosh, S.K. Dubey, R. Roy Burman, Nishi Sharma, S.R.K. Singh, M.S. Nain and Sudipta Paul who very professionally edited the papers to bring out this issue on time. I also express my sincere gratitude to the researchers who have contributed the quality research papers for the journal. I extend my special thanks to Dr. Reshma Gills, Ms. Subhashree Sahu and Dr. Hema Baliwada in shaping this issue of the journal as on-line editors.

J.P. Sharma
Chief Editor

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Construction and Standardization of Knowledge Test to Measure the Knowledge Level of Maize Growers on Maize Production Technologies

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ABSTRACT

Knowledge is one of the important components of behaviour as such it plays an important role in the covert and overt behaviour of an individual. To measure the knowledge level of maize growers of Jammu division of J&K state about recommended maize cultivation practices, a knowledge test has been developed that cover process objective of recall and recognition with content area of maize cultivation practices. A preliminary test of fifty three (53) items was initially administered to twenty four (24) maize growers. Difficulty and discrimination indices of test items were calculated. Only few items were discarded to ensure content validity of the test. All process objectives are represented in the standardized test. Difficulty index was used for arranging the test items in increasing order of difficulty to ensure the split of the test into two parallel halves. The reliability of the knowledge test was measured with the help of split-half method and found to be 0.72. The reliability coefficient of the total test was worked out by using Spearman-Brown prophecy formula and found to be 0.84, which indicates that knowledge test is quite reliable. Moreover, the intrinsic validity of the knowledge test was found to be 0.91, which proves that test is valid for measuring the knowledge of maize growers. The final test was consisted of forty four (44) test items which contains four (4) objective type, two (2) close ended, five (5) identification of objects from photographs and thirty three (33) open response items.

Keywords: Maize growers, Knowledge test, Difficulty and discrimination indices, Reliability and validity

INTRODUCTION

Maize (*Zea mays* L.) is one of the most important crops in world agricultural economy grown over an area of 177 million hectares with a production of 967 million tonnes (KPMG, 2014). India ranks fourth in area and sixth in production of maize. As maize has yield potential far higher than any other cereal, it is referred to as the miracle crop or the 'Queen of Cereal' (Anonymous, 2011). Maize is the third most important food grain in India after wheat and rice. It is grown throughout the country, but the main producing states are Andhra Pardesh, Karnataka, Maharasthra, Bihar, and Madhya Pardesh (Ministry of Agriculture, 2015).The area under maize crop is 9.2 million hectares with a production of 24.17 million tonnes (AICRP on Maize, 2016).

As the demand for maize is growing globally due to its multiple uses for food, feed and industrial sectors, we need to produce more from same or even less resources. In India, maize occupies third position both in area and production after rice and wheat. Maize is grown in all the seasons namely *kharif, rabi* and spring. Of these three seasons, nearly 90% of the production is in *kharif* season, 7 to 8% during *rabi* season and remaining 1-2% during spring season (Dass, 2009). Since 1950, there was slight increase in area of maize crop but production increased by eight times and productivity increased by three and half times (MoA, 2015).

Maize is the major crop of hilly districts of Jammu and Kashmir State and plays an important role in the livelihood of the people. In J&K, maize is predominantly

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grown as rainfed crop during *kharif* season and forms a staple food of vast majority of rural households, beside its use as livestock feed and fodder. In J&K, future increases in maize production to meet domestic demand will have to rely on improvements in yield per hectare rather than on the expansion of maize production area.

In the Jammu region 75 per cent cultivated area is rainfed (DES, 2011). The productivity of maize at the national level for 2014-15 was 2.56 t/ha whereas for the same period it was 1.49 t/ha in J&K state (AICRP on Maize, 2016).

The main intention to develop knowledge test was to identify the knowledge level of maize growers about recommended maize production technologies. The details of the standardization of the items are as follows

MATERIAL AND METHODS

Knowledge as defined in this study included those behaviours and test situations which emphasised the remembering either by recognition or recall of ideas, material or phenomena (Bloom *et al.*, 1956). The variable indicated the extent of knowledge possessed at the time of the interview as evident from his or her responses to a set of questions scientifically prepared for this purpose. Considering the importance of maize production technologies in enhancing the productivity of maize acknowledge test was developed by employing the following methodology and standardization of test items was made as given below.

Collection of knowledge items: An item pool of questions was prepared by reviewing literature such as books, bulletins, magazines, the package of practice of Sher-e-Kashmir university of agriculture sciences and technology of Jammu, field extension personnel and conducting discussions with subject matter specialists. Finally a through scrutiny of the item pool was made with the assistance of subject matter specialists. The items were collected with respect to scientific maize production technologies. The items were edited and drafted in such a way that each item highlighted only one idea and did not have any ambiguity.

Item analysis: The item analysis usually yields two kinds of information, item difficulty and item discrimination. The index of item difficulty reveals how difficult an item is where as the index of discrimination indicated the extent to which an item discriminates the well informed individuals from poorly informed ones. The initially prepared 53 items on scientific maize production technologies were administered to a group of 24 respondents prior to the preparation of the final schedule on non sampled respondents from village Sarnoo of Rajouri district of J&K state.

Each statement was having two response categories either correct or wrong. Each correct answer was given '1' score while wrong answer was awarded '0' mark. Thus total score secured by all individual respondents on 53 items for correct answers was the knowledge score. The scores obtained by 24respondents were arranged in descending order and divided into six groups i.e. 4 respondents in each group. The groups were named as G1, G2, G3, G4, G5 and G6. The range of score obtained by the respondents of six groups was as follows:

Table 1: Range of scores obtained by the respondents (n=36)

Group	Score range	No. of respondents
G1	38-33	4
G2	33-32	4
G3	31-30	4
G4	30-28	4
G5	28-26	4
G6	26-24	4

For the purpose of item analysis, the middle two groups G3 and G4 were eliminated keeping four extreme groups with high and low scores. The data pertaining to the correct response for all the items in respect of these four groups were tabulated for calculating the difficulty and discrimination indices.

Calculation of difficulty index: Difficulty index of an item was defined as the proportion of respondents giving correct answers to that particular item. This was calculated by the formula:

$$Pi = ni/Ni \times 100$$

Pi = Difficulty index in % of the ith item

ni = Total number of respondents giving correct answer

Ni = Total number of respondents to whom the ith item was administered

For example in the first item given in Table 2, 19 respondents (ni) gave the correct answer and this schedule was administered to 24 respondents.

Thus the difficulty index was calculated as

$$Pi = ni/Ni \times 100 = 19/24 \times 100 = 79.16$$

Which was rounded to 79.

Calculation of discrimination index: The method suggested by Mehta (1958) was adopted. The formula where by item discrimination index was calculated is given below.

$$E1/3 = \frac{(S1+S2) - (S5 + S6)}{N/3}$$

G1 G2 G5 G6 indicated frequencies of correct answers given for the respective sub group of respondents for an item in the test. In the first item given in Table 2, 4 respondents in the first group G1 were able to give the correct answer while 4 respondents answered it correctly in the second group G2. In the low groups, G5 and G6, 3 and 2respondents respectively gave the correct answer.

Thus the discrimination index was calculated as

$$E1/3 = \frac{(S1+S2) - (S5 + S6)}{N/3}$$

$$= \frac{(4 + 4)3 + 2)}{24/3}$$

$$= 0.375$$

Which was rounded to 38.

Total Items Selected : Out of 53 items 44 items were finally selected based on the following criteria.

1. Items with difficulty level indices ranging from 20 to 80.
2. Items with discrimination indices ranging from 0.20 to 0.80.

All important components of the recommendations have been covered. The items were prepared in such a way that no important component has been left out. If any important item of the test is left by failing to pass the above said criteria that can also be included in final knowledge test in order to cover all the components which are important for the study. The finally selected knowledge test items comprised forty four (44) test items which contains four (4) objective type, two (2) close ended, five (5) identification of objects from photographs and thirty three (33) open response items.

Reliability of the Test: The difficulty index was used for arranging the test items in increasing order of difficulty to ensure the split of the test into two parallel halves. The reliability of the knowledge test was measured with the help of split-half method by following formula.

$$r_{oe} = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}}$$

The Pearson Product Movement Correlation coefficient was computed between two halves and found to be 0.72

The reliability coefficient of the total test was worked out by using Spearman-Brown prophecy formula

$$r_{tt} = \frac{n.r_{oe}}{1 + (n-1)r_{oe}}$$

Where, r_{tt}= reliability coefficient of total test

o and e = Knowledge scores of two sets (odd and even)

n = 2 (Number of halves)

The reliability coefficient of knowledge test was 0.84 which indicates that test is reliable to use.

Validity of the test: The content validity of the knowledge test was derived from a long list of test items representing the whole universe of recommended package of practices of maize cultivation collected from various sources as discussed earlier and includes materials from literature, experts opinion, findings of past work and discussions with extension workers, officials of the Department of Agriculture and progressive farmers. It was assumed that the score obtained by administering the knowledge test of this study, measures what was intended to measure. Thus, the knowledge test developed in the present study measures the knowledge about recommended maize production technologies of farmers as it showed a greater degree of reliability and validity.

Intrinsic Validity: According to Guilford (1954) validity may be stated in terms of reliability. The validity calculated from reliability is called intrinsic validity and is worked out as follows:

Table 2:

Practices	Difficulty index	Discrimination index
Sowing Time and Land preparation		
Sowing time of maize crop	79	0.38
Number of ploughings sufficient for land preparation	67	0.50
Seed rate and spacing		
Seed rate of hybrid maize	49	0.25
Seed rate of composite maize	13	0.38
Seed rate of local maize	58	0.25
Spacing between line to line	33	0.38
Spacing between plant to plant*****	08	0.13
Depth of placing seeds in the line	42	0.25
Varieties		
Name at least one variety of hybrid maize	75	0.38
Name at least one variety of composite maize	0	0.00
Seed treatment		
Name at least one chemical used for seed treatment	13	0.50
What is its recommended does	0	0.00
What is the benefit of seed treatment	50	0.25
Weed management		
For how many days maize crop should be kept weed free after sowing	50	0.38
How weeds can be controlled?	79	0.50
Name at least one chemical used for weed control	25	0.25
Recommended dose of the chemical	25	0.38
What are the benefits of weed control	79	0.75
Fertilizer management		
Recommended dose of urea per hectare	50	0.63
Recommended dose of DAP per hectare	63	0.75
Recommended dose of MOP per hectare	54	0.50
How many times urea should be applied	46	0.38
What are the stages when urea should be applied	46	0.25
When DAP should be applied	79	0.50
When MOP should be applied	79	0.38
Should zinc sulphate be applied in maize crop*	0	0.00
When zinc sulphate should be applied*	0	0.00
Over use of fertilizers than recommended dose increase the yield*	13	0.88
Insect and disease management		
Identify the insect-pests of maize crop from the photograph		
Blister beetle	79	0.63
Stem borer	75	0.50
Cut warm	75	0.50
Name the chemical used to control blister beetle	17	0.25
Name the chemical used to control stem borer	0	0.00
Name the chemical used to control cut warm	13	0.13
Identify the disease of maize crop from the photograph		
Head smut	50	0.38
Common smut	50	0.50
Name the chemical used to control head smut	0	0.00
Name the chemical used to control common smut	0	0.00
What precautions should be taken at the time of pesticide spraying	67	0.63
Which time is suitable for spraying? *****	71	0.50

Table 2: contd.....

Practices	Difficulty index	Discrimination index
What are the harmful effects of insecticides?	63	0.38
What first aid should be followed in case of insecticide poisoning?	54	0.25
Water management		
What is the effect on maize crop if water remains stagnant in the field?	75	0.63
How excess water in maize fields can be managed?*	91	0.13
What are the critical stages of maize crop for irrigation*	17	0.13
Inter cropping		
Name the crops that can be grown as intercrop in maize	75	0.63
What is the benefit of inter cropping with maize	79	0.75
Seed replacement		
Should the seed of hybrid maize be replaced every year?	54	0.42
Should the seed of composite maize be replaced every year?	42	0.38
What are the benefits of seed replacement?	75	0.50
Harvesting		
When should maize be harvested?	79	0.75
What should be the moisture content of grains at the time of harvesting? *	13	0.13
Yield of maize grains per hectare *	91	0.13

$$\text{Validity} = \sqrt{r_{tt}}$$
$$= \sqrt{0.84}$$
$$= 0.91$$

The intrinsic validity of the test was found to be 0.91 which again proves that test is valid.

CONCLUSION

Knowledge test to measure the knowledge of maize growers acts as an important instrument for enhancing maize production. Hence the attempt to develop knowledge test emerged with standard measuring instrument. The stability of the instrument was measured with the help of calculating reliability and validity and which indicated that the test is highly reliable and valid for further use. Thus it can be concluded that finally selected items are highly statistically fit for the measuring knowledge of maize growers towards maize production technologies. The final test was consisted of forty four test items which contains four objective type, two close ended, five identification of objects from photographs and thirty three open response items. The correct response will be assigned a score of 1 and a score of 0 was assigned to incorrect response. The total score of correct answers given by an individual respondent will be the knowledge of that particular respondent. Thereafter, the respondents will be categorized into different groups i.e. low, medium and high.

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Adoption and Impact of Kisan Mobile Advisory - an ICT tool on Agriculture Progress in *Malwa* Region of Madhya Pradesh

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ABSTRACT

The advent of the twenty-first century has seen a number of technological developments which affect almost every aspect of our lives. At the core of this is the ever-growing use of ICT in all realms of life, from the work place to the sports field, in schools and on a personal or social level. ICT is defined as a global network in which ideas are exchanged, or information and knowledge is shared, through using communication like cell phones, and technology like computers, to connect people. In the recent past Mobile Technology has emerged as a best telecommunication technology resulting in the overwhelming increase in the number of mobile user day by day. There are 900 million users of mobile phone in India at present. This cost effective means of communication is being utilized by a top level business tycoon to a low level labour. Agricultural Scientist aims to improve and strengthen existing agriculture extension services by integrating Information Technology with mobile services. Sharing of knowledge among experts, farmers, students and research scholars are very important to the growth of the agriculture sector. The study has revealed that though, farm advisories through mobile phones may not be the only agent for improving farm production, productivity and rural economy, yet the quality of information, timeliness of information and trustworthiness of information help the farmers to a considerable extent in their day to day job for which they were found struggling with the non-experts or the inputs dealers and most of the times ended up in disaster and loss.

Keywords: Adoption, Agriculture, ICT, Impact, Kisan Mobile Advisory

INTRODUCTION

Access and use of information sources is a first step toward better targeting of extension programs and advisory services that facilitate information sharing (Nain *et al.*, 2015). Mobile communications technology has become the world's most common way of transmitting voice, data, and services, and no technology has ever spread faster. At the end of 2010 there were 5.25 billion cellular telephone subscriptions worldwide. By 2015 the number of mobile phone connections is expected to exceed the global population, Quiang *et al.* (2011). There are 900 million users of mobile phone in India at present. Mobile applications are software designed to take advantage of mobile technology and can be developed for technology besides mobile phones. But mobile phones have many key advantages: affordability, wide ownership, voice communications, and instant and convenient service delivery. As a result, there has been a global explosion in the number of m-apps, facilitated by the rapid evolution of mobile networks and by the increasing functions and falling prices of mobile handsets. This cost effective means of communication is being utilized by a top level business tycoon to a low level labour. There are number of changes occur in cell phone viz its size, shape, mode of operation, operating system, number of applications which reflect the price in the market. At present multiple number of web based application which are using for sending SMS to the User free of cost. These web enabled message done through internet and single message can be sent to bulk user at a time. Besides, farmer may visit ATIC, functioning as a repository of agricultural information for confirmation about the technology (Pandey & Solanki, 2015).

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There are an estimated 127.3 million cultivators in India. The majority of them are farmers subsisting on small plots of land, less than 5 acres in size. Deficits in physical infrastructure, in the availability of agricultural inputs such as seed, fertilizer and services in rural areas and in access to information are the major reasons for low productivity growth. These factors create the communications and logistics environment for farming Fan *et al.* (1999) and Fong (2009). Deficits in physical infrastructure, problems with availability of agricultural inputs and poor access to agriculture-related information are the major constraints on the growth of agricultural productivity in India. The more rapid growth of mobile telephony as compared to fixed line telephony and the recent introduction of mobile enabled information services provide a means to overcome existing information asymmetry. It also helps, at least partially, to bridge the gap between the availability and delivery of agricultural inputs and agriculture infrastructure, Mittal *et al.* (2010). Krishi Vigyan Kendra, Ujjain which is a knowledge hub for the transfer of technology to the grass root level, started farm advisory services (Kisan Mobile Advisory) for farmers in 2008 and the impact was assessed in two phases extending from 2008 to 2014. The basic objective behind this project was to:

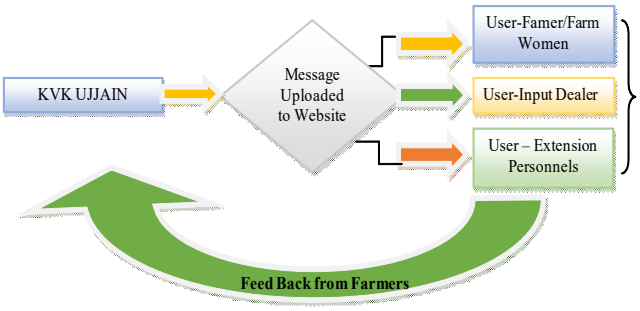
- Provide improved services to the farming community through use of ICT.
- Advice and help farmers to solve problems related to their farming activities.
- Providing information to farmers so that they get alerted on important/useful information.
- Updates farmers on latest technology in Agriculture sector for improved productivity and quality farmers.
- Developing an advisory system which can be extended with any other types of crops in any other state of India through the KVK network.
- Improving agricultural extension service by using mobile device so that farmers can send queries about their farming problem from their mobile device.

MATERIALS AND METHODS

KVK establishment have only one senior scientist, six scientists and three technical assistant. The population of Ujjain district is 1986597 (Census, 2011) and there is only one KVK. The farm families are 160375. Farmers need latest agriculture technologies which can be provided by the scientist. But reaching of these 10 scientists to 1.6 lakh farm families is not possible because any technology of agriculture needs many years for adoption in the area. So no technology can be spread to the entire district until or unless awareness is being created. Keeping this in view and hoping for benefits of farmers, the messaging starts in April 2008 twice a week throughout the year. The beneficiaries included Farmers, Farm Women, Agriculture Input supplier, Extension workers etc. Important aspect of messaging is time specific and time efficient.

The area is Ujjain district where the study was conducted in two phases. First phase year 2008 to 2011 and second phase year 2011 to 2014. These phases were distinguished on the basis of messaging script and number of beneficiaries. In First Phase the message were in roman script "Khet main pani bharne na de" can be read by only those farmer who can read English and number of beneficiaries were only 500 to 2000. In the second phase the messaging were on Unicode text supported on every platform which can be read by farmer who know Hindi but cannot read English and the number of beneficiaries were 2000 to 5000 which shows the impact of "Messaging in Local Language". The assessment of the impact of messaging on adoption of technology and creation of awareness to latest agriculture technology during these phases was the main aspect behind the study. The component used for study is well prepared questionnaire, survey, interviews and direct as well as indirect interaction. 250–250 beneficiaries were randomly selected from each phase. The message delivery mechanism is depicted below.

Message delivery Model



RESULT AND DISCUSSION

Phase-1: The results of the intervention during the two phases of advisory services are presented in depth with

the aid of data and figures as depicted below. Data in Table 1 indicate that the age of the respondents varied from 18 to more than 50 who were actively engage in the farming business. Majority of the respondents were the youths comprising more than 59 percent who are suppose to be highly active group. Education wise 51 percent had passed high School or higher secondary. Agriculture being a male dominant area majority of the respondents 90 percent was males. Holding wise majority of the respondents were having 2 to 5 hectare which represents the general phenomenon of holding in this part of the country. Similar findings were also been reported by Omprakash *et al.* (2012).

Table 1: Descriptive Statistic and demographic profile of respondent (N=500)

Category		Frequency	Percent
Age	18-30	125	25
	30-40	170	34
	40-50	130	26
	Above 50	75	15
Educational qualification	Middle to High School	120	24
	High School to Higher Secondary	255	51
	Graduate or Post Graduate	85	17
	Illiterate	40	8
Gender	Male	450	90
	Female	50	10
Land Holding	<2ha	140	28
	>2 ha and <5 ha	260	52
	> 5ha	100	20

Data in Figure 1 and 2 enumerates the total number of messages sent to the respondents during 2008-09 to 2013-14. It also gives a clear picture of the thematic area on which the farm advisory was given. This is a clear indicative of the facts that the district has its own priorities and the fields like crop production, integrated crop management, plant protection against insect pest and diseases were the focal points on which the farmers had the desire to get the information's.

The study shows that in phase I only 45% percent beneficiaries understand the message but in phase II the percentage of beneficiaries who understand message is

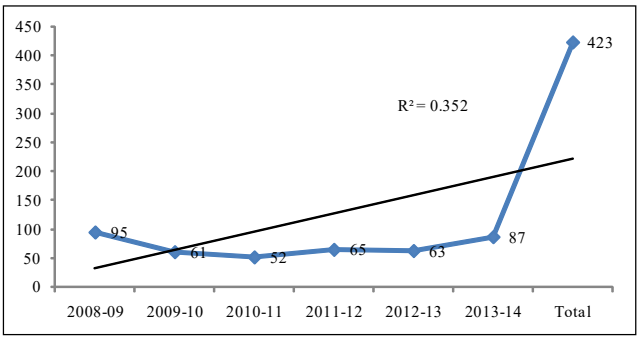


Figure 2: Number of Messages Delivered

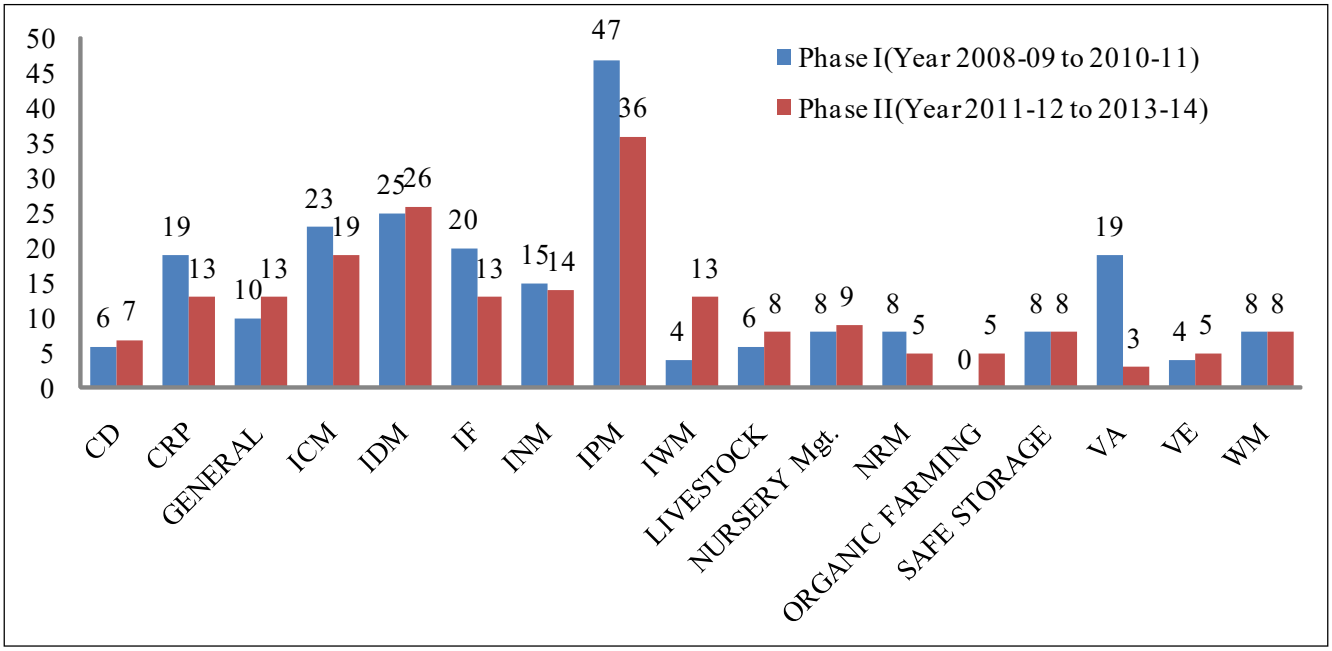
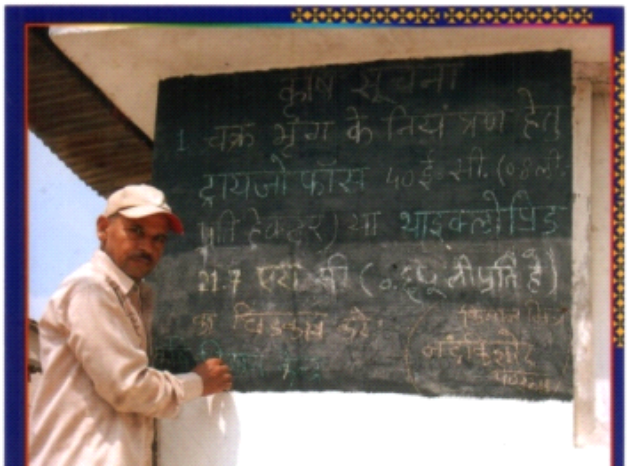


Figure 1: Major Thematic area of the messages sent

Response of (Farmers) Beneficiaries

Impact of Message in local language



increased by 26% which reflects the use of Hindi text or messaging in Hindi Unicode is attracting much farmers than English roman text. Other response of the farmers in terms of time specificity, significance, grasping of the messages and social upliftment is presented in tabular form below. All the responses indicate that there was a phenomenal change towards the adoption of the messages. Time specificity increased by 29 percent, selected themes getting a response ranging between 79 to 88 percent, increase in the understanding of the message by 26 percent and reliance on new gadgets by 45 percent.

From the above model we can conclude:

1. Selection of Crop: As evident from the above impact analysis, farmers were motivated for the selection of alternate crop owing to reduction in the total growing period of soybean crop and inclusion of potato in the irrigated ecosystem, resulting in crop diversification from year 2008 to 2014. In the year 2008 there were 90% farmers had no alternate to their traditional crop, variety which reduced 10% in phase I and further 10% in phase II. Similarly adoption based on "Scientific recommendation" increases from 10% in both phases respectively.

2. Selection of Variety: Study on the horizontal spread of seed based technology in the district based upon the actual sale of certified seed by various agencies from 2008 to 2014 reveal that before intervention the average

a) Time Specific information

Phase 1		Phase 2	
Yes	**No**	**Yes**	**No**
60%	40%	89%	11%

b) Significance of Theme

IPM		INM		ICM		VE		NRM	
Yes	**NO**	**Yes**	**NO**	**Yes**	**NO**	**Yes**	**NO**	**Yes**	**NO**
88%	12%	79%	21%	83%	17%	81%	19%	46%	14%

c) Grasping of message (Message Understanding)

Phase I			Phase II		
Yes	**No**	**Can't Say**	**Yes**	**NO**	**Can't Say**
45%	33%	12%	71%	22%	7%

d) Social upliftment & Awareness about gadget

Phase I			Phase II		
Yes	**No**	**Can't Say**	**Yes**	**No**	**Can't Say**
20%	70%	10%	65%	25%	10%

Impact Study of Message in Terms of Various Factors Listed Below:

Parameter	Cropping Pattern	Net Income per year (Rs.)	Percent change	System Productivity (kg/ha/day)	Percent change
Before Intervention	Soya-Wheat	57400	-	12.82	-
After Intervention	Soya-Potato-Wheat	152150	165	64.49	483

production per hectare in soybean-wheat rotation was 36.0 q/ha and the net income was Rs 41370 / ha. Prompt adoption of high yielding variety led to an overall increase in productivity by 41.4 percent and in income by 56.6 percent. The rate of adoption was 3 per cent in phase I of and further 5% in phase II.

3. Selection of Insecticides and pesticides: There is also a remarkable change in vendor suggested insecticide and pesticides. There were 60% farmers chosen insecticides and pesticides as suggested by vendor but this percent reduces from 60% to 45%(-15) in phase I and further 40% in phase II.

Parameter	Varietal Selection in two season	Productivity (qt/ha)	Net Income/ha (Rs)
Before Intervention	Soybean: Late variety	11.7	17600
	Wheat – Durum (HI-8498)	52.5	58000
	Aestivum- LOK-1	43.8	48510
	Mean	**36.0**	**41370**
After Intervention	Soya-Medium:JS-93-05	16.2	30950
	Early : JS-9560		
	Wheat – Durum (Poshan)	71.5	84600
	Aestivum- HI-1544 and GW-366	65.0	78750
	Mean	**50.9**	**64766**
	Percent change	**41.4**	**56.6**

Parameters	Crops	Insect/pest/disease identification	Cost incurred per hectare on pesticides	Farmers yield/ha	District average	Percent change
Before Intervention	Soybean	Girdle beetle, Green semilooper	3175	12.5	11.30	10.6
	Chickpea	Pod borer, Tobacco caterpillar	3850	10.5	9.70	8.2
After Intervention	Soybean	Girdle beetle, Green semilooper, collar-rot, rhizoctonia root rot	3650	16.5	12.5	32.0
	Chickpea	Pod borer, Tobacco caterpillar, fusarium wilt and collar rot	3550	14.5	11.5	26.1

4. Latest Machinery for sowing: Farmers were used to perform traditional farming using hand picking, ploughing through bullock cart etc. On or before 2008 the percent of farmers were 60% which reduces to 45% in phase I and 35% in phase II.

5. Conservation of natural resources: Farmers were not aware to conserve natural resources mainly soil & water. There is a certain change in phase I and phase II comparing to the previous year. Farmers continually approaching KVK for the guidance of constructing roof water harvesting unit. They are moving to implement latest agricultural machinery like raised bed and ridge and furrow planter for conservation of water. There is a positive change seen in perception of conservation of natural resources.

6. Adoption of new technology: Farmers were scared to adopt new technology in the farm but when seen the result in the demonstrated plot of KVK, they realize and move to adopt new technologies in farm in both phases as 30% before 2008, 40% in phase I and 45 in phase II.

7. Attraction towards ICT tool: There is a change in percent of user of ICT tools like mobile, internet etc from 25% to 34% in phase I and 40% in phase II.

CONCLUSION

This study has provided in depth potential and future opportunities of mobile phones in affecting the agricultural sector as a whole. As mobile phone continues to grow in popularity, acceptability and affordability among the farming community and information services continue to adapt and proliferate, sufficient potential exists for a much deeper rural productivity impact in future, but achieving full productivity potential will depend on reducing other constraints which limit the use of information that farmers can obtain through their mobile phones. The result indicated that 423 different messages were sent to the respondents covering 17 thematic areas of farming. There was a sharp rise (45 to 71 %) in the understanding of the message when sent in Unicode text rather than Roman text. There was a phenomenal change in the adoption level of new varieties, crop diversification (cropping intensity increasing from 132 to 174 %), system productivity (increase by

483 %), judicious use of pesticides (Yield increase by 32%), curtailing the cost of production and increase in the net profit per unit area (56%) and earning per family (Rs 41500 to 65,000). Simultaneously, there was increased awareness towards adoption of new farm machineries, ICT tools, conservation of natural resources particularly water harvesting systems to increase the farm productivity. KVK has finally approached to over 15053 farm families till the end of present financial year and is likely to cover the entire district by the end of XIIth plan.

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Introduction of Climbing Perch (*Anabas Testudineus, Bloch*) in Low Lying Rice Field as a Component of Integration for Doubling Farmers Income in Assam

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ABSTRACT

Climbing perch (*Anabas testudineus*) is one of the high valued fish species which have high demand both nutritionally and commercially in Assam. It is an air breathing species, which is known as Kawoi or Koi in Assam and adjacent states. In nature Kawoi is commonly found in beels, river, paddy fields and swamps and its preferred habitats are heavily-vegetated stagnant waters. Field trials were done to access the possibility of Kawoi culture in low laying paddy field as a component of integrated rice-fish farming. The outcome of the experiments were very promising as the production from unit area has increased fourfold in terms of monetary value in comparison to single rice cultivation in low lying area. The calculated Benefit Cost Ratio for control was 1.73 which was 2.37 in treatments.

Keywords: Alternative farming, Options for doubling farmers' income, Integration, Air breathing, Larvivorous

INTRODUCTION

Climbing perch (*Anabas testudineus, Bloch*) locally known as Kawoi is one of the most demanded indigenous fish species of Assam. The hardy nature made this species a preferred one among the consumer. It is found in oxbow lakes, swamps, estuaries, medium or large rivers, flooded fields and stagnant waters in most tropical and sub-tropical Asia (Talwar *et al.,* 1992). Naturally, Kawoi is a larvivorous species which is marketed at a size of 40gm or above. The induce breeding and culture of this species started in recent time owing to the market demand and lack of landing from the natural resources. The availability of seed from induce breeding made it possible to culture kawoi in confined water bodies like pond. However, there is very less report of culture of this species on a scientific line.

Recent studies suggest that worldwide 20% of all fresh water species are extinct, endangered or vulnerable (Moyle *et al*., 1992). The availability of this species is declining due to rough and unplanned water management policy for irrigation, over exploitation, illegal practice of capture fisheries and various ecological changes in its natural habitat; this native species is threatened now (Chakraborty *et al*., 2010). Considering the importance of this species in nutritional, economics and biodiversity point of view, it is required to develop an appropriate culture technique of *A. testudineus*. The successful induce breeding and seed rearing of Kawoi in farmers field (Bhuyan *et al.,* 2017) open up the farming possibilities of the species. As a part of farming possibility Kawoi was introduced in low lying rice field with the aim of utilization of natural food of Kawoi fish found in rice field *i.e.* larvae of insect/pest. The introduction of Kawoi also works as a systematic and scientific culture of fish in seasonal ponds of paddy field which were often act as growing ground of wild fish. Of course, wild catch from these resources are very much uncertain and unpredictable as scientific mode of integration of kawoi in paddy fields will usher certainity in production. Moreover, introduction of kawoi was also done to test the possibility of controlling the recurring army worm pest creating

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havoc in most of the rice fields of Assam. Hence, the present communication was undertaken to record the performance of Kawoi in rice field and economics of the integration of Kawoi with rice farming was evaluated.

MATERIALS AND METHODS

The study was conducted in both Brahmaputra and Barak valley of Assam. Three numbers of districts namely Nalbari, Udalguri and Karimganj were selected from both the valleys owing to the availability of manpower, infrastructural facilities under the mandated programme of the KrishiVigyan Kendras of the selected district.

Experimental plots and its design: A total of fifteen numbers of suitable experimental plots five in each district were selected. The size of the selected plots was in between 0.2-0.4 ha having a shallow seasonal pond/ trench covering one third of total area. A temporary dyke was kept in between the paddy plot and pond area to control the flow of muddy water into the pond area during rice plot preparation. The entire plots were covered with a well built dyke encircling with nylon net to protect the escaping of fish.

The plots were prepared during the month of May as per the package of practice for rice fish farming developed according to the agro-climatic situation of Assam. Liming and manuring were done as per the soil quality tested using the Mridaparishak available in the KVKs of the district. Fish seeds having a size of 3-5 g were stocked @ 20000 no/ha in the pond area in the third week of May. The seed were procured locally from the breeders of the district. Long duration high yielding variety of rice namely Ranjit was transplanted in the second week of June. Partial feeding was done regularly with locally available fish feed or kitchen waste, broken piece of biscuits, puffed rice etc.

An attempt was made to maintain a minimum depth of 15-20 cm water for a period of three months in the transplanted paddy area. Regular monitoring of fish growth in terms of weight in gram was done fortnightly through test netting. However, apart from maintenance of pH of water through liming, other water quality parameters were not taken into consideration owing to the air breathing and hardy nature of the Kawoi.

In each district, a low lying rice plot with that of a similar size of experimental plot were maintained as a control plot so as to compare the production and

productivity. The benefit cost ratio tool was used to calculate the economic performance of both the system under study.

RESULT AND DISCUSSION

Fish production: From the periodic study on growth of fish through test netting, it was found that the growth performance was more or less uniform in all locations. The marketable size of Kawoi in local markets on an average is 40 g which was attained during the study within

2.5 to 3 months of culture. At the end of three months of culture, when final harvesting was done the average production per 0.2 ha from the experimental plot were recorded from Nalbari, Udalguri and Karimganj as 115 kg, 98 kg and 119 kg respectively. During the studies, it was evident that there was movement of fish in each nook and corner of the plot with a grasping behavior in search of larvae/insects in the paddy field. There was no incidence of pest attack in the rice plot which may be inferred in relation to the stated behavior of kawoi.

Table 1: Average weight of kawoi in the different districts under studies

Days of culture	Growth in weight (g)		
	Nalbari	Udalguri	Karimganj
After 15 days	12	10	16
After 30 days	19	17	21
After 45 days	33	29	32
After 60 days	37	40	41
After 75 days	47	43	49
After 90 days during final harvesting	55	48	62

Table 2: Rice produced during the study in selected district

District	Average production (kg/ha)	
	Treatment plot	Control plot
Nalbari	4325	4470
Udalguri	3920	3330
Karimganj	4950	4780

N.B.: The data were round off to nearest round digit.

Table 3: Economic analysis of experimental plot and control plots of the study (Average value per 0.2 ha)

Particulars	Experimental plots			Control Plots		
	Quantity	Unit cost	Total cost (Rs)	Quantity	Unit cost	Total cost (Rs)
Lime	50kg	12.00	600.00	—	—	—
Cow dung	400kg	1.50	600.00	400kg	1.50	600.00
Preparation of paddy plot	3 times	300.00	900.00	3 times	300.00	900.00
Fertilizer	Ls	Ls	600.00	Ls	Ls	600.00
Rice seed	6 kg	33.33	200.00	6 kg	33.33	200.00
Rice Transplanting	0.15 ha	500.00 per 0.1 ha	750.00	0.20	500.00 per 0.1 ha	1000.00
Plot preparation	8 man days	250.00	2000.00	6 man days	250.00	1500.00
Fish seed	4000 nos	2.00/seed	8000.00	—	—	—
Rice harvesting	0.15 ha	400.00 per 0.1 ha	600.00	0.20	400 per 0.1 ha	800.00
Fish feed	85 kg	30.00	2550.00	—	—	—
Fish harvesting	Ls	Ls	800.00	—	—	—
Miscellaneous including prophylaxis etc.	Ls	Ls	1000.00			200.00
Grand total cost		**18600.00**			**5800.00**	

Production:

Particular	Experimental plots			Control Plots		
	Quantity (kg)	Unit value (Rs)	Production in terms of monetary value (Rs)	Quantity (kg)	Unit value (Rs)	Production in terms of monetary value (Rs)
Rice	880	12	10560.00	838	12.00	10056.00
Kawoi Fish	110	300	33000.00	—	—	—
Straw	600	1	600.00	700	1.00	700.00
Total production (Rs)		**44160.00**			**10756.00**	

Net income in experimental plots: Rs (44160.00-18600.00) = Rs. 25560.00
BCR in experimental plots: 2.37
Net income in control plots: Rs (10756.00 -5800.00) = Rs. 4956.00
BCR in control plots: 1.73
* Calculation was done on per 0.2 ha

Production of rice: There were no major differences in rice production between the experimental plot and control plot within the district. Highest production of 4950 kg/ha of rice was recorded in the Karimganj district whereas the lowest production in the control plot was recorded with a production of 3300 kg/ha in the Udalguri district. Production of rice in the control plot of Nalbari district was recorded as 4470 kg/ha which was higher than the experimental plot. Since, there was no report of pest attack particularly army worm in the control plots so the variation of production was not significant in the study. The occurrence of pest/army worm would have certainly affected the production scenario of rice.

Economic analysis of the integration system: From the economic analysis of the treatment and control plot it was found that the average net income from the control plot was only Rs. 4956.00 whereas it was Rs. 25560.00 in case of experimental plots. The Benefit Cost Ratio for control unit was only 1.73 which stands at 2.37 in the experimental plots. The details of the economic analysis are given in the Table 3.

CONCLUSION

The culture of Kawoi has been popularized because of the need to exploit vast swampy and low lying paddy fields for immediate benefit to the people without involving expensive process. The vast low laying paddy fields need to be exploited carefully adopting scientific rearing to enhance productivity. However, at present the fisheries potential of these resources is still underutilized. The air breathing insectivorous Kawoi can be best utilized as a candidate species suitable for integration in the paddy fields. Hence aquaculture reforms should address issues this area to enhance fish production to ensure sustainable livelihood by enhancing income and at the same time the havoc experienced in damaging paddy fields in recent time in the state of Assam due to pest infestation can be minimized by undertaking this model cropping measure technology. The economic analysis echoes the possibility of doubling the farmers' income through the adoption of integrated kawoi fish with rice cultivation in paddy field. The farmers can take full advantage of judicious use of low laying paddy fields and reap the benefits of model cropping measure technology.

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A Study on Instigation of Farmer-led innovations and its Spread

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ABSTRACT

To assess the process of origin and spread of farmer-led innovations, this study was conducted in Punjab and Uttar Pradesh during 2015-16.A sample size of 50 innovators and 50 non-innovators constituting 100 farmers selected by stratified sampling. The socio-economic profile was compared between innovators and non-innovators, the results showed that there is significant difference between two groups. Wilcoxon Mann Whitney test results showed that innovators have comparatively high mean rank for innovativeness (mean rank =67.11, U=419.50) and risk orientation (mean rank = 71.27, U=211.50) than non-innovators. Study also found significant difference of level of social empowerment between innovators and non-innovators by using Wilcoxon Mann Whitney test. The results revealed that innovators have comparatively high mean rank of 60.94 than non-innovators (mean rank 40.06) due to their active social involvement and striving for recognition in the society. The major stimulants for different category of innovations identified were 'Problem faced by self' for crop production (70%) and horticulture (50%), 'innovation induces innovation' for farm machinery (80%), 'experimented purposefully with curiosity' for processing and value addition (70%) and animal husbandry (60%). The time gap from idea generation to innovation is more (4-6 years) for farm machinery and processing and value addition innovations and less for horticulture innovations (1-6 months). Majority of the respondents received technical support (mean rank 3.07) from the institutes followed by input support (mean rank 2.76), extension support (mean rank 2.46) and financial support (mean rank 1.71). Friedman test analysis revealed that major means of spread by farmers is through linkage with organizations (mean rank 5.50) and by institutions is through melas/exhibitions (mean rank 4.99) conducted by different institutions involved in scaling up of innovations. The major reasons for low adoption of innovations by the non-innovators identified were location specificity of the innovations (mean rank 6.52) and lack of demonstrations (mean rank 4.66).

Keywords: Farmer-led innovations, Spread, Stimulants, Time gap

INTRODUCTION

Farmers acquire the knowledge required for their work through their own experience with agricultural practices and management of natural resources. In addition, they innovate due to necessity, changing conditions and curiosity by doing informal experiments on new ideas either from their own ingenuity or learned from other farmers, researchers, extensionists and other information sources like mass media. There are several factors that can trigger the implementation of innovation generation activities. These factors include shocks, scarcity of factors of production, opportunities, interaction with key stakeholders, coincidence, creativity or socio-economic factors (Saad, 2002). Innovation is viewed as the outcome of various actors combining knowledge from different sources. This process of combining knowledge requires different forms of interaction. Informal structures, inter-personal contact and even physical mobility are all considered mechanisms for the mobilization of knowledge and stimulating innovations (Wolf, 2008). Innovation in agriculture and rural enterprise happened for millennia through chance and through the informal and also purposive action of rural people seeking new and better ways of production and organization. Rural people themselves, therefore, have been a major source of new knowledge and practices. Small-scale farmers'

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own creative responses continue to be important sources of improvement to agricultural productivity in many regions of developing countries (Nigel *et al.*, 2006).

There is often a significant interval between the time an innovation is developed and adopted by the fellow farmers. For most innovations, there will also be a period of decline where the innovation is replaced by a new one. It is also dependent on the innovative farmer contacts with other persons and the amount of distance in the locality, the adoption of a new technology by the fellow farmers may entail significant travel and transport costs, and these costs increase with distance (Sunding *et al.*, 2000). According to Akinnagbe (2010), the challenge in adoption of farmer-led innovations is that, it is not easy for fellow farmers to get accepted by fellow farmers and the community in general due to culture and attitude. Because of this reason, many people do not only provide "no support" but also discourage the innovative farmers, considering them someone wasting time for "no good" reasons. Previous studies reported that farmer-led innovations are vital and the creativity depends on the prevailing socio-economic condition of the farmers. In this context, present study was undertaken with an objective of exploring comparative analysis of profile of farm innovators and non-innovators, to understand the origin, spread of farmer-led innovations and to identify the reasons for less adoption by the fellow farmers.

MATERIALS AND METHODS

A list of innovative farmers recognized and awarded by various institutions such as

ICAR (Indian Council of Agricultural Research), PPVFRA (Protection of Plant Varieties and Farmer's Rights Authority), Ministry of Agriculture and Farmers Welfare, NIF (National Innovation Foundation) and TIFAC (Technology Information, Forecasting and Assessment Council) of Department of Science and Technology, IARI (Indian Agricultural Research Institute), State Agricultural Universities was prepared. The data from these secondary sources revealed that Uttar Pradesh and Punjab have more number of innovative farmers compared to other states. Therefore the present study was conducted in these two purposively selected states *i.e.*, Uttar Pradesh and Punjab. The whole population of innovative farmers was divided into 5 broad categories. The broad areas of innovation selected for the study were crop production, horticulture, farm machinery, processing and value addition and animal husbandry. At least 5 innovative farmers were available in each category. Therefore 5 innovative farmers were selected from each category by stratified random sampling. Similarly 5 non-innovative farmers were selected randomly from the same locality for better comparison. Fifty innovative and fifty non-innovative farmers constituted the total sample size of 100 farmers. These selected farmers fall into the 7 districts of Punjab (Batinda, Faridkot, Hoshiarpur, Nawanshahar, Ludhiana, Patiala and Sangrur) and 10 districts of Uttar Pradesh (Aligarh, Bulandshahr, Ghaziabad, Hapur, Kanpurnagar, Kannauj, Meerut, Muzaffarnagar, Rampur and Saharanpur).

RESULTS AND DISCUSSION

Economic profile: The basic economic profile of the respondents was compared between innovators and non-innovators with respect to own land, total cultivable land, farming experience and annual income. For analyzing the significant difference between two independent groups, 't' test was carried out and the results are presented.

From the Table 1, it is clear that the innovators (mean 23.82) significantly differ from non-innovators (mean 13.54) in having higher total cultivable land size. As far as own land is concerned, there is not much difference between innovators (mean 18.76) and non-innovators (mean 11.82), but the innovators can go for substantial land increase due to their progressive nature. Therefore the total cultivable land is more for innovators. It is also evident that majority of the innovative farmers lies in the category of high annual income (Rs. 454000) than non-innovators (Rs. 242000). Further return per unit land is also high in case of innovators. With respect to farming experience, there is no significant difference between innovators (mean 30.00) and non-innovators (mean 30.02). Further the value of 't' test statistic is significant at 5 per cent level for own land (-4.329), total cultivable land (-5.118) and annual income (-5.686). The present study findings are similar to Nigel *et al.* (2006) who reported that several factors influencing the number of farmer innovations include level of education, size of household, amount of land available, age of household head and degree of contact with other areas.

Social profile: The extent of involvement of innovators and non-innovators with respect to their social

Table 1: Comparative economic profile description of innovators and non-innovators (N=100)

Category		Mean	Standard error of mean	Levene's test for equality of variances F	t-test for equality of means (Equal variances) t
Own land (acre)	Non-innovator	11.82	0.97	3.099*	-4.329*
	Innovator	18.76	1.27		
Total cultivable land (acre)	Non-innovator	13.54	1.20	3.946*	-5.118*
	Innovator	23.82	1.61		
Farming experience (years)	Non-innovator	30.02	0.11	0.077	0.119
	Innovator	30.00	0.11		
Annual income (Rs)	Non-innovator	242000	20221.22	12.148*	-5.686*
	Innovator	454000	31325.80		

* $p<0.05$, F=Value of the F-statistic; t= Value of the t statistic

participation, mass media exposure and extension orientation was analyzed by Wilcoxon Mann Whitney test in order to identify the significant difference in social profile of respondents between two groups.

The data from the Table 2 indicates that the innovators (58.37) have comparatively high mean rank than non-innovators (42.63) with respect to social participation due to their active social involvement. It is also evident that the innovators have comparatively high mean rank for mass media exposure (59.54) and extension orientation (70.59) than non-innovators mass media exposure (41.46) and extension orientation (30.41). It was found that the innovators were also having high information seeking behavior. Further the test statistic of Wilcoxon Mann Whitney 'U' value revealed that there is significant difference in social participation (856.5), mass media exposure (798.0) and extension orientation (245.5) at 5 per cent level. Similar findings reported by Ruter (2008), that farm innovations arise either from their own ingenuity or learned from other farmers, researchers, extensionists and other information sources like the mass media and extension orientation. Shilpashree (2011) also reported that majority of the innovative farmers belongs to high mass media utilization and extension orientation category.

Innovativeness: Innovativeness in terms of socio-psychological orientation of an individual to get linked or closely associated with change was compared between innovators and non-innovators. The responses of both the groups were taken on the set of statements and analyzed using Wilcoxon-Mann-Whitney test in order to identify the significant difference between the groups. The mean ranks and the test statistic are presented in Table 3.

Table 2: Comparative social profile description of innovators and non-innovators (N=100)

Category	Mean rank		Mann –Whitney U value	Wilcoxon W	Z value
	Innovator (n_1=50)	Non-innovator (n_2=50)			
Social participation	58.37	42.63	856.5*	2131.50	-2.763
Mass media exposure	59.54	41.46	798.0*	2073.00	-3.190
Extension orientation	70.59	30.41	245.5*	1520.50	-7.017

* $p<0.05$ significant difference at 5 per cent level

Table 3: Comparison of innovativeness as per Wilcoxon Mann Whitney test (N=100)

Group	Mean rank	Standard deviation	Mann whitney U	Wilcoxon W	Z value
Innovator	67.11	2.532	419.50*	1.69	-5.767
Non-innovator	33.89	0.503			

* $p<0.05$ significant difference at 5 per cent level

Table 3 reveals that innovators have comparatively high mean rank (67.11) than non-innovators (33.89) due to their creative thinking and problem solving nature. Further the test statistic value (419.50) showed that there is significant difference at 5 per cent level between the two groups. Similar findings by Gebre (2014) who inferred that farming experience, participation in non-farm activities, access to credit service, participation in extension events and in social organizations were the major factors influencing innovativeness.

Risk orientation: The degree to which the respondents are oriented towards risk and uncertainty and has courage to face the problem was compared between two groups. From both the groups the responses were taken on a set of statements and Wilcoxon-Mann-Whitney test was carried out to identify the significant difference and mean ranks.

It is clear from the Table 4 that innovators have comparatively high mean rank (71.27) than non-innovators (29.73) due to their psychological willingness to take risk in the venture. The value of test statistic (211.50) indicates that there is a significant difference at 5 per cent level between two groups. Regarding the risk orientation, the study results of Leitgeb *et al.* (2013) were in controversy with the findings of present study, where it concluded that a few of the farmers indicated that their innovations were unsuccessful, and this is expected since innovation generally involves decision making under uncertainty which can result in positive or negative outcomes.

Social empowerment: The level of social empowerment of both the innovators and non-innovators were taken on the fourteen statements under the category of social empowerment. Wilcoxon-Mann-Whitney's test was carried out in order to identify the significant difference between two groups.

Data in the Table 5 represents significant difference of level of social empowerment between innovators and non-innovators by using Wilcoxon Mann Whitney test. The results revealed that innovators have comparatively high mean rank of 60.94 than non-innovators (mean rank 40.06) due to their active social involvement and striving for recognition in the society. Further Wilcoxon Mann Whitney test statistic value (728.00) reveals that it is significant as the computed p-value is less than the significant level at five per cent ($p < 0.05$). It can be inferred that the innovators and non-innovators are significantly differed in level of social empowerment due to the innovation. The findings are in line with the results of Gebre (2014) who inferred that involvement in social organizations would create suitable condition that may enable the farmers to develop leadership experience. While they are practicing leadership in the community, they would have an opportunity to get diverse information on various aspects of agricultural practices which in turn may be the basis for the enrichment of innovativeness.

Stimulants of innovation: Broadly six different stimulants of innovation (problem faced by self, problem faced by peers, experimented purposefully with curiosity, own thinking but not faced any problem, simply occurred the idea and innovation induces innovation) which were relevant to the present study were identified. Then the innovators ($n_1=50$) responses under each selected broad category of the innovations were analyzed.

From the Table 6, it is evident that the percentages of the respondents in each category varied according to the type of stimulants. In respect of innovations developed in crop production category, 'problem faced

Table 4: Comparison of risk orientation as per Wilcoxon Mann Whitney test (N=100)

Group	Mean rank	Standard deviation	Mann whitney U	Wilcoxon W	Z value
Innovator	71.27	4.479	211.50*	1.48	-7.180
Non-innovator	29.73	0.503			

* $p<0.05$ significant difference at 5 per cent level

Table 5: Level of social empowerment based on Wilcoxon Mann Whitney test (N=100)

Group	Mean rank	Standard deviation	Mann Whitney U	Wilcoxon W	Z value
Innovator	60.94	10.32	728.00*	2003.00	-3.60
Non-innovator	40.06	0.50			

* $p<0.05$ significant difference at 5 per cent level

Table 6: Comparison of thestimulants of innovation (n_1=50)

Category	Crop production *f (%)*	Horticulture *f (%)*	Farm machinery *f (%)*	Processing & value addition *f (%)*	Animal husbandry *f (%)*
Problem faced by self	7(70)	5(50)	2(20)	-	-
Problem faced by peers	-	-	-	-	-
Experimented purposefully with curiosity	-	2(20)	-	7(70)	6(60)
Own thinking but not faced any problem	2(20)	1(10)	-	2(20)	3(30)
Simply occurred the idea	1(10)	2(20)	-	1(10)	1(10)
Innovation induces innovation	-	-	8(80)	-	-

Figures in parenthesis indicate percentage

by self' is the major stimulant (70%) followed by 'own thinking but not faced any problem' (20%) and 'simply innovation occurred by idea' (10%). Similar findings reported by Olga (2015), innovations appearing at the grassroots level are triggered most often by needs of the everyday life in circumstances of limitations in resources. In horticulture category of innovations, major stimulant identified is 'problem faced by self' (50%) followed by 'experimented purposefully with curiosity' and 'simply occurred the idea' with 20 per cent each and 'own thinking but not faced any problem' (10%). It can be inferred that majority of the crop production and horticulture innovations are developed either to increase production or income, therefore problem faced by self is the major stimulant in both the categories. 'Innovation induces innovation' (80%) is the major stimulant for farm machinery category of innovations followed by 'problem faced by self' (20%). Most of the farm machinery developed at farmer's level is the modifications of the existing ones to make minor improvements either to reduce labour cost or to increase efficiency of the existing machinery. In processing and value addition category, the innovations mostly developed by 'experimenting purposefully with curiosity' to start a new venture (70%) followed by 'own thinking but not faced any problem' (20%) and 'simply occurred the idea' (10%). The same trend is also seen in animal husbandry category of innovations where majority developed innovations by 'experimenting purposefully with curiosity to start a new venture' (60%). It is followed by other stimulants like 'own thinking but not faced any problem' (30%) and 'simply occurred the idea' (10%). This is similar to the findings of Bayer (2013) who identified that one-third of the innovations developed with 'out of curiosity' and one-fourth with a target to increase the production. It can be concluded from the data that different stimulants promote different type of innovations.

Time gap from idea generation to innovation: The time gap from idea generation to innovation development under different category of innovations was analyzed from the responses of the innovators. The periods of time gap (immediately, 1-6 months, 7-12 months, 1-3 years, 4-6 years and more than 6 years) were identified based on the category and the results are presented in Table 7. The percentage of the respondents (innovators) in each category is varied according to the time gap from idea to innovation.

Table 7: Analysis of the time gap from idea generation to innovation (n_1=50)

Category	Crop production *f (%)*	Horticulture *f (%)*	Farm machinery *f (%)*	Processing and value addition *f (%)*	Animal husbandry *f (%)*
Immediately	-	-	-	-	-
1-6 months	-	7 (70)	-	-	-
7-12 months	9 (90)	2 (20)	-	-	3 (30)
1-3 years	1 (10)	1 (10)	1 (10)	-	7 (70)
4-6 years	-	-	9 (90)	10 (100)	-
> 6 years	-	-	-	-	-

Figures in parenthesis indicate percentage

In crop production category, the results showed that 90 per cent of ideas took only 7-12 months and only 10 per cent ideas took a period of 1-3 years time. More than two-third of horticulture ideas took 1-6 months followed by 7-12 months (20%) and 1-3 years (10%). Since the cereal crops are season specific, it took at least one year in majority of the cases to convert the idea into innovation. However in case of horticulture crops which are either short duration or perennial, more than two-third of the ideas took only 1-6 months. Whereas the farm machinery ideas took minimum of 4-6 years in majority of the cases (90%) followed by 1-3 years (10%). It is due to the fact that it requires sufficient time for complementary equipment for the manufacturing or modifying the design to suit the requirement. In case of processing and value addition category 100 per cent of ideas took 4-6 years as the establishment of processing unit needs suitable machinery, technical guidance and financial support. In case of animal husbandry ideas, more than one-third of the ideas took 1-3 years followed by 7-12 months (30%) as it also needs technical guidance and financial support.

Type of support: The support received by the innovators from different institutes for scaling up the innovation was categorized into technical, input, extension and financial support. The overall and category wise support is mentioned to analyze the major form of support received by the innovators. From the Figure 1, it is evident that there is significant difference in the mean ranks of different types of support received. Majority of the respondents received technical support (mean rank 3.07) from the institutes followed by input support (mean rank 2.76), extension support (mean rank 2.46) and financial support (mean rank 1.71).

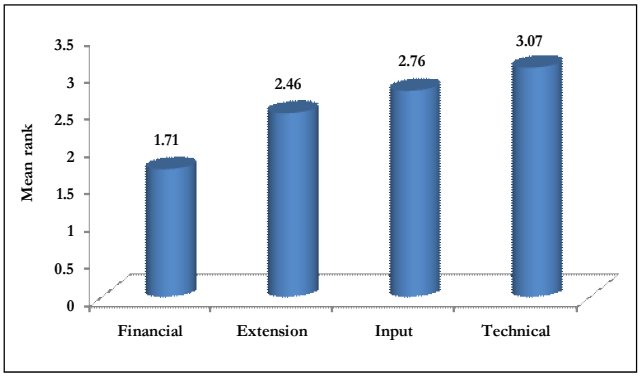

Figure 1: Type of support received by the innovators

Figure 2 shows innovation category wise support received by the innovators. Most of the crop production innovators received input support (67%) followed by technical (26%), financial (4%) and extension support (3%). In case of crop production, it does not require much financial support because most of the government schemes are focusing on giving input subsidy. In horticulture innovations, more than one-third received input support followed by technical (29%), extension (23%) and financial support (10%). Here the percentage of support is almost uniform due to the fact that horticulture needs input subsidy, technical guidance and to some extent financial support for establishment of green house and other infrastructure. Where as in case of farm machinery innovations, 71 per cent the respondents received technical support followed by input (19%), extension (8%) and financial support (2%). It is due to designing of the machinery needs technical guidance than others. More than three-fourth of the processing and value addition innovators received financial support followed by technical (10%), input (8%) and extension support (4%). The financial support is more in case of processing and value addition category, mainly due to the establishment of processing unit needs financial support for infrastructure equipment. Where as in case of animal husbandry innovations more than half of the respondents received extension support followed by technical (32%), financial (9%) and input support (4%). It is observed that animal husbandry innovations need more extension and technical support.

Table 8: Friedman test statistics ofsupport received by innovators (n_1=50)

Test statistic value	
Q (Observed value)	38.08*
Q (Critical value)	7.81
df	3
P value	< 0.02

* p<0.05 significant difference at 5 per cent level

Further Friedman's test was carried out to identify the significant difference in type of support received for different category of innovations. It is clear from the Table 8 that the computed p-value is significant at five per cent level ($p < 0.05$) with Q value 38.08. It can be inferred that the type of support received by the innovators from different institutions are significantly different according to category of innovations.

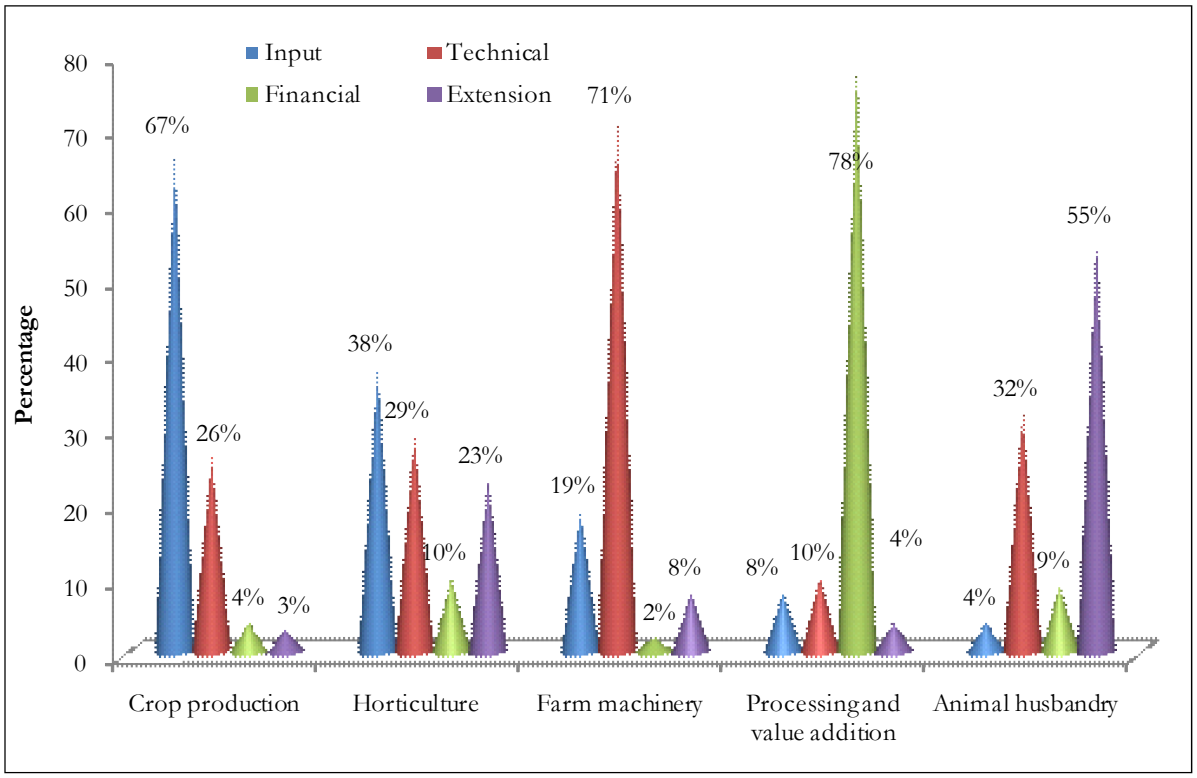

Figure 2: Category wise support received by innovators

Spread of innovations: Means of spread considered under the present study were identified to find out the different means used by innovators and institutions. The innovators were asked to rank the responses starting from 1= to a very low extent to 5= to a very high extent on different components. Total score of each component was taken into account and further compared using Friedman's test. The test results indicate that the mean ranks varied for different means of spread.

Friedman's test statistics results revealed that the computed p-value is significant at five per cent level ($p < 0.05$) with Q value 73.22. It can be inferred that the different means of spread by farmers are significantly different according to innovators perception. It is clear from the Table 9 that the major means of spread of innovations is through linkage with organizations (mean rank 5.50). Linkage provides platform for display of innovations and further the innovations are documented and then published for wider diffusion. The present study results were similar to the findings of Mckenzie (2011) who stated that there were multiple pathways for innovation exchange and the linkages between farmer innovation, education and extension are essential in generating knowledge and fostering technological change.

Table 9: Means of spread by innovators as per Friedman's test (n_1=50)

Category	Mean rank	Groups		
Distributing free samples	3.04	A		
Fellow farmers	3.12	A		
Social networking	3.27	A		
Family members	3.63	A		
Personal contact	4.21	A	B	
Attending exhibitions/melas	5.23		B	C
Linkage with organizations	5.50			C

Table 10: Means of spread by institutions as per Friedman's test (n_1=50)

Category	Mean rank	Groups	
Demonstrations	1.79	A	
Inviting as resources persons	2.94	A	
Local media	4.31		B
Published literature online/offline	4.46		B
Recognition/rewards	4.72		B
Institutional tie ups	4.79		B
Melas/exhibitions	4.99		B

The perception of the innovators on different means of spread through institutions was identified and analyzed by Friedman's test. The test statistics results with Q value 105.03 is significant at five per cent level ($p < 0.05$). It can be inferred that the different means of spread perceived by the institutions are significantly different according to innovators perception. The data from the table 10highlights that the major means of spread is through melas/exhibitions (mean rank 4.99) conducted by different institutions involved in scaling up of innovations. It is followed by tie ups of the innovators with the institutions (mean rank 4.79), recognition/ rewards (mean rank 4.72), published literature online/ off line (mean rank 4.46), local media (4.31) and inviting as resource persons (mean rank 2.94). The least means of spread is through conducting demonstrations of innovations with mean rank 1.79.

Non-innovators: The responses were taken from the non-innovators (n_2=50) in the study area regarding source of information on innovations and motivating factors for adoption. The different sources and motivating factors were identified and the respondents were asked to rank the preferences.

It is clear from the Table 11, that farmers melas/ exhibitions are the major source (mean rank 6.32) of information for the non-innovators where the innovations are displayed as live models with their economic impact and further direct interface with the innovators is possible. It is followed by information from fellow farmers (mean rank 4.90), personal contact with innovative farmer (mean rank 4.70), contact with innovative farmer (mean rank 4.70), information from family members (mean rank 3.88), published literature (mean rank 3.20) and supporting organizations (mean rank 2.94). The least source of information is local media (mean rank 2.06). Further Friedman's test statistics Q value 148.05, which is higher than the critical value (12.59) and is significant at five per cent level ($p < 0.05$). It can be inferred that the different sources of information on innovations are significantly different according to non-innovators perception.

Table 11: Source of information for the non-innovators as per Friedman's test (n_2=50)

Category	Mean Rank	Groups			
Local media	2.06	A			
Supporting organizations	2.94	A	B		
Published literature	3.20	A	B		
Family members	3.88		B	C	
Innovative farmer	4.70			C	
Fellow farmers	4.90			C	
Farmers melas/exhibitions	6.32				D

Data was collected from the non-innovators regarding the innovation category wise motivating factors. The percentage of the respondents in each category varied according to type of innovations. It is clear from the table 12that in crop production innovations, the major motivating factor for the non-innovators is economic gain of the innovation (62%) followed by demand driven (28%); business factor and drudgery reduction with 4 per cent each and social factor (2%). In horticulture innovations, the major motivating factor is business factor (40%) followed by economic gain (34%), demand driven (20%), social factor (4%) and drudgery reduction (2%). Nearly half of the respondents in case of farm machinery were opined that drudgery reduction is the major motivating factor followed by social factor (24%), business factor (14%), economic gain (8%) and demand driven (4%). In processing and value addition innovations, business factor (44%) is the major motivating factor followed by social factor (22%), economic gain (16%), demand driven (14%) and drudgery reduction (4%). The similar results are seen in animal husbandry innovations,

Table 12: Motivating factors for the non-innovators (n_2=50)

Factors	Crop production	Horticulture	Farm machinery	Processing and value addition	Animal husbandry
	f (%)	*f (%)*	*f (%)*	*f (%)*	*f (%)*
Demand driven	14(28)	10(20)	2(4)	7(14)	12(24)
Business factor	2(4)	20(40)	7(14)	22(44)	16(32)
Social factor	1(2)	2(4)	12(24)	11(22)	15(30)
Economic gain	31(62)	17(34)	4(8)	8(16)	6(12)
Drudgery reduction	2(4)	1(2)	25(50)	2(4)	1(2)

Figures in parenthesis indicate percentage

where the major factor is business factor (32%) followed by social factor (30%), demand driven (24%), economic gain (12%) and drudgery reduction (2%).

For generalization of results, Friedman's test statistics ($Q=112.02$, $P<0.05$) was carried out to analyze the major motivating factors of non-innovators for all the innovations. From the results, it is clear that the major motivating factor is drudgery reduction (mean rank 4.38) followed by economic gain (mean rank 3.85), social factor (mean rank 2.96), business factor (mean rank 2.10) and demand driven (mean rank 1.71).

Table 13: Reasons for non-adoption of innovations (n_2=50)

Problems	Mean score	Rank
Lack of awareness on innovation	3.89	V
Lack of demonstrations on innovations	4.66	II
Culture, attitude and perception of farmers	3.98	IV
Poor economic condition and size of holdings	3.10	VI
Location specificity of the innovations	6.52	I
Risk factor and psychological fear	4.06	III

Results from the Table 13 show that the major among the constraints was location specificity of the innovations as some of the innovations developed by the farmers' suits to their own requirement or to a particular locality. This was similar to the findings of Gebre (2014) who reported that three-fourth of the respondents revealed that they were unable to accept the innovations by other farmers in that area because of its unsuitability while one-fourth revealed they were complex in their application. It is followed by lack of demonstrations on innovations. This was similar to the findings of Gupta (2013) who summarized that the government and aid organizations seldom consider acquiring ideas or innovative products and services designed at the grassroots by the people they are trying to assist. The question of reciprocating the innovations to fellow farmers seldom arises. In addition, a very small number of these ideas reached people taking the initiative to do so on their own.

CONCLUSION

The present study findings concluded that there is significant difference in profile comparison of innovators and non-innovators which are directly linked to innovative thinking and creates platform for the new ideas of the respondents. The basic economic profile, involvement in social organizations, psychological characteristics were compared between innovators and non-innovators. The study results showed that the innovators significantly differ from non-innovators in having higher total cultivable land, high annual income than non-innovators. With respect to farming experience, there was no significant difference between the two groups. Social profile comparison analysis showed that the innovators have comparatively high mean rank than non-innovators with respect to social participation, mass media exposure and extension orientation than non-innovators. In the context of innovativeness, innovators were comparatively in higher side due to their creative thinking and problem solving nature. At the same time innovators have high risk orientation due to their psychological willingness to take risk in the venture. The present study mainly identified the origin and spread of farmer-led innovations. On the basis of results, category wise stimulants of innovations were identified and percentages of the respondents in each category were varied according to the type of stimulants. 'Problem faced by self' in crop production and horticulture, 'Innovation induces innovation' in farm machinery, 'curiosity to start a new venture' for processing and value addition and animal husbandry. Further, time gap from idea generation to innovation development under different category of innovations was analyzed. Farm machinery and processing and value addition category takes more time as the establishment of unit needs suitable machinery, technical guidance and financial support. Different means of spread by the innovators and institutions was identified. Linkage with organizations and conducting promotional activities in scaling up of innovations like melas/exhibitions/seminars by farmers and institutions are the major means of spread of innovations. Study also found reasons for low adoption of innovations like location specificity of the innovations and lack of demonstrations.

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Cropping and Irrigation Dynamics under Different Groundwater Market Regimes in West Bengal

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ABSTRACT

The present study was conducted in purposively selected Paschim Medinipur district of West Bengal having better cropping and groundwater irrigation scenario. A total of 120 farmers including 60 member-farmers of WUAs, operating and managing government sources of groundwater irrigation as well as 60 farmers under private owned groundwater irrigation command area were sampled as respondents. Under private owned systems, farmers were categorized based on their presence in groundwater marketing *viz.* self user, self user + seller, self user + seller + buyer, self user + buyer and buyers. Most of the farmers were buyers as they do not have any source for groundwater irrigation. The irrigation use cost for self user is Rs. 22 per hour, while that for self user + seller, self user + seller + buyer and self user + buyer is Rs. 23, Rs. 24 and Rs. 24 per hour, respectively. It is interesting to note that self user + seller and self user + seller + buyer category of farmers sell the irrigation at a cost of Rs. 31 and Rs. 30 per hour, respectively. Buying cost of irrigation varied from Rs. 28 to Rs. 30 per hour. Due to less bargaining power of the farmers not having any groundwater irrigation source are forced to buy at a relatively higher rate. The cropping scenario and irrigation use efficiency are found better in case of buyer category of farmers, followed diversified cropping pattern.

Keywords: Groundwater market, Groundwater irrigation, Farmers' perceptions, Cropping scenario

INTRODUCTION

Indian water policy stresses on optimization of groundwater use in a way that its draft does not exceed its recharge potential (GOI, 2002). However, groundwater development in India is not in congruence with the policy of sustainable and equitable exploitation of groundwater (Jeet, 2005). While it is over exploited in the north western states, it remains poorly developed and under-utilized in the eastern states on account of several economic and non-economic reasons (Srivastava *et al.*, 2012). The eastern region has 130 billion cubic meter (BCM) of annual replenishable groundwater, yet only 27 per cent of it has been developed (Srivastava *et al.,* 2014). Thus, there is ample scope to harness groundwater potential in this region for enhancing agriculture growth and benefit of the farmers. Due to the poor maintenance of canal irrigation system, increasing number of tubewell water markets has developed, particularly in West Bengal. Marginal and small farmers sell less water and buy more water in comparison to other categories of farmers (Singh and Singh, 2003; Narayanamoorthy, 1995). Groundwater markets provide the institutional mechanisms for increasing the poor farmers' access to ground water irrigation resources. In recent years, due to inequality in the distribution of tubewells and non-availability of canal water during the *rabi* season, most of the non-tubewell owners are forced to purchase water from the tube well owner (Singh *et al.*, 2007). On this backdrop, present study was contemplated to analyse cropping and irrigation dynamics under different groundwater market regimes in West Bengal.

MATERIALS AND METHODS

Paschim Medinipur district in the state of West Bengal was purposively selected having best agricultural and irrigation scenario in general and groundwater irrigation in particular. Two blocks i.e. Sankrailand Keshiary blocks and four villages from each block were randomly

selected. A sample of 15 farmers from each of the selected villages was randomly chosen as the respondents for present study. Thus, a total of 120 farmers became the respondents in this present study.

The groundwater market scenario was analysed through exploration of information from different categories of farmers in groundwater irrigation market as indicated below:

1. Self-users: The self-users do not enter the water markets because neither they have surplus water to sell nor are interested to buy from others.
2. Self-Users + Sellers: They are the owners of water extraction mechanism (WEM) and their landholdings are consolidated. They sell surplus water to other farmers because their landholdings are small to utilize the full capacity of WEM and water markets offer an opportunity to spread its overhead expenses by increasing the WEM utilization.
3. Self-users + Sellers + Buyers: Existence and operation of this form of water markets is due to high degree of farm fragmentation. On the big parcel of holding, farmers install a WEM to irrigate their field, supply surplus water to neighbouring farmers and go for buying on the other parcel.
4. Self-users + Buyers: This form of water markets exists generally because of fragmentation of holdings. When the farmers install a WEM on the big fragments to irrigate their fields only, the lack of surplus water for the other parcel of land or inaccessibility compels them to purchase water from the neighbouring WEM owners.
5. Buyers: This form of water markets arises mainly because of small size of holdings. Buyers are generally resource-poor farmers and they do not get a suitable partner to pool their resources to install a WEM. Another important reason is economic viability of WEM due to small and fragmented holding. These farmers buy sufficient water from neighboring WEM as and when required.

Groundwater market scenario in Pascim Medinipur district in West Bengal is explored through understanding detail of groundwater extraction mechanism/device and functioning, crops grown with groundwater irrigation supply and groundwater pricing detail under different groundwater marketing regimes. Responses were taken from the selected farmers with the help of an interview schedule.

RESULTS AND DISCUSSION

Present study has considered eight groundwater systems representing both government owned implementing participatory irrigation management (PIM) through water user association (WUAs) and private owned with five different groundwater marketing regimes *viz.* self user, self user + seller, self user + seller + buyer, self user + buyer and buyer, where 6 farmers as self user, 2 farmers as self user + seller, 11 farmers as self user + seller + buyer, 3 farmers as self user + buyer and 38 farmers as buyers are there.

It is evident from the Table 1 that out of government owned four irrigation systems three systems are of Medium Duty Tubewell (MDTW) and rest one of Low Duty Tubewell (LDTW). However, private owned

Table 1: Detail of groundwater extraction mechanism/device and functioning in Paschim Medinipur district of West Bengal

Name of selected Groundwater irrigation scheme	Pumping capacity (HP) and discharge	Energy consum-ption (Kilowatt)	Energy cost (Rs./ hour of running)	Other cost (Rs./ hour of running)	Total cost of oper-ation (Rs./ hour of running)
Pithapura MDTW Irrigation Scheme	7.5 HPDischarge 100 cubic meter/hour	5.52	11.04	5	16.04
Kathnimaro MDTW Irrigation Scheme	7.5 HPDischarge 100 cubic meter/hour	5.52	11.04	5	16.04
Baghmari MDTW Irrigation Scheme	7.5 HPDischarge 100 cubic meter/hour	5.52	11.04	5	16.04
Gopalpur LDTW Irrigation Scheme	2.5 HPDischarge 30 cubic meter/hour	1.84	3.68	2	5.68
Pirot STW Irrigation	2 HPDischarge 30 cubic meter/hour	1.47	2.94	2	4.94
Karanji STW Irrigation	2 HPDischarge 30 cubic meter/hour	1.47	2.94	2	4.94
Meghdumbur STW Irrigation	2 HPDischarge 30 cubic meter/hour	1.47	2.94	2	4.94
Shipurlalpur STW Irrigation	2 HPDischarge 30 cubic meter/hour	1.47	2.94	2	4.94

irrigation systems are of Shallow Tubewell (STW). The pumps with MDTWs, LDTW and STWs are of 7.5 HP, 2.5 HP and 2 HP respectively. The discharge rate of MDTW is 100 cubic meter per hour, while that of both LDTW and STW is 30 cubic meter per hour. Energy consumption in MDTW, LDTW and STW is 5.52, 1.84 and 1.47 kilowatt, respectively. The operating cost / running cost as opined by the farmers are about Rs. 16, Rs. 6 and Rs. 5, respectively that includes the energy cost as well as other costs of operation.

Table 2: Major crops grown and groundwater irrigation supply in government owned groundwater irrigation projects in Paschim Medinipur district of West Bengal

Season wise name of the crop grown	Mean value			
	Area (acre)	No. of irrigation given	Cost of each irrigation (Rs.)	Total irrigation cost (Rs.)
Pithapura MDTW Irrigation Scheme under Pithapura WUA (n=15):				
Kharif season				
Paddy	0.70 (0.42)	4 (2)	146 (112)	580 (279)
Rabi season				
Paddy	0.54 (0.29)	20 (2)	136 (62)	2720 (1269)
Vegetables	0.46 (0.25)	24 (3)	95 (50)	2280 (1258)
Summer season				
Vegetables	0.67 (0.26)	25 (3)	150 (54)	3750 (1556)
Kathnimaro MDTW Irrigation Scheme under Kathnimaro WUA (n=15):				
Kharif season				
Paddy	1.09 (0.44)	6 (1)	226 (44)	1350 (237)
Rabi season				
Paddy	0.75 (0.21)	15 (1)	268(96)	4020 (1466)
Wheat	0.67 (0.24)	9 (1)	335 (186)	3010 (1565)
Vegetables	0.67 (0.47)	25 (1)	146 (99)	3650 (2475)
Summer season				
Vegetables	0.88 (0.41)	26 (3)	189 (91)	4910 (2297)
Baghmari MDTW Irrigation Scheme under Baghmari WUA (n=15):				
Kharif season				
Paddy	1.30 (0.70)	8 (6)	270 (375)	2160 (1038)
Rabi season				
Paddy	0.50 (0.40)	19 (5)	163 (89)	3090 (1308)
Wheat	0.60 (0.70)	10 (4)	246 (73)	2460 (746)
Vegetables	0.60 (0.20)	22 (2)	123 (26)	2700 (80)
Summer season				
Vegetables	0.67 (0.59)	22 (6)	140 (82)	3080 (1813)
Oilseeds	1.10 (0.80)	4 (1)	327 (253)	1300 (1000)
Paddy	0.60 (0.40)	20 (1)	153 (40)	3060 (808)
Gopalpur LDTW Irrigation Scheme under Gopalpur WUA (n=15):				
Kharif season				
Paddy	0.90 (0.40)	3 (1)	206 (108)	620 (201)
Rabi season				
Paddy	0.50 (0.30)	14 (1)	174 (98)	2430 (1794)
Wheat	0.44 (0.35)	11 (4)	200 (143)	2200 (2309)
Oilseeds	0.34 (0.24)	3 (1)	75 (35)	220 (141)
Summer season				
Vegetables	0.50 (0.18)	17 (1)	179 (65)	3040 (1054)
Oilseeds	0.33 (0.17)	5 (1)	105 (48)	520.00 (265)

Note: Figures in the parenthesis indicate standard deviation values

Major crops grown and groundwater irrigation supply as responded by selected sample farmers in government owned groundwater irrigation projects in Paschim Medinipur district of West Bengal are presented in Table 2.

Under Pithapura MDTW irrigation command areas, during *kharif* season, paddy is grown in an average area of 0.70 acre that used to require 4 irrigations (mainly protective irrigation) with cost of Rs. 580. However, the paddy crop grown in *rabi* season in mean area of 0.54 acre requires about 20 irrigations with cost of Rs. 2720. Vegetables are grown both in *rabi* and summer season in an average area of 0.46 and 0.67 ha requiring 24 and 25 irrigations with a cost of Rs. 2280 and Rs. 3750, respectively.

In Kathnimaro MDTW irrigation command, similar cropping pattern is observed, paddy being the major crop both in *kharif* and *rabi* season with mean area of 1.09 and 0.75 acre requiring 6 and 15 irrigation with average cost of Rs. 1350 and Rs.4020, respectively. Wheat is grown by the selected farmers in *rabi* season covering a mean area of 0.67 acre requiring 9 irrigation with average cost of Rs. 3010. Vegetables are grown both in *rabi* and summer season in an average area of 0.67 and 0.88 acre requiring 25 and 26 irrigations with cost of Rs. 3650 and Rs. 4910.

Diversified cropping pattern is followed by the sampled farmers (15) in Baghmari MDTW irrigation command. Paddy occupies 1.30 acre and 1 acre area in *kharif* and *rabi* season, respectively. In *kharif* season, protective irrigations (8±6) are used to given; however on an average 19 irrigations are required for paddy in *rabi* season with cost of Rs. 3090. Paddy is also grown in summer season (0.60 acre) requiring 20 irrigations with cost of Rs. 3060. Thus, irrigation cost for paddy crop grown in summer costs very high. During *rabi* season, other crops grown are wheat and vegetables each with 0.60 acre requiring on an average 10 and 22 irrigations with a cost of Rs. 2460 and Rs. 2700. Vegetables are also grown in summer season in an area of 0.67 acre with 22 irrigations costing Rs. 3080. Oilseeds are grown in relatively more area (1.10 acre) that requires 4 irrigations with cost of Rs. 1300.

Farmers in Gopalpur LDTW irrigation command grow paddy both in *kharif* and *rabi* season in average area of 0.90 and 0.50 acre providing 3 and 14 irrigations with a cost of Rs. 620 and Rs. 2430. Oilseeds are grown both in *rabi* and summer season in 0.34 and 0.33 acre

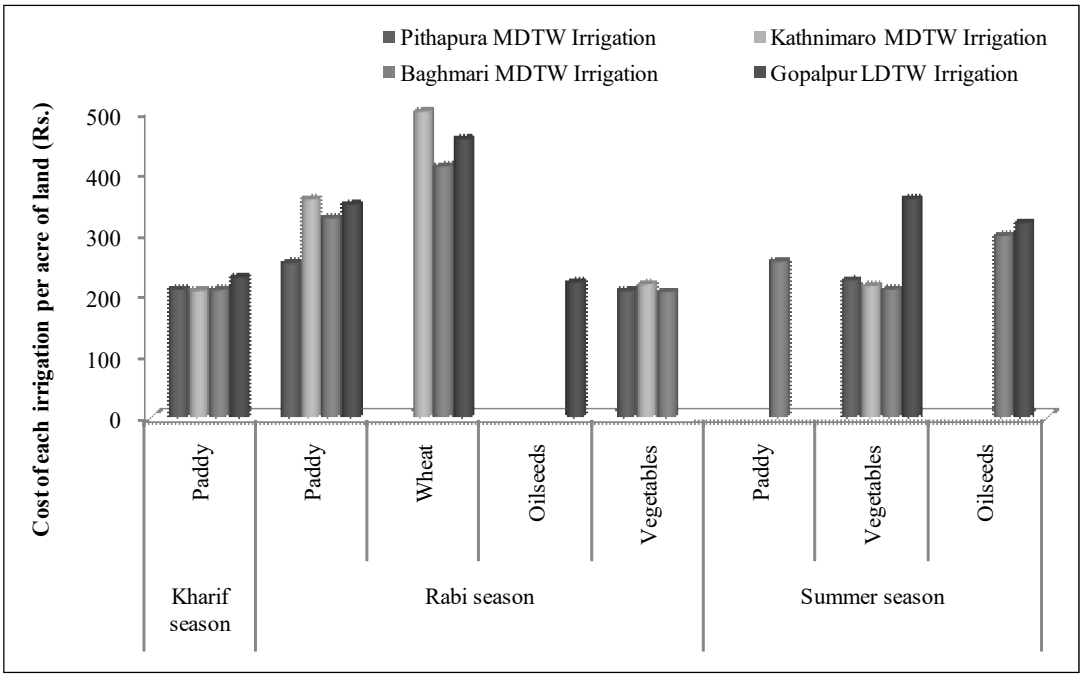

Figure 1: Crop wise cost of irrigation per acre of land under government owned groundwater irrigation systems in Paschim Medinipur district of West Bengal

with 3 and 5 irrigations costing Rs. 220 and Rs. 520, respectively. Wheat is grown in an area of 0.44 acre with about 11 irrigations costing Rs. 2200 during *rabi* season. Farmers also cultivate vegetables a mean area of 0.50 acre that is used to require 17 irrigations with cost of Rs. 3040.

It is worth mentioning here that the diversified cropping pattern is followed in all the selected groundwater irrigation systems' command, where WUAs manage the irrigation. The paddy occupies larger area followed by vegetables in dry season (*rabi* + summer) both requiring large number of irrigations as compared to other crops grown like oilseeds and wheat. The cost of each irrigation per acre of land cultivated is maximum in case of paddy and wheat grown in *rabi* season followed by oilseeds and vegetables grown in summer season (Figure 1).

Major crops grown and groundwater irrigation supply in private owned groundwater irrigation projects under different groundwater marketing regimes in Paschim Medinipur district of West Bengal are presented in Table 3. The farmers are categorized based on their presence in groundwater marketing as self user (6 farmers), self user + seller (2 farmers), self user + seller + buyer (11 farmers), self user + buyer (3 farmers) and buyers (38 farmers).

Self users grow paddy in all three seasons with cost of each irrigation per acre of land being highest in summer season followed by *rabi* season and *kharif* season (Figure 2). It occupies 1.28, 1.17 and 0.83 acre of land with irrigation cost of Rs. 793, Rs. 7675 and Rs. 5140 in *kharif, rabi* and summer season, respectively. Pulses are also grown in *rabi* season covering a mean area of 0.83 acre with irrigation cost of Rs. 790. Vegetables are also cultivated in 0.83 acre of land in summer season with irrigation cost of Rs. 4920.

In the present study, there were two farmers who are having STWs from which they provide irrigation to their own crops as well as sell the water to others. These self user + seller category of farmers cultivate paddy in both *kharif* and *rabi* season in an average area of 1.33 and 1.63 acre with irrigation cost of Rs. 750 and Rs. 8005, respectively. They grow vegetables in summer season in an area of 1.17 acre with total cost of irrigation Rs. 5260. Cost of irrigation per acre of land is less for self user + seller as compared to self user (Figure 2).

There are 11 out of 60 farmers sampled for present study have STWs from which they irrigate their own crops and sell the water to neighbouring farmers; however, due to fragmented holdings and patches of land at distant locations also buy the water for irrigation to cultivated crops. These farmers also grow diversified crops as evident from Table 3. Paddy is grown in all three seasons. In *rabi* season, oilseeds and vegetables are grown in 1 and 0.50 acre of land with total irrigation cost of Rs. 1160 and Rs. 3675, respectively. Vegetables are also grown in summer season in an average area of 0.74 acre with total irrigation cost of Rs. 4645. The cost of irrigation per acre of land for this category of farmers is more than self user + seller but less than self user as they sell the water to balance the cost they incur as buyer.

The farmers having more land and at different places in fragmented manner not only use the water from their own groundwater source (STW) but also buy the water from others to grow the crops. These self user + buyer category of farmers (3) in present study cultivate paddy in 1.08 acre with total cost of irrigation of Rs. 1163. They grow vegetables in mean area of 0.67 acre with cost of irrigation Rs. 4500 both in *rabi* and summer season. Self user + buyer category of farmers bear more cost of irrigation as compared to previous three categories.

Most of the farmers (38 out of 60) in present study are buyers as they do not have any source for groundwater irrigation. They cultivate paddy in 0.89 acre and 0.79 acre with irrigation cost of Rs. 671 and Rs. 5295, respectively. The vegetables are also grown by them in both *rabi* and summer season covering 0.40 acre and 0.60 acre area requiring 26 irrigations with mean irrigation cost varying from Rs. 3090 to Rs. 4554. Oilseeds are grown in 0.67 acre with 6 irrigations costing Rs. 1000. The cost of irrigation is highest for the buyers in study area (Figure 2).

Comparative cost of irrigation for the farmers as buyers from private groundwater irrigation source (STWs) is higher than the member farmers of WUAs, operating and managing government sources of groundwater irrigation implementing the participatory irrigation management reform (Figure 3). A perusal of the Table 4 suggests that irrigation use cost for self user is Rs. 22 per hour, while that for self user + seller, self user + seller + buyer and self user + buyer is Rs. 23, Rs.

Table 3: Major crops grown and groundwater irrigation supply in private owned groundwater irrigation projects in Paschim Medinipur district of West Bengal

Season wise name of the crop grown	Mean value (n=60)			
	Area (acre)	No. of irrigation given	Cost of each irrigation (Rs.)	Total irrigation cost (Rs.)
Self user (n = 6) under private STWs				
Kharif season				
Paddy	1.28 (0.77)	3 (1)	268 (199)	793 (497)
Rabi season				
Paddy	1.17 (1.04)	16 (1)	480 (361)	7675 (5344)
Pulses	0.83 (0.24)	6 (1)	133 (47)	790 (71)
Summer season				
Vegetables	0.83 (0.18)	25 (3)	197 (57)	4920 (1591)
Paddy	0.83 (0.24)	15 (1)	343 (81)	5140 (1414)
Self user + seller (n= 2) under private STWs				
Kharif season				
Paddy	1.33 (0.47)	3 (1)	250 (212)	750 (778)
Rabi season				
Paddy	1.63 (0.24)	16 (1)	501 (49)	8005 (1768)
Summer season				
Vegetables	1.17 (0.71)	28 (4)	188 (181)	5260 (6010)
Self user + seller + buyer (n=11) under private STWs				
Kharif season				
Paddy	1.79 (1.20)	3 (1)	350 (94)	677 (333)
Rabi season				
Paddy	1.51 (1.40)	16 (2)	518 (217)	8285 (3125)
Oilseed	1.00 (0)	5 (1)	232 (155)	1160 (115)
Vegetables	0.50 (0.33)	25 (2)	101 (100)	3675 (2869)
Summer season				
Vegetables	0.74 (0.24)	28 (3)	166 (71)	4645 (2324)
Paddy	0.50 (0.24)	14 (1)	200 (151)	2800 (2121)
Self user + buyer (n=3) under private STWs				
Kharif season				
Paddy	1.08 (0.69)	5 (2)	233 (153)	1163 (306)
Rabi season				
Vegetables	0.67 (0)	27 (1)	167 (26)	4500 (707)
Summer season				
Vegetables	0.67 (0)	27 (1)	167 (26)	4500 (707)
Buyer (n = 38) under private STWs				
Kharif season				
Paddy	0.89 (0.59)	3 (1)	225 (163)	671 (387)
Rabi season				
Paddy	0.79 (0.53)	15 (1)	353 (247)	5295 (4218)
Vegetables	0.40 (0.20)	26 (2)	119 (54)	3090 (1582)
Oilseed	0.67 (0.47)	6 (1)	167 (1)	1000 (1000)
Summer season				
Vegetables	0.60 (0.27)	26 (3)	175 (84)	4554 (2325)

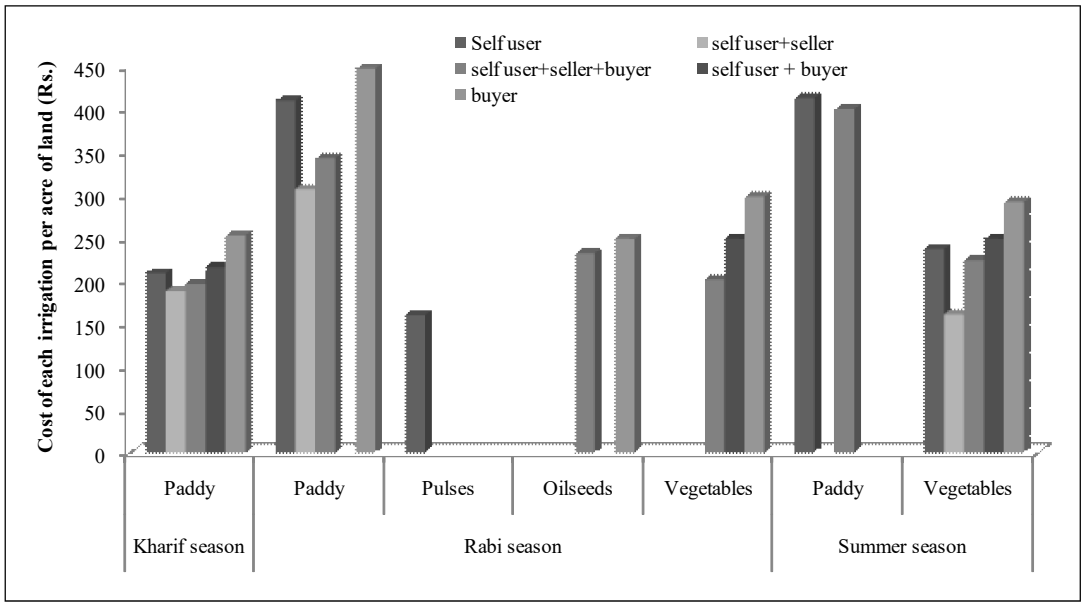

Figure 2: Crop wise cost of irrigation per acre of land under different groundwater marketing regimes in private owned groundwater irrigation systems in Paschim Medinipur district of West Bengal

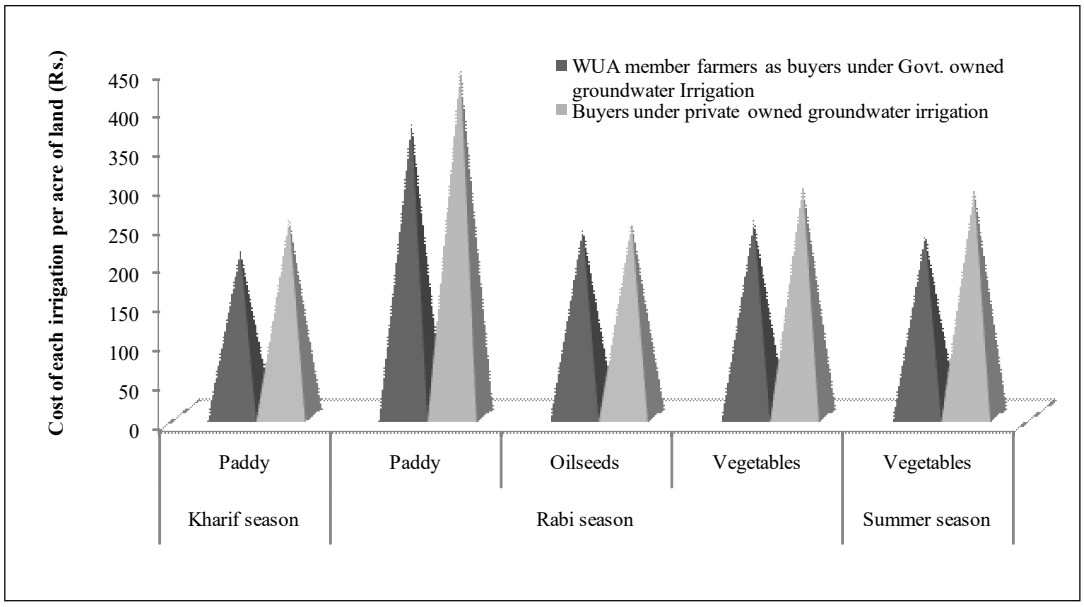

Figure 3: Comparative cost of irrigation per acre of land paid by farmers as buyers under government and private owned groundwater irrigation systems in Paschim Medinipur district of West Bengal

24 and Rs. 24 per hour, respectively. It is interesting to note that self user + seller and self user + seller + buyer category of farmers sell the irrigation at a cost of Rs. 31 and Rs. 30 per hour, respectively, which is varied as evident from standard deviation value. Buying cost of irrigation varied from Rs. 28 to Rs. 30 per hour. It is worth mentioning here that due to less bargaining power of the farmers not having any groundwater irrigation source are forced to buy at a relatively higher rate as compared to those farmers who are having source (STWs) but buy water due to fragmented holdings.

Findings of present study reiterates the statement of Chaudhary (1990) and Shah (1991) who mentioned that the term 'water market' has been used to describe a localized, village-level informal arrangement through which owners of Water Extraction Mechanisms (WEMs) sell irrigation services to other members of the

Table 4: Groundwater irrigation costing/ pricing detail under different groundwater market regimes in Paschim Medinipur district of West Bengal

Status	Irrigation use cost (Rs/ hour)	Irrigation selling cost (Rs/ hour)	Irrigation buying cost (Rs/ hour)
Self-users	22 (1)	—	—
Self-Users + Sellers	23 (1)	31 (6)	—
Self-users + Sellers + Buyers	24 (2)	30 (2)	28 (2)
Self-users + Buyers	24 (3)	—	29 (1)
Buyers	—	—	30 (2)

Note: Figures in the parenthesis indicate standard deviation values

community. Empirical research indicated a variety of contract forms and a wide range of prices in groundwater markets. Buyers may pay for water by providing labour, or a share of the crop, though the tendency is to move towards a cash charge per hour of water supplied as groundwater markets developed. In the present study, it is observed that most of the farmers being marginal do not have any access to groundwater; therefore, they rely on others to get the water for raising the crops. Moench (1994) also observed that groundwater markets, in which farmers buy and sell irrigation water, provide one of the most promising institutional mechanisms for increasing access to and use of groundwater for irrigation. Sharma and Sharma (2006) studied the groundwater market in Rajasthan and found that selling groundwater had become a growing business for making profit at the social cost. The sellers of water charged exorbitant prices, i.e. more than three times of the cost of water extraction for buyers, as water price which became exploitative for the buyers of the water, and contributed to increasing inequality among the rich and poor farmers. Both cash based and in–kind types of transactions were observed in the study area. About 47 per cent of water buyers paid through cash mode on hourly basis, while 53 per cent preferred to pay through crop –output sharing mode. Srivastava *et al.* (2009) reported that both buyers and owners of WEMs are technically inefficient in water–use, as the actual use of irrigation water has been found much higher than the optimum level. However, 'Buyers have been found comparatively more efficient than 'Owners' in water utilization. Overexploitation of groundwater resources raises concerns about the future sustainability of agriculture. It is, therefore, becoming increasingly important that groundwater is used efficiently and groundwater market can emerge as a better tool for improving the efficiency of irrigation water across farm-sizes and crops.

CONCLUSION

The present study revealed groundwater marketing scenario in Paschim Medinipur district of West Bengal. The irrigation performance as the perceived by the farmers indicated a better irrigation performance of private owned groundwater lift irrigation command as compared to the government owned groundwater lift irrigation command. The differential cropping patterns being followed by the farmers in Paschim Medinipur district showed the crop diversification has been testimony in the minor (groundwater) irrigation command area with better productivity. The assured irrigation from groundwater source largely influenced acreage under non-food grain crops like vegetables, oilseeds, pluses etc. With the development of groundwater market, small and marginal farmers are also benefited, as they get access to irrigation.

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Capacity Building: A Pathway for Changing Behaviour of Self help Groups

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ABSTRACT

Capacity building is an action plan to give training to improve skills of the members of self help groups to upgrade them. The present study was conducted in *Majha, Malwa* and *Doaba* zones of Punjab to determine the change in behaviour of the members of self help groups after the trainings organised for them by various institutions. Twelve self help groups were selected from three cultural zones of Punjab. A total of 200 members enrolling in these groups were selected based on probability proportion to size (PPS) of the self help group in each district. The data were collected with the help of interview schedule. Majority of the respondents enrolled in a group for employment opportunities (97.5%), economic benefits (96%) and to develop habit of savings (91%). Most of respondents availed training opportunities provided to them by different agencies regarding product preparation for their capacity building that resulted in behavioural changes in terms of knowledge, attitude and skill. Change in behavior of the members facilitates the effective functioning of the self help groups.

Keywords: Behaviour, Capacity building, Training, Self help groups

INTRODUCTION

Punjab over the last 10 years has recorded growth of 9.4% in constant terms and CAGR of 15.3% GSDP growth in current prices for the same period. Against a growth target of 5.9% during the 11th plan period, the state achieved 6.7%; with target in the 12th plan period (2012-17) being set at 6.4%. Growth in the state has always been supported by strong agri-sector output. Indeed, Punjab being one of the largest producers of food grains (particularly wheat) recognized as the food bowl of the country as a result of which India's food security depends vitally on wheat and rice production in Punjab, which contributes more than 50 per cent of the central pool of cereal stocks. Punjab is home to 2.3% of the country's population. The state contributes about three per cent to India's GDP through its contribution in the agricultural sector. It is interesting to note that Punjab records a per capita income of Rs 89,345 above the national average level of Rs 68,747 for the same year (Anoymous, 2013a).

Punjab agriculture is the home of small and marginal farmers (80%). Therefore, the future of sustainable agriculture growth and food security in Punjab depends on the performance of small and marginal farmers. These farmers are heavily indebted as they are dependent on money lenders for credit facility (Kalkat, 2011). Poverty and unemployment are the major problems faced by the rural community (Singh *et al.,* 2017). Also majority living in rural areas are illiterate and are below poverty line having poor economic status. Besides this, in comparison to urban, rural people have limited access to all kinds of resources such as educational facilities, transportation, training facilities, credit and technology etc. These are problems that cannot be tackled individually but can be better solved through group efforts. Promotion of self help groups is one of the strategies that have been adopted by the government as part of their community participation approach for the socio-economic development of rural people.

Uployment and undemployment in rural areas is a matter of serious concern. Industrial sector in the state has failed to create sizeable employment for wards of farmers and rural labour. There is an urgent need to increase the avenues of employment in rural areas. The

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policy of empowerment of the rural poor through skill development, better health and education services and vocational training is urgently required which will ensure employment for local people. The importance of devoting attention to the economic betterment and development of rural women through capacity building is associated to improve the skills of rural women that resulted inefficient performance of different agricultural activities to increase agricultural production in a further extent (Anonymous, 2013b). Capacity building enabled the feasible environment including community participation (of women in particular) for skill development. It includes human resource development, the process of equipping individuals with the understanding, skills and access to information, knowledge and training that enables them to perform effectively; Organizational development, the elaboration of management structures, processes and procedures, not only within organizations but also the management of relationships between the different organizations and sectors (public, private and community) and Institutional and legal framework development, making legal and regulatory changes to enable organizations, institutions and agencies at all levels and in all sectors to enhance their capacities (Anonymous, 1997). Capacity building is a system for changing behaviour in order to produce an increase in quantity or an improvement in quality of an individual's contribution to the goals of an organization (Kondal, 2014).

To raise status in society was prime reason for respondents joining the self help groups followed by promoting income generating activities, getting of loan, promoting savings and repaid the old debts (Lakshmi and Vadivalagan, 2011). However looking at other reasons, the present study has been planned to identify various reasons for joining the group and to determine their participation in various training programmes.

MATERIALS AND METHODS

A complete list of women self help groups operating in different parts of Punjab has been collected from different sources viz. regional office of National Bank for Agriculture and Rural Development (NABARD) Chandigarh, regional office Milkfed Chandigarh and self help groups formed under Agricultural Technology Management Agency (ATMA) has been procured from the Chief Agriculture Officer of different districts.

The present study was conducted in three cultural zones viz. *Majha, Malwa and Doaba* of Punjab State. Two districts from each cultural zone viz. Pathankot and Amritsar (Majha), Jalandhar and Hoshiarpur (*Doaba*), Moga and Ludhiana (Malwa) were selected randomly. At the third stage, from these 6 selected districts, 12 functional women self help groups namely Mian Mamli, Nari Shakti, Amar Das, Ram Das, Maha Laxmi, Durga, Chetna, Sada Shiv Modern, Assal, Veer Honey, Baba Budha and Bibi Rajni self help groups were selected by using probability proportion to size (PPS) of self help groups in each district. Thus a sample of 200 members were selected for the investigation. The data were collected with the help of interview schedule and analysed with the help of frequencies and percentages.

RESULTS AND DISCUSSION

Reasons for enrolling as a member of self help groups: The objective of the study was to identify the various reasons to join the group by the members of self help groups. The reasons for joining the groups by the members have been presented in Table 1. A close examination of the data revealed that a large percentage of members of *Majha, Malwa* and *Doaba* region enrolled in a group for getting employment opportunities (97.5%), economic benefits (96%) and to develop a habit of savings (91%). It indicated that promotion of self help groups provided employment to large number of people for economic upliftment. It is important to note that forty five per cent of members of *Majha* region joined group to overcome exploitation from money lenders charging high rate of interest on credit as compared to *Malwa* (37.93%) and *Doaba* (37.50 %) region. This showed that members of *Malwa* region are more dependent on money lenders to satisfy the economic needs of the family. Findings of Geethamma (2007), Lakshmi and Vadivalagan (2011) and Kondal (2014) were in line with the present study who reported that members joined the groups for family support , to develop habits of savings, for employment opportunities, to avail credit facility thus improving financial conditions of the family.

Training attended by the members of self help groups: Training is the need of the hour as it has significant impact to change knowledge, skills and attitude of members of self help groups. Data exhibited in Table 2 revealed that members underwent various training

Table 1: Reasons for enrolling as a member of self help groups (n=200)

Reasons	Majha(n=62)		Malwa(n=58)		Doaba(n=80)		Overall	
	f	%	f	%	f	%	f	%
Supplement family income	45	72.58	55	94.82	55	68.75	155	77.5
Develop social ties	58	93.54	48	82.75	59	73.75	165	82.5
Economic benefit	59	95.16	56	96.55	77	96.25	192	96.0
Easy access to credit	45	72.58	40	68.96	59	73.75	144	72.0
Employment opportunities	61	98.38	57	98.27	77	96.25	195	97.5
Overcome exploitation	45	72.58	22	37.93	30	37.50	97	48.5
Develop habit of savings	55	88.70	58	100.00	69	86.25	182	91.0
Repay old debts	20	32.25	30	51.72	50	62.5	100	50.0
Utilization of free time	10	16.12	12	20.68	43	53.75	65	32.5
Motivated from KVKs	5	8.06	2	3.44	12	15.00	19	9.5

*Multiple response

programmes for improving and upgrading their skills in various entrepreneurial projects.

The various trainings conducted by KVKs, NGOs and Welfare societies were categorized into two categories viz. product preparation training and capacity building of self help groups. A crical look at the data in Table 2 reported that members participated in product preparation trainings like candle making (15.5%), detergent making (9%), processing of seasonal fruits and vegetables (5%), preparation of pickles, vermicelli and juices (38.5%), promotion of embroidery work (17%), art of making household products (13%) and art of making *dunas* (7.5%). However they also participated in capacity building of training which included formation and management of self help groups (19%) and entrepreneurial development (20%).

It is remarkable to note that members of Maha Laxmi, Durga and Sada Shiv Modern and Assal self help groups participated in more than one training. This may be because of their keen desire to learn new techniques to make groups more successful and were able to increase their income in the range of Rs. 1500-2500 and monthly savings in the range of 150- 250 per month. The increase in income and savings were measured before and after joining the groups.

The members of other groups like Baba Budha and Bibi Rajni had attended only one training (Table 2).

It was quite clear from the data presented in Table 2 that KVKs organised 11 trainings followed by welfare societies, NGOs and PAU who organised ten, six and three trainings respectively. This indicated that the KVKs have a limited role in group formation but play a significant part in promoting these groups through provision of trainings.

A scrutiny of data from Table 3 reported that maximum duration of training was seven days followed by 5 days, 3 days, 2 days and one day respectively. It was found that most of the respondents (42.5%) attended trining of two days duration while 29 per cent of the respondents attended training of one day on produt preparation. It was noted that the members of Durga, Assal and Maha Laxmi self help groups attended 7 days training while members of Ram Das and Durga attended 5 days training. It is because of the family support that members of the Durga self help were able to attend both 5 and 7 days duration of the trainings.

Overall members of Maha Laxmi and Durga self help groups participated in four different trainings due to their strong links with extension personnel while members of Sada Shiv Modern and Assal self help groups participated in three trainings. As members of these groups had high extension contacts with scientists of KVKs, Punjab Agricultural University (PAU) and NGO. PAU acts as platform for the members to provide space in Kisan Mela to sale their produces while NGOs linked the groups with various banks to avail loan for purchase of raw materials for undertaking entrepreneurial activities on a small scale (Kaur *et al.,* 2017). As a result, their income and savings were more than other self help groups. A scrutiny of data in Table 4 revealed that members availed training opportunities provided to them. A large majority (99%) attended only one training while18.5 per cent of the respondents participated in

Table 2: Distribution of respondents based on the trainings attended by them (n=200)

Name of the self help groups	Name of training	Duration (Days)	Organising agencies	Beneficiaries No.
Product preparation training				
Mian Mamli (n=20)	Candle making	2	Pahal, Jalandhar	11 (5.5)
	Detergent making	1	KVK, Jalandhar	18 (9.0)
Nari Shakti (n=15)	Candle making	2	Pahal, Jalandhar	7 (3.5)
	Processing of seasonal fruits and vegetables	1	KVK, Jalandhar	10 (5.0)
Amar Das(n=18)	Preparation of pickles	2	Save Planet, Amritsar	9 (4.5)
	Preparation of vermiceli	3	Save Planet, Amritsar	9 (4.5)
Guru Ram Das (n=14)	Promotion of embroidery work	2	Save Planet, Amritsar	12 (6.0)
	Art of embroidery on suits	5	Sri Dharmasthal Educational Trust, Syndicate bank	7 (3.5)
Maha Laxmi (n=15)	Preparation of pickles	1	KVK, Gurdaspur	3 (1.5)
	Preparation of squashes	2	KVK, Gurdaspur	7 (3.5)
Durga (n=15)	Art of embroidery on suits	7	Baba Dhana Singh Educational welfare Society	7 (3.5)
	Art of making soft toys	2	KVK, Gurdaspur	5 (2.5)
	Promotion of embroidery work of shawls	5	Baba Dhana Singh Educational welfare Society	8 (4.0)
Chetna (n=15)	Art of making Dunas	2	Shubh Karman Society	15 (7.5)
Sada Shiv Modern (n=30)	Preparation of pickles	1	KVK, Gurdaspur	14 (7.0)
	Preparation of squashes	1	KVK, Gurdaspur	10 (5.0)
Assal (n=15)	Preparation of pickles	2	KKG, PAU, Ludhiana	6 (3.0)
	Preparation of household products and rural crafts	7	KKG, PAU, Ludhiana	5 (2.5)
Veer Honey (n=14)	Basics of beekeeping	1	KKG, PAU, Ludhiana	3 (1.5)
Baba Budha (n=16)	Art of making soft toys as a source of self employment	3	JS Educational Welfare Trust	16 (8.0)
Bibi Rajni (n=13)	Techniques of candle making	2	KVK, Moga	13 (6.5)
Capacity building of self help groups				
Amar Das (n=18)	Formation and management of self help groups	1	Save Planet, Amritsar	5 (2.5)
Maha Laxmi (n=15)	Entrepreneurship development among farmers	1	KVK, Gurdaspur	8 (4.0)
	Integrated training course in Home Science for entrepreneurship skill development	7	KVK, Gurdaspur	5 (2.5)
Durga (n=15)	Management of self help groups	2	Baba Dhana Singh Educational welfare Society	8 (4.0)
Chetna (n=15)	Formation of self help groups	1	Shubh Karman Society	10 (5.0)
Sada Shiv Modern (n=30)	Women empowerment	1	Shubh Karman Society	20 (10)
Assal (n=15)	Income generating activities for women	1	Rameshwar Welfare Society	7 (3.5)
	Cooperative farming and group formation	1	Directorate of Extension Education, Ludhiana	4 (2.0)
Veer Honey (n=14)	Benefits of self help groups	1	Rameshwar Welfare Society	11(5.5)

*Figures in parentheses indicate percentages

Table 3: Overall participation of members of self help groups in various training programmes (n=200)

Name of the training	Duration	Name of the group	Beneficiaries
A) Product preparation			
Detergent making	One	Mian Mamli	18 (9.0)
Processing of seasonal fruits and vegetables		Nari Shakti	10 (5.0)
Preparation of pickles		Maha Laxmi	6 (3.0)
Preparation of squashes		Sada Shiv Modern	10 (5.0)
Preparation of pickles		Sada Shiv Modern	14 (7.0)
Candle making	Two	Mian Mamli	11 (5.5)
Preparation of pickles		Amar Das	9 (4.5)
Candle making		Nari Shakti	7 (3.5)
Promotion of embroidery work		Guru Ram Das	12 (6.0)
Preparation of squashes		Maha Laxmi	7 (3.5)
Art of making soft toys		Durga	5 (2.5)
Art of making *Dunas*		Chetna	15 (7.5)
Preparation of pickles		Assal	6 (3.0)
Techniques of candle making		Bibi Rajni	13 (6.5)
Preparation of Vermicelli	Three	Amar Das	9 (4.5)
Art of making soft toys		Baba Budha	16 (8.0)
Art of embroidery on suits	Five	Ram Das	7 (3.5)
Promotion of embroidery work of shawls		Durga	8 (4.0)
Art of embroidery on suits	Seven	Durga	7 (3.5)
Preparation of household products and rural crafts		Assal	5 (2.5)
B) Capacity building of self help groups			
Formation and management of self help groups	One	Amar Das	5 (2.5)
Entrepreneurship development among farmers		Maha Laxmi	8 (4.0)
Basics of bee keeping		Veer Honey	3 (1.5)
Formation of self help groups		Chetna	10 (5.0)
Women empowerment		Sada Shiv Modern	20 (10)
Income generating activities for women		Assal	7 (3.5)
Cooperative farming and group formation		Assal	4 (2.0)
Benefits of self help groups		Veer Honey	11 (5.5)
Management of self help groups	Two	Durga	8 (4.0)
Integrated training course in Home Science for entrepreneurship skill development	Seven	Maha Laxmi	5 (2.5)

*Figures in parentheses indicate percentages

two trainings. It is remarkable to note that members of Durga self help groups attended all the three trainings viz. art of embroidery on suits, art of making soft toys and promotion of embroidery work of shawls. However the members of others groups namely Mian Mamli, Nari Shakti, Amar Das, Ram Das, Maha Laxmi, Durga and Assal attended trainings twice while rest of the groups attended trainings once in a time. This showed that whenever any training opportunities come, they must be grasped by the members based on their relevancy and needs.

Change in behaviour after training: Behaviour is the tendency by the members of self help groups to react positively or negatively towards materials and human objects. It is a favourable or unfavourable feelings of members regarding the resources available with them such as common place for work, collected money to invest, transportation facilities, wisdom of managers and local rural institutions. It is apparent from the data in Table 5 that a very high increase in knowledge was perceived in terms of selection, purchase and market of raw material, among majority of respondents (91.50%)

Table 4: Percentage distribution of the respondents according to their frequency of participation in the training

Name of training	Name of the group	Number of times (f)			
		Zerof	Oncef	Twicef	Thricef
Product preparation training					
Candle making, detergent making	Mian mamli	1	9	10	-
Candle making, Processing of seasonal fruits and vegetables	Nari shakti	5	3	7	-
Preparation of pickles, Preparation of Vermicelli	Amar Das	4	10	4	-
Promotion of embroidery work, Art of embroidery on suits	Ram Das	2	15	2	-
Preparation of pickles, Preparation of squashes	Maha Laxmi	6	5	4	-
Art of Embroidery on suits, Art of making soft toys, Promotion of embroidery work of shawls	Durga	2	10	2	2
Art of making *Dunas*	Chetna	-	15	-	-
Preparation of pickles, Preparation of squashes	Sada Shiv Modern	-	24	-	-
Preparation of pickles, Preparation of household products and rural crafts	Assal	5	7	3	-
Art of making soft toys as a source of self employment	Baba Budha	-	16	-	-
Techniques of candle making	Bibi Rajni	-	13	-	-
Capacity building of self help groups					
Formation and management of self help groups	Amar Das	-	5	-	-
Basics of bee keeping, benefits of self help groups	Veer Honey	-	14	-	-
Entrepreneurship development among farmers, Integrated training course for entrepreneurship skill development	Maha Laxmi	6	7	3	-
Management of self help groups	Durga	-	8	-	-
Formation of self help groups	Chetna	-	10	-	-
Women empowerment	Sada Shiv Modern	-	20	-	-
Women empowerment through income generating activities, cooperative farming and group formation	Assal	7	7	2	-

Table 5: Distribution of respondents based on change in behaviour after training (n=200)

Dimensions of behaviour	Majha (n=62)		Malwa (n=58)		Doaba (n=80)		Overall	
	f	%	f	%	f	%	f	%
Change in knowledge	56	90.32	50	86.20	77	96.25	183	91.50
Change in skill	55	88.70	48	82.75	65	81.25	168	84.00
Change in attitude	57	91.93	45	77.58	67	83.75	169	84.50
Develop group cohesiveness	60	96.77	55	94.82	76	95.00	191	95.50
Strengthen group interaction	60	96.77	50	86.20	77	96.25	187	93.50

*Multiple response

in all the groups after joining the group and a significant change in their skills (84%) regarding preparation of various products on small scale was also observed after the training programmes. It indicated that willingness of members to participate in various activities of the groups and keen desire to learn new techniques made a favourable change in their attitude (84.50%). The findings are in consonance with study of Gupta and Singh (2012), Sharma *et al.* (2012) who observed that there was an increase in knowledge, change in attitude and development of skill after participating in the training programme. The data further indicated that group interaction (93.50%) proved to be a remarkable outcome of the training programme which further facilitated group cohesiveness (95.50%). It can be attributed to the fact that members of the group get in touch with each other and there was strong a bonding among them during these training programmes. The probe into the data further revealed that change in knowledge was remarkable in *Doaba* region (96.75%) and *Majha* (90.32%) as compared to *Malwa* (86.20%) regions of Punjab.

CONCLUSION

Capacity building enhances the ability and skills of the members to realize their full potential that enable them to work in a group and play different roles, necessary for development and maintenance of the groups. Training given by various NGOs and KVKs helped the women members of self help groups in acquiring the essential skills required for certain income generating activities. Positive behaviour played a great role in tackling the issues of rural poverty for improving sustainable livelihood security. It is observed that respondents underwent trainings on candle making, detergent making, processing of seasonal fruits and vegetables, preparation of pickles, vermicelli and juices, promotion of embroidery work, art of making household products, art of making *dunas,* formation and management of self help groups and entrepreneurial development. New areas of capacity building need to be explored in the changing scenario of agriculture based on the needs of women. Problems encounted by the members of self help groups in attending training needs to be given special attention and all efforts should be made to overcome difficulties and problems so as to enhance their wholehearted participation in various training programme.

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Participatory Agro-ecological and Socio-economic Analysis of Jute Cultivation in West Bengal

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ABSTRACT

Jute cultivation in India is plagued with diverse socio-economic and technological issues and the area and production has reduced gradually over the period. Therefore the present study was undertaken in North 24 Pargan district of West Bengal with a sample of 150 jute cultivators to understand the major issues, problems and devise future strategies using participatory assessment technique. The secondary data was used to understand and support the primary findings. In jute there was incidence mainly of jute semi looper locally called *ghora or ladha poka* which caused heavy losses because it attacks the crop at an early stage, other pests in jute were red hairy caterpillar and yellow mite. Stem rot was the most important disease in jute in this village. It is understood from wealth ranking that majority of the Jute growers belonged to poor family (50%) followed by middle class (40%), rich (7%) and very rich (3%) families. The major problems identified by the jute growers were use of low quality seeds (Rank based quotient score-89.58), followed by pre-monsoon water shortage, semi-looper problem, labour shortage etc. The policy makers need to understand these ground problems before devising any strategy for revival of golden era in Jute cultivation.

Keywords: Agro-ecological, Jute, Participatory, Socio-economic, West Bengal

INTRODUCTION

Jute, known as golden fibre, is one of the most important natural fibres after cotton in terms of cultivation and usage. India is the largest producer of jute contributing about 60 per cent of the total world production (Chapke, 2013). The significant role played by jute in the country's economy can be accessed from the fact that more than 4 million farm families are involved in jute farming and majority of them belong to small and marginal categories (JTM scheme details, texmin.nic.in, 2016).

The jute production in India faced major setback after independence as main chunk of jute growing areas fell into Bangladesh. Government of India took several reformative initiative, and after initial upward trend in area and production during post-independence period, a declining trend was witnessed during 1985-86 and 1995-96 in area (decline being 35.6 per cent). The production has also depicted the similar trend~ increasing at an average annual rate of 6.54 per cent during 1950-51 and 1985-86 but declining at an average annual rate of 2.89% afterwards (Raja, K, Complete information on Area and Production of jute in India, http://www.preservearticles.com/). Strenuous efforts were made to increase production and area of jute but only with limited success.

Till today, the jute cultivators in our country faced multiple crises like lack of quality seed, general socio-economic backwardness, slow progress in implementing new technologies, lack of farmers' organization, inconsistent government price policy, lack of HYV, lack of high fibre quality variety, lack of mechanization etc. Intermittently, government has been trying to push them up by diversifying the usage of jute product, banning of plastic and polythin bags, campaigning its eco-friendliness etc. Still the situation is not as good as expected. Sometimes, traditional jute growers get compelled to

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change their crops or even the farming profession to earn their livelihood. Hence, it is high need to analyze the livelihood scenario of the jute growers using participatory tools and techniques to understand the problem and devise future policy. According to Dabas *et al.* (2009), the PRA (Participatory Rural Appraisal) is one of the most effective tools to understand the technologies, extent of adoption, priorities, problems and prospects of farming community. Sharma *et al.* (2010) used the different participatory tools and techniques to understand the agri-rural situation for research, development and policy interventions in Badarpur said cluster of Faridabad district of Haryana. Hence, the present study was undertaken to assess the livelihood status of jute growers and their problem using different participatory techniques to prepare micro level action plan to address the issue.

MATERIALS AND METHODS

Participatory Rural Appraisal (PRA) technology was used to understand the livelihood scenario of jute growers. The state West Bengal was purposively selected as it was occupying the maximum area (71.15%) and also the leading producer of Jute (78.03%) in 2014-15 (www.jutecomm.gov.in). In West Bengal, jute is predominantly cultivated by the marginal (65%) and small (25%) farmers (Chapke *et al.,* 2006). The district North 24 Pargana was purposively selected as Jute is one the main cash crops to majority of the farmers in the district. The village Bargachia, a predominantly jute growing village, was selected randomly from North 24 pargana district. Total 150 jute cultivators were randomly selected as a sample for the present study. The hot and humid climate and alluvial loamy soils of the district provide ideal conditions for the cultivation of Jute.

Different PRA tools used for the study include transect walk, agro-ecological mapping, social mapping, time trend, seasonal calendar, time line, problem – solving tree etc. Advance GPS technology was used to prepare the village map. Beside these, the secondary data were also analyzed to understand production trend of Jute. The major problems identified in the village were listed and Rank Based Quotient (RBQ) of the problems was calculated based on the ranking score and formula as given by Sabarathnam (1988). The following wealth ranking formula was used for categorizing the farmers into different social ladder-

Wealth ranking formula, $S_i = [(n+1-C_i)/n]\times100$

Where, S_i is score of the household as per KI's, C_i is category of the household as per KI's, n is the total no. of wealth categories

RESULTS AND DISCUSSION

Basic information about the village: The village Bargachhia is situated in Amdanga block of North 24 Pargana district, one of the important jute growing belts of West Bengal. The mean annual rainfall was 1500 mm with 120-130 rainy days per annum. The mean annual temperature ranged between 15-38^{0}C with 80-85% relative humidity. The village was inhabited by 685 households with a total population of 5626. The average literacy rate was 72 per cent while male literacy (73%) rate was marginal higher than the female literacy (70%) rate. Majority (70%) of the farmers were marginal farmer (<1 acre) followed by medium (1-5acre) farmer (20%) and large (>5acre) farmers (10%).

Village transect: GPS (global positioning systems) observations were taken at different landmarks and throughout the outer boundaries to sketch maps of the study village. The GPS observation gave the longitudinal and latitudinal positions of different landmarks. Latitude and longitude were needed to create a basic display on Google earth. The spreadsheet of lat/long co-ordinates were imported to Google earth and pop-up balloons, icons and paths were easily created from the spreadsheet data and the map of the village was drawn. The original village map was almost similar to that drawn from GPS observation (Figure 1).

Agro-ecological map: Agro-ecological map of the village *Bargachhia* was drawn to identify the various agro-ecological diversity present in the village. From the map (Figure 2), it can be understood that the cultivated area of the village was distributed on either side (East and West) of the residential area. The soil type varied from clay-loam to clay. The low lands were mainly covered with clay soil whereas the upland and medium land with clay- loam.

In *kharif* season rice and Jute were the major crops with some patches of vegetables like ridge gourd, bottle gourd, pointed gourd, chilli and brinjal in the uplands. In the *rabi* season, the farmer with irrigation facility cultivated onion, rice, mustard and vegetables like cauliflower, cabbage, tomato, brinjal, potato, bitter gourd, coriander, chilli, okra, garlic etc. In pre-*kharif* season lentil and

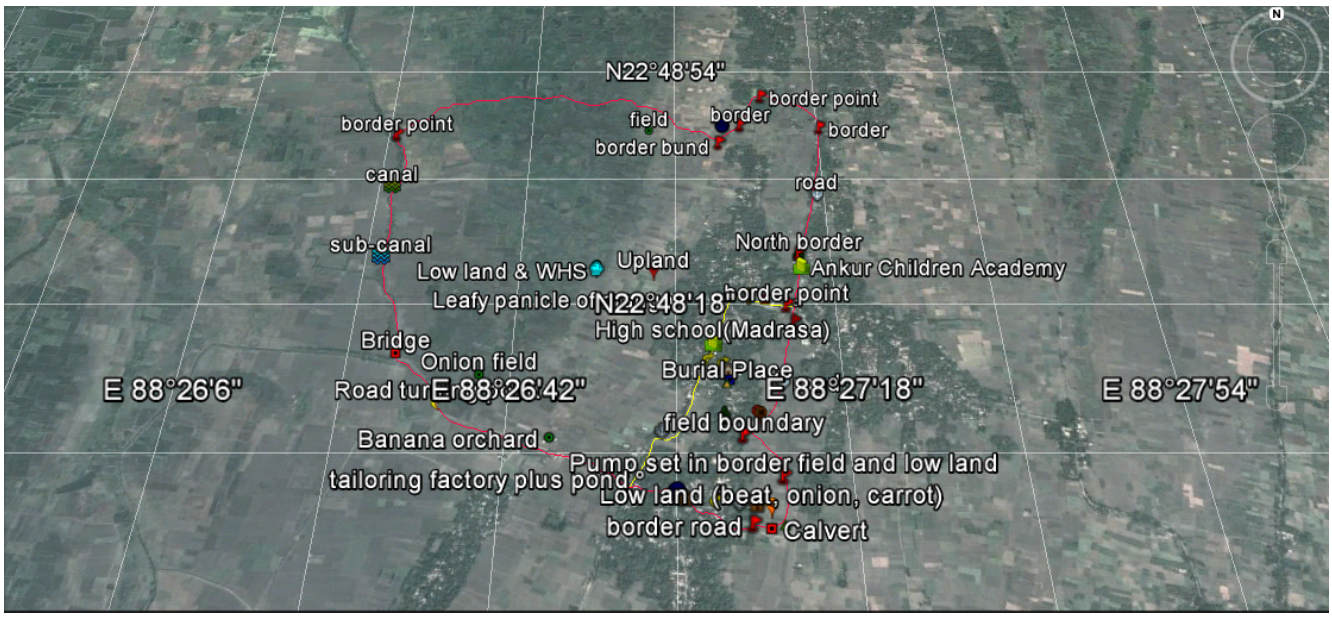

Figure 1: GPS map of village *Bargachhia*

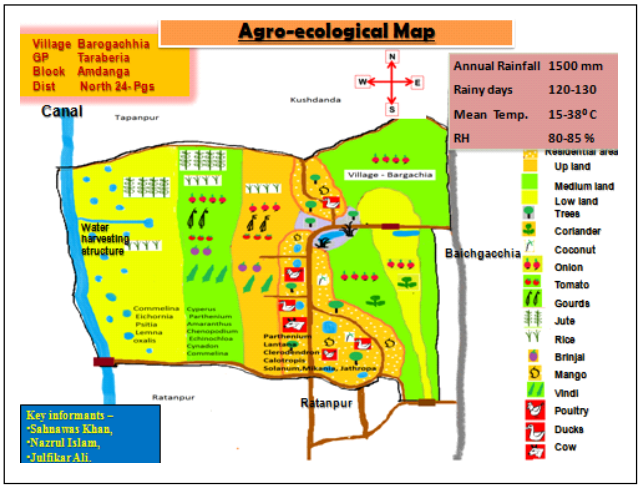

Figure 2: Agro-ecological map

cucurbitaceous vegetables were mostly grown. Canal was the major source of irrigation in the low land, whereas in the up land and medium land bore wells (60-150ft deep) were the major source of irrigation.

Resource map: The village had a large area under cultivation and the detailed resources of the village are depicted in Figure 3. The village has mainly clay soil types. Clay loam soil is dominant in upland and medium land where mostly onion and other vegetable crops are grown. Lowland areas predominantly have clayey soil type. Bargachhia village was very rich in crop resources. Rice, jute, onion and vegetables were the major crops in the village. Lentil was the main pulse crop grown in the village. Coriander was grown for its leaves and seeds. Mustard as the major oilseed crop was grown by the jute growers.

The canal (*Khal*) was the most important source of water in the village for agriculture. There were approximately 150 shallow bore wells used for minor irrigation for vegetable cultivation and 400 tube wells for drinking water needs and household consumption of village.

In the residential area, livestock like cattle, goats, ducks and poultry (broiler, *golakata*-local breed) were the important livestock resources available to the jute cultivators for supplying milk, meat, eggs, manure etc. The village also had important resources like gas connections, cell phone, electricity supply, cable connection, radio and dish TV.

Family labour was the main human resource for all agricultural activities to the jute cultivators. Getting labour from within the village was getting lesser day by day. Both men and women were equally contributing towards the jute cultivation activities. However, activities like weeding, removing jute stick after retting, drying etc. were done by women while land preparation, cutting, transporting, retting and marketing were done by men.

Seasonal problem analysis: Jute was the most important crop after rice at the *Bargachhia* village, which

Figure 3: Resource map

was broadcasted in the month of March and harvested in the end of July. Jute was mainly grown in low land area and covered almost 45% of land area. In rice BPH (brown plant hopper), yellow stem borer and leaf folder were the common insect pest and diseases like blast, brown spot and leaf blight were encountered by the farmers. In jute there was incidence mainly of jute semi looper locally called *ghora or ladha poka* which caused heavy losses because it attacks the crop at an early stage, other pests in jute were red hairy caterpillar and yellow mite. Stem rot was the most important disease in jute in this village. In case of vegetable crops Yellow vein mosaic virus (okra), fruit and shoot borer (brinjal), sucking pests like aphids, thrips in onion, cabbage, cauliflower and disease like blight in all vegetable mainly early and late blight in potato and tomato, alternaria leaf spot in cabbage-cauliflower, powdery mildew in cucurbits create major constraint.

Wealth Ranking and Analysis: Wealth ranking refers to placing people on the different steps of the social ladder according to their own criteria. Agricultural development must take in to account differences in wealth among farmers in order to determine priorities for research and to develop interventions and technical packages that are relevant to and adoptable by majority of the farmers. In present study wealth ranking has been done based on real data about wealth to make it more quantitative and realistic.

The respondents were classified based on pre-defined criteria like very rich (>10 bigha land, *pakka* house, vehicles, farm implements etc.), rich (5-10 bigha land, *pakka* house), medium (3-5 bigha land, *pakka* or tin house, bike etc), and poor (<3 bigha land, *kachha* house). The key informants were asked to classify the 100 sample households of the village based on above criteria. Wealth score of household as per KI was calculated and correction factor was calculated using the maximum and minimum score and number of wealth categories by KI's. With correction factor the category range was derived.

The value of S_1, S_2, S_3 and S_4 was come out as 100, 75, 50 and 25. The correction factor was come out as

Table 1: Seasonal problem analysis of jute cultivators

Crops	Mar	April	May	June	July	Aug	Sept.	Oct	Nov	Dec	Jan	Feb
Amon Rice					BPH	YSB, Blast & Blight						
Boro Rice	Labour problem									BPH, Labour	YSB, Blast & Blight, Irrigation	
Jute		Semi looper, Yellow mite, RHC, Stem rot & labour	Water stagnation, Labour problem									
Onion									Seeds	Thrips, Leaf blight Irrigation, Storage		
Cauliflower &									Aphid, alternaria leaf blight, powdery mildew & Irrigation			
Cabbage Tomato, brinjal									Aphid, late blight, leaf curl, fruit and shoot borer			

18.75. Thus, if the average scores for household ranged between 25 to 41.25, 41.25 to 63, 63 to 81.25 and 81.25 to 100, they were classified as very poor, poor, medium and rich respectively.

From the above Table, it is understood that majority of the Jute growers belonged to poor family (50%) followed by middle class (40%), rich (7%) and very rich (3%) families. Hence, the policy makers must consider the socio-economic status of the jute growers before formulating any strategy for improving the livelihood status of jute growers.

Table 2: Distribution of respondents according to their wealth

Category	Range	Percentage
Very Rich	81.25-100	3
Rich	62.49-81.24	7
Medium	43.73-62.48	40
Poor	Less than 43.73	50

Technology Table of Jute: Technology map is used to know the different types of technology present in the village and behavioural pattern of the villagers towards technology adoption (Chambers *et al* 1989). Adoption type, discontinuance, rejection and over adoption are the different type of technology behaviour. This technique is used as feedback mechanisms which helps to identify the problems of the farmers by scientist and extension personnel.

From the Technology table, it can be understood that major varieties of Jute used by the farmers were

Table 3: Technology table of Jute

Crop	Technology	Status	Reason
Jute	Naveen 524	Highly adopted	Early sowing in March, Good yield, Less thorn in the stem, fine fibre qualityLesser water requirement, lesser pest and disease incidence, delayed harvesting does not result in reduced sugar recovery percentage, smoother leaf edge prevents injury while harvesting
	JRO 632	Adopted	Late sowingDrastic reduction of sugar content on delayed harvesting, highly susceptible to white fly, more spiny
	NSC	Adopted	More height of the plant
	Mahabeej	Rejected	Susceptible to top shoot borer, lesser sugar recovery

Naveen 524, JRO 632, and NSC seed. Among these, the variety Naveen 524 was highly popular in early sowing condition due to its multiple advantages like-Good yield, less thorn in the stem, fine fibre quality, lesser water requirement, lesser pest and disease incidence, etc.

Time trend analysis of area and production of Jute: Time trend is a simple PRA technique, usually depicted in the form of graph (bar/ line) to show the trend of crop/ animal production, commodity prices, human/ cattle population etc. The PRA finding of time trend revealed that area and production in the villages declined in last few decades due to low prices, lack of technology and government supports. The similar trend was also reported in national figure. Hence, secondary data were analysed on area, production, import-export and prices over the period to understand the Jute dynamics in India.

From the Figure 3, it can be deduced that after initial gain in area coverage there was a declining trend in last 3-4 years. In case of production, it showed a fluctuating trend over the years. Many factors were responsible for this fluctuation in production like irregular minimum support price, lack of input services like quality seeds, new varieties, declining pond in village ecosystem creating crisis of retting area of jute, lack of labour, lack of technological support like better crop management, pest management, fertilizer management; and lack of government support etc.

Minimum Support Price (MSP) and Market Price (MP) Trend of Jute: From the Figure 4, it can be understood that MSP of Jute had increased substantially from Rs.785 in 2000-01 to Rs. 2700 in 2015-16. However, this increase was far below the required level of Jute cultivator to maintain their livelihood standard as the annual inflation rate (CPI) had increased more than 5% from 2005 onwards (http://www.inflation.eu/). Moreover, the percentage increase in MSP in last few years (2011 to 2014-15) showed a declining trend. It may be one of the important reason for leaving jute cultivation in rural West Bengal which can be understood from the fact that the acreage under Jute in 2015-16 was very less (only 8.2.9 t/ha). It is beyond doubt that MSP is one of the important driving force for promoting farmers towards jute cultivation and policy makers should provide a fair MSP to maintain the livelihood standard of jute growers.

Gross cost and net return trend in Jute cultivation: The farmer of the villages reported about increasing cost and less return from Jute cultivation as compare to other crops. Hence, three years data of Gross cost and Net return on Cost 2 basis were analyzed and findings indicated low profit (Figure 5) of farmers from the Jute cultivation. The secondary data of MoA also supprted the same hypothesis which revealed that indeed farmer faced a loss of Rs. 2419/ha from jute cultivation. Hence,

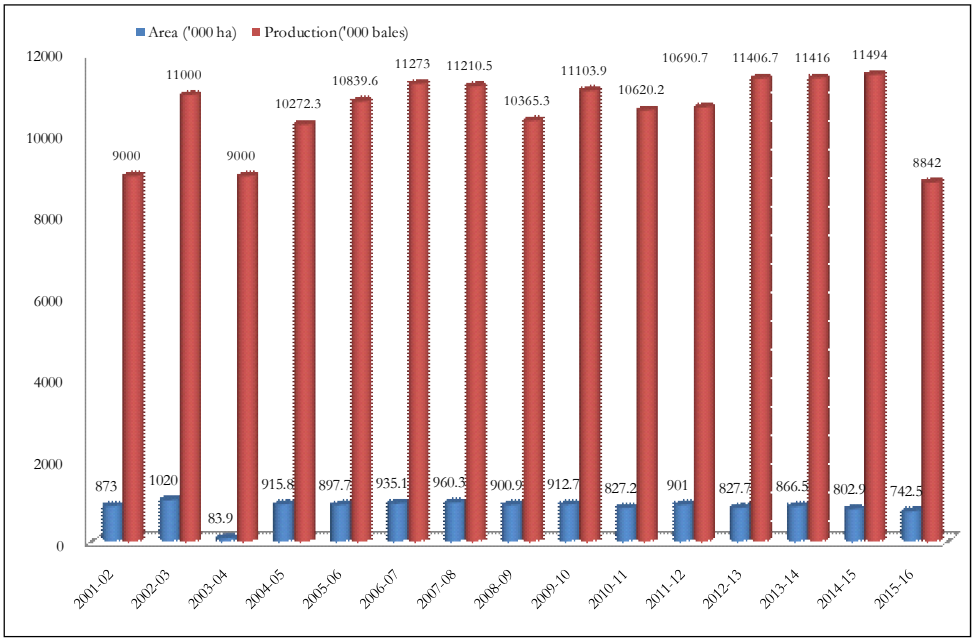

Figure 4: Area and Production trend of Jute (Source:www.jutecomm.gov.in)

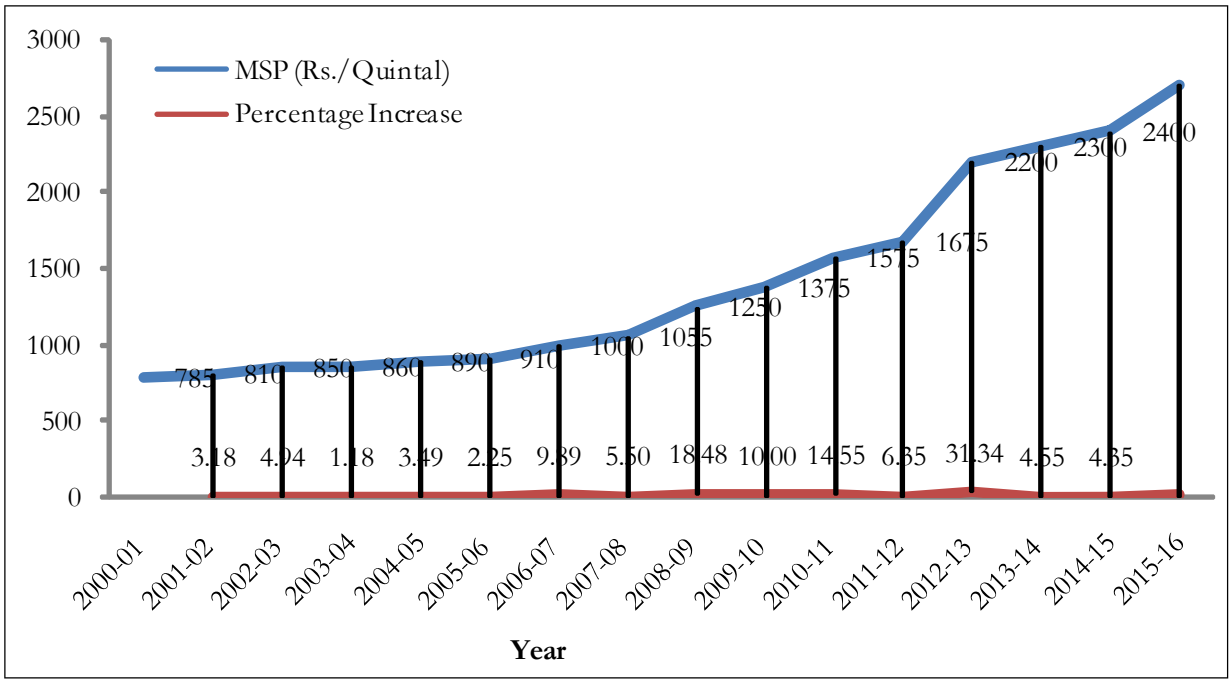

Figure 5: MSP Trend of Raw Jute for TD-5 Grade, Ex-Assam (source: price policy for jute, 2014; cacp.dacnet.nic.in, and http://texmin.nic.in/sites/default/files/note_on_jute_sector_0.pdf)

intesive efforts and farmers friendly startegies need to be adopted to make Jute cultivation profitable.

Imports and exports trend of Jute: Before independence India had monopoly in world jute production. But, India suffered a great setback in the production of jute as a result of partition of the country in 1947 because about 75 per cent of the jute producing areas went to Bangladesh. As a result, India had to import huge amount of raw jute from Bangladesh. To bridge the gap between import and export, a lot of initiatives were taken by government and production of raw jute experienced a significant rise. However, recently the gap between import and export had increased resulting into heavy loss to Indian ex-chequer and jute industry (Figure 6).

Problem Identification and Ranking: The major problems of the jute growers were identified based on perceived ranking and RBQ score was calculated for each problem, which is presented in Table 4.

The major problems identified by the jute growers were use of low quality seeds, followed by pre-monsoon

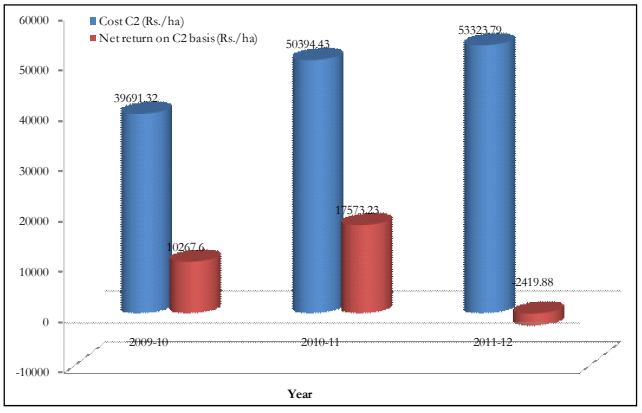

Figure 6: Gross cost and net return from Jute cultivation (source: http://eands.dacnet.nic.in/)

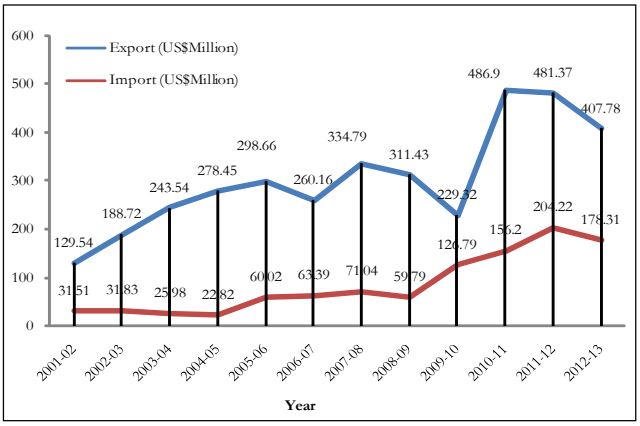

Figure 7: Export-Import trend of Jute, source:cacp.dacnet.nic.in, price policy for Jute, Oct. 2013

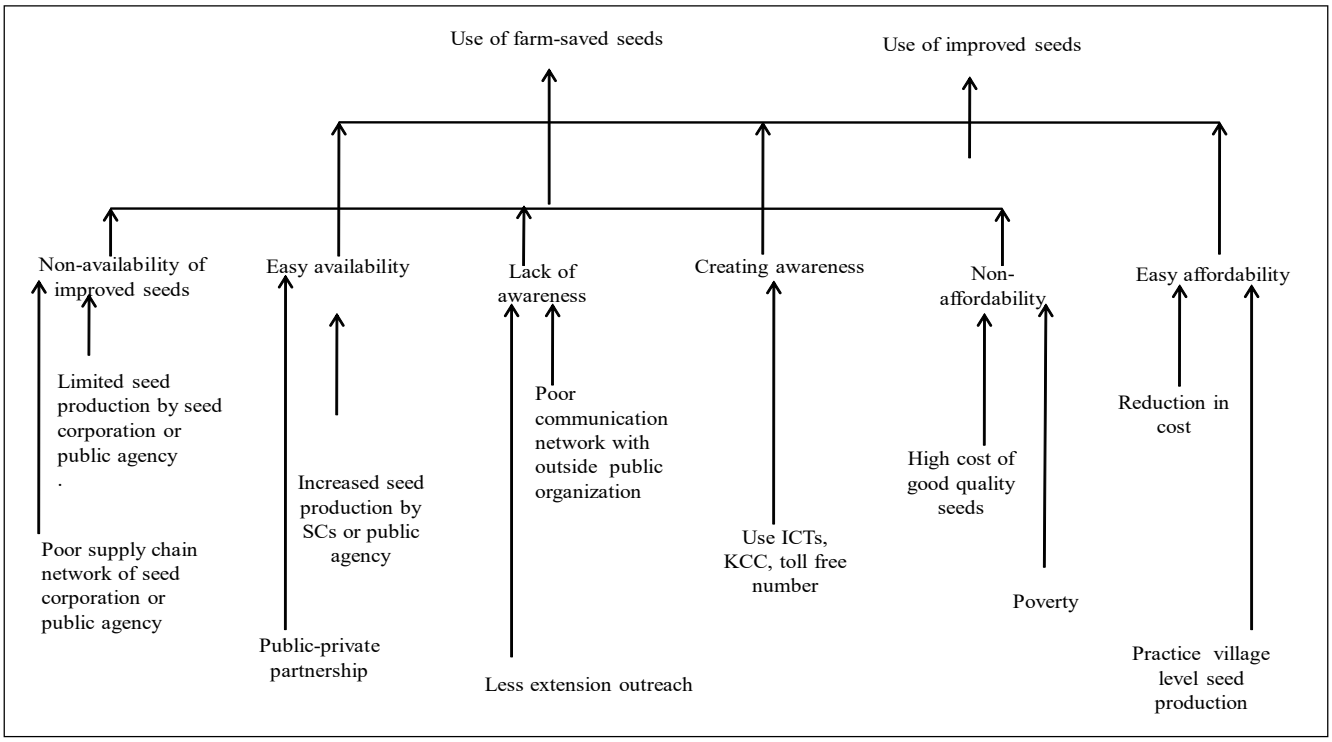

Figure 8: Problem tree and solution tree for jute cultivation

Table 4: Ranking of Problem in jute cultivation

Problem	RBQ
Labour shortage in Jute	77.29
Semi looper in Jute	77.92
Yellow mite in Jute	49.79
Red Hairy caterpillar in Jute	27.5
Water stagnation in jute and stem rot	42.5
Use of local variety seeds	89.58
Pre-monsoon water shortage (boro rice, onion and ridge gourd)	88.96

water shortage, semi-looper problem, labour shortage etc. Based on the RBQ score, local and uses of inferior quality seed was identified as a major problem and possible problem tree and solution tree was drawn to address the issue (Figure 8).

Problem Tree and Solution Tree: The possible causes of the problem were asked to the farmers, they triangulated among themselves and the solutions for each specific cause were also discussed which are presented in following diagram.

CONCLUSION

Participatory Technology is a people-centred community development approach using PRA tools to analyse and empower and tackle their problems, opportunities and visions. It can greatly accelerate the process of self-help and learning. The findings of present study showed that the jute growers lack behind in adoption of latest technologies, *viz.* quality seed of new varieties, mechanization, improved retting tank, disease management, pest management etc. The jute cultivators lacked in innovative social and community institution like Custom hiring centre, Jute growers association which can facilitate the farmers to adopt latest technologies from relevant institution. Hence, intensive extension efforts should be directed towards mobilizing and sensitizing the communities to organize themselves to form community based institution. The lack of quality seed and uses of local market seed was a big problem in the village. It not only lowered the production but also faced low income, resulting into shifting towards other cash crops. Hence, the extension workers should promote the high quality certifies seed to demonstrate the potential of good quality seed and its yield performance. There was also need of policy support from Government side like fair minimum support price, subsidy to jute industry, promotion of jute products at national level, investment in research and extension, and high quality seed production policy etc. Then only, it can withstand the

steep pressure from neighbouring countries. Moreover, separate extension programs need to be formulated and implemented with participatory approach considering the local resources to attract more farmers towards jute cultivation to restore the golden time in jute industry in the country.

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Assessment of Non-Timber Forest Products (NTFPs) based Livelihood Systems among the Forest Dwellers of Chhattisgarh

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ABSTRACT

In this paper an attention is given to identify and assess the NTFPs based livelihood systems of the forest dwellers in Bilaspur district of Chhattisgarh. For this study total135 NTFPs collecting forest dwellers were randomly selected as the respondents from the three randomly selected blocks of the Bilaspur District. The data were collected from each respondent personally by using pretested interview schedule. This study elucidates that, 100.00 per cent of the respondents were engaged in NTFPs collection as the sample population was NTFPs gatherers. However, 91.85 per cent were adopted NTFPs collection + agriculture, kind of occupation. Maximum NTFPs were available to the respondents in May month and all sample households were involved in mahua collection. With regard to prevailing NTFPs based livelihood systems it was found that system 2A i.e. "NTFPs (Mahua, Tendupatta, Jamun, Sitaphal, Putu and Chhatani) + crop (*kharif* rice)" was most popular among 60 per cent of respondents. But system 2D i.e. "NTFPs (Mahua, Tendupatta, Jamun, Sitaphal, Putu and Chhatani) + crop (*kharif* rice) + dairy" gives the highest per family average annual income. SWOT analysis of such prevailing NTFPs based livelihood systems describes the various strengths, weaknesses, opportunities, and threats which are associated to such systems.

Keywords: Annual income, Forest, Non-timber, Occupation, Products, Respondents, SWOT analysis

INTRODUCTION

Forests provide significant social and economic benefits at all levels, especially in developing countries. Forests offer numerous benefits to society (Wollenberg and Ingles, 1998; Oksanen *et al*., 2003; Lawes *et al*., 2004), e.g. employment, aesthetics and ecological services such as carbon sequestration. Forest products contribute to the wellbeing of people, especially to low-income earners in rural areas (World Bank, 2002; Kaimowitz, 2003; Sunderlin *et al*., 2005). The use of forest resources by rural communities may reduce the incidence of poverty (Neumann and Hirsch, 2000; Wunder, 2001; Sunderlin *et al.,* 2005). On one hand, forest support the livelihood of the poor people of our country, especially the tribes, and on other hand it is remarkable to see that the poorest people of our country live in the rich forest and natural resource base (Narain *et al*., 2005). Forest has always played an important role in providing sustenance to millions of rural people especially the tribal living in and around the forest areas. It has been estimated that about 275 million poor rural people in India depend on forests for at least part of their subsistence and cash livelihoods.

Among these forest products, Non-Timber Forest Products (NTFPs) play a vital role in livelihood of people in and around the forests (Quang, 2006). However, the level of benefits that NTFPs can provide is location-specific and boom and bust cycles for specific products impact income generation significantly. NTFPs provide 50 per cent of forest revenue and 75 per cent of forest export income. It is claimed by Peters *et al.* (1989) and Schwartzman (1989) that timber-oriented forest management often results in a decrease in productivity of the forest and alienation of forest-dependent populations. This has motivated the search for alternative forest management strategies or policies. Such strategies or policies should promote long term sustainable use of such available NTFPs resources on one hand and also prevent it from their depletion and unsustainable

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utilization on the other hand (Gupta *et al.,* 2017). Non-timber-oriented forest management often promotes sustainable forestry, because exploitation of non-timber forest products (NTFPs) may result in integration of the use and conservation of forests (Gradwohl and Greenberg, 1988). At global level, more than two billion people are dwelling in forest, depending on NTFPs for subsistence, income and livelihood security (Vantomme, 2003).

NTFPs are considered to be important for sustaining rural livelihoods, reducing rural poverty, biodiversity conservation and facilitating rural economic growth at global level (Global NTFP Partnership, 2005). NTFPs contribute over 75 per cent of total forest export revenue and add significantly to the income of about 30 per cent of rural people (International Tropical Timber Organisation, 2006). Non-timber forest products (NTFPs) play vital role among the tribal people and provide a source of income and subsistence living (Peters *et al.,* 1989; Hegde *et al.,* 1996). NTFPs like fuel-wood, medicinal plants, wild edible vegetables, house building materials etc. are integral part of day-to-day livelihood activities especially for tribal people (Sarmah, 2006). Other estimates suggest that up to 35 per cent of the income of tribal households in India comes from the collection of unprocessed NTFPs. Also, since NTFPs involve a large variety of seasonal products, returns are frequent and relatively continuous. Moreover, local processing of NTFPs can increase off-farm rural employment opportunities.

The Recorded forest cover in Chhattisgarh is 55,621 sq. km. which is 41.14% of its geographical area. In Chhattisgarh, where 11,185 villages out of the total 19,720 villages are forest fringed. The importance of NTFPs in the livelihood security of the rural population has led the state government to declare NTFPs such as tendu leaves, saal seed, harra, gum (khair, dhawara, kullu and babool) as nationalized NTFPs and establish the Chhattisgarh Minor Forest Product Federation (CGMFP) with an objective to promote trade and development of these Non-Timber Forest Products (NTFPs) in the interest of NTFPs collectors, mostly tribes. The remaining other NTFPs were left free for trade because their distribution and production varied with respect to time and space. Bilaspur district is one of the district of Chhattisgarh Plains Agro-climatic Zone, which has the maximum area under forest along with wide diversity of the plant species. NTFPs collection is one of the most important activity that is performed throughout the year by the forest dwellers of Chhattisgarh in general and Bilaspur district in particular for their livelihood sustainability. Beside this activity the forest dwellers were also depends on other activities like wage earning, rainfed agriculture, animal husbandry etc to sustain their livelihood. But they are engaged themselves on such other activities for a limited period of time in a year. Hence the objective of present study is assessment of NTFPs based livelihood systems among the forest dwellers of Chhattisgarh.

MATERIALS AND METHODS

Research design: In the present investigation, ex-post facto research design was employed. This design was appropriate because the phenomenon had already occurred. Ex-post-facto research is the most systematic empirical enquiry in which the researcher does not have any control over independent variables as their manifestation has already occurred or as they are inherent and not manipulate able thus, inferences about relations among variables were made without direct intervention from concomitant variation of independent and dependent variables.

Location of Study: The study was conducted in Bilaspur district of Chhattisgarh state during the year 2014-2015. The Bilaspur district was selected purposively because this district is one of the densest forest district of Chhattisgarh Plains Agro-climatic Zone and the forest area falls under this district is quite rich in terms of diversity and abundance of plant species. Out of total seven blocks in the Bilaspur district, Pendra, Gaurela and Kota blocks were selected purposively because such blocks are densest forest block of the district as well as the researcher is well familiar with these blocks. Then the three villages were selected randomly from each selected block to make a total of nine villages in the sample.

Selection of respondents: Fifteen NTFPs collecting forest dwellers were selected randomly from each selected village. Thus, the total 135NTFPs collecting forest dwellers (9X15=135) were considered as respondents for this study.

Collection and analysis of data: The data were collected personally through pre-tested interview schedule. Collected data was tabulated, processed and

analyzed by using appropriate statistical tools and methods.

Operational definition of the NTFPs based livelihood systems: In this investigation for defining the NTFPs based livelihood systems the following operational definition had been developed.

NTFPs based livelihood system is a system which comprises more than one occupation sources as subsystems, in which NTFPs collection is the main occupation source. Such occupation sources is associated with each other in such a manner that they have provide enough employment and income to the persons or households who are involved in it, so that they can sustain their livelihood for long term. Among such occupation sources the NTFPs collection is only occupation which is available throughout the year to the persons or households who are living in or near the forest fringes. There are too many NTFPs based livelihood system is possible in the same forest area or in different forest areas. Which is mainly depends upon the availability of the various NTFPs in those areas.

Designing of NTFPs based livelihood systems: Based on the enquired data from the respondents, prevailing NTFPs based livelihood systems had been designed. For designing such systems only those occupation sources were selected in which more than 40 per cent respondents were involved and which had significantly contribute the livelihood of the respondents. While the selection of various NTFPs under such systems was done on the basis of the criteria viz., number of households involved in collection of those NTFPs, economic contribution made by those NTFPs and importance of those NTFPs in the livelihood of the respondents.

Finally, for creating the prevailing NTFPs based livelihood systems, the cluster of five or more than five NTFPs were combined with the other selected occupation sources (i.e. occupations other than NTFPs collection). In this way it was found that there were too many combinations of such system were possible. But here only those systems were picked up which had provides the optimum contribution in the livelihood of the respondents, which had the potential to provide the employment throughout the year and in which greater than twenty five sampled households were involved. In this way total seven systems were finally selected but in case of some systems few subsystems were also selected.

SWOT analysis of prevailing NTFPs based livelihood systems: SWOT analysis of prevailing NTFPs based livelihood systems was done on the basis of observations of the researcher and discussions made between researcher and the respondents during collection of data. This analysis helps in identification of strengths, weaknesses, opportunities and threats related to such systems.

RESULTS AND DISCUSSION

Occupation: The data from Table 1 reveals that 100.00 per cent of the respondents were involved in NTFPs collection. This might be because of the fact that various NTFPs are available to them in different seasons of a year. Sawhney and Engel (2003) pointed out that in Bandhavgarh National Park, India the majority of the sampled households (97%) were engaged in collection of NTFPs.

Table 1: Distribution of the respondents according to their occupation

Kind of occupation*	Frequency	Percentage
NTFPs collection	135	100.00
NTFPs collection + Agriculture	124	91.85
NTFPs collection + Animal Husbandry	56	41.48
NTFPs collection + Wage earning	73	54.07
NTFPs collection + Business	07	05.19
NTFPs collection + Services	29	21.48

*Data are based on multiple responses

While 91.85 per cent of them were involved in NTFPs collection + agriculture, 54.07 per cent in NTFPs collection + wage earning, 41.48 per cent in NTFPs collection + animal husbandry, 21.48 per cent in NTFPs collection + services and only 5.19 per cent respondents had adopted NTFPs collection + business as their occupation (Table 2). Tejaswi (2008) reported that majority of the respondents i.e. cent per cent were involved in NTFPs collection followed by wage earning (75.80%), agriculture (27.47%) and livestock rearing (26.37%). While only 6.59 per cent of them were engaged in services and allied activities. Saha (2015) stated that100 per cent of the sample households had engaged in fish related activities. Almost 60 per cent of them participated in different nonfarm income activities as well as in livestock production. 48.57 per cent of them practiced crop production. A large number of fishers' households engaged in wages income and income from other sources

Table 2: Number of households involved in collection of various NTFPs

Nature of particular NTFPs	Name of particular NTFPs	Number of households*	
		Frequency	Percentages
A) NTFPs of plant origin	Mahua (*Madhuca longifolia)*	135	100.00
	Aam (*Mangifera indica*)	130	96.30
	Jamun (*Syzygium cumini*)	129	95.56
	Tendupatta (*Diospyros melanoxylon*)	128	94.81
	Sitaphal (*Annona squamosa*)	125	92.59
	Bihi (*Psidiumguajava*)	123	91.11
	Tendu (*Diospyros melanoxylon*)	112	82.96
	Ber (*Ziziphus mauritiana*)	76	56.30
	Sal beej (*Shorea robusta*)	70	51.85
	Char beej (*Buchanania lanzan*)	65	48.15
	Harra (*Terminalia chebula*)	53	39.26
	Bel (*Aegle marmelos*)	30	22.22
	Bhelwa (*Semecarpus anacardium*)	28	20.74
	Emli (*Tamarindus indica*)	27	20.00
	Aawla (*Phyllanthus emblica*)	25	18.52
	Bahera (*Terminalia bellirica*)	20	14.81
	Kathal (*Artocarpus heterophyllus*)	17	12.59
	Gond (Gum)	10	7.41
	Kheksha (*Momordica subangulata*)	07	05.19
	Sahatoot (*Morus nigra*)	06	04.44
	Jimikand (*Amorphophallus paeoniifolius*)	02	01.48
B) NTFPs ofanimal origin	Sahad (Honey)	31	22.96
	Lakh (Lac)	14	10.37
C) NTFPs of fungi origin	Putu and Chhatani (*Scleroderma* spp. & *Termitomyces* spp.)	102	75.56

*Data are based on multiple responses

such as remittance, gifts and assistance from the government etc.While the contribution of income from forestry was lower among the fishers in the study area.

Availability period of various NTFPs and number of households involved in the collection of various NTFPs: Figure 1 represents the month wise availability of various NTFPs to the respondents in the study area. The findings illustrate that the availability of various NTFPs was distributed throughout the year. During the study it was recorded that maximum NTFPs (i.e. eleven NTFPs) were available to the respondents in the month of May. The reason for this might be that during this month such 11 NTFPs were naturally available to the forest dwellers in abundant quantity. Such eleven NTFPs were as follows tendupatta, sal beej, gond, aam, tendu, char beej, bel, bhelwa, kathal, sahad, and lakh. While in the February and August month only one NTFP was available to the respondents i.e. bihi in February and wild edible mushroom (putu and chhatani) in August. So, based on this result it can be inferred that May month was the peak month of NTFPs availability in the study area. Mitchell *et al.* (2003) reported that various NTFPs were available throughout the year but most of the NTFPs (more than fifteen) were available to them between October to February. Among the various NTFPs mushroom and puffballs were available between July to September, sal and mahua seed in June and July while, the lac was available to them for nine month except March, April and September.

Number of households involved in collection of various NTFPs is presented in Table 2. With respect to the percentages of households involved in the collection of NTFPs of plant origin the table portrays that cent per cent of respondents were engaged in mahua collection. While 96.30, 95.56, 94.81, 92.59, 91.11, 82.96, 56.30, 51.85, 48.15, 39.26, 22.22, 20.74, 20.00, 18.52, 14.81, 12.59, 07.41, 05.19, 04.44 and 01.48 per cent sample households were engaged in the collection of aam, jamun, tendupatta, sitaphal, bihi, tendu, ber, sal beej, char beej, harra, bel, bhelwa, emli, aawla, bahera, kathal,

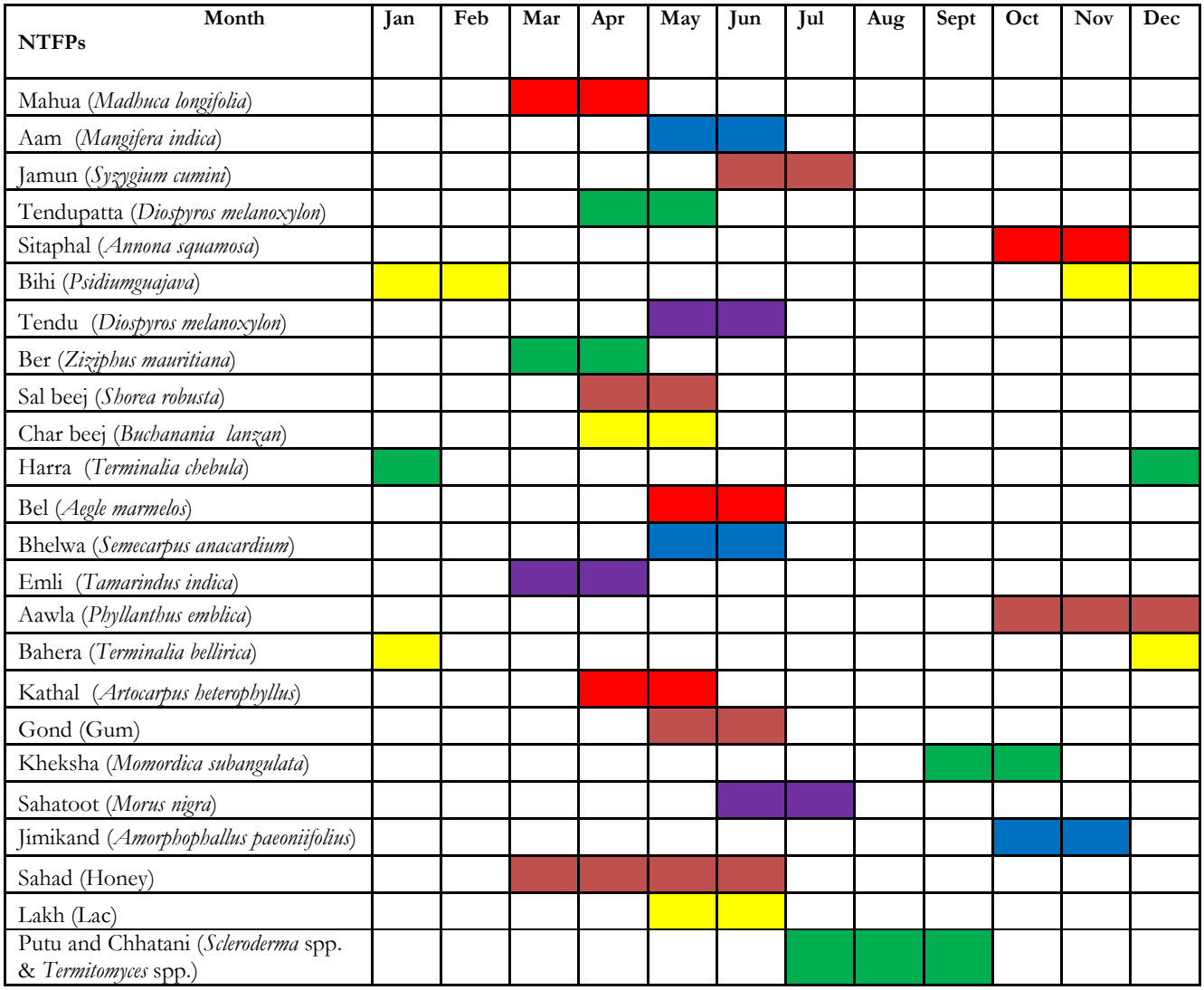

Figure 1: Month wise availability of various NTFPs to the respondents

gond, kheksha, sahatootand jimikand, respectively. With regard to NTFPs of animal origin it was found that 22.96 per cent of households were involved in sahad collection and only 10.37 per cent were engaged in lakh collection. However, in the case of NTFPs of fungi origin it was observed that 75.56 per cent of the households were involved in the collection of putu and chhatani. The probable reason behind this result might be because of the importance of such collected NTFPs in the livelihood of the respondents and the availability of such collected NTFPs in the study area. Singh *et al.* (2010) identified that in Mangrove forest of Sundarban nearly 19-25% of the households were engaged in fishing followed by firewood (15-22%), both honey and wax collection (15-21%) and 10-19 per cent in prawn collection. While almost 7 per cent and 9 per cent were engaged in pati grass collection and crab collection, respectively.

Prevailing NTFPs based livelihood systems among the respondents: Existing NTFPs based livelihood systems among the respondents is presented in Table 3. It can be inferred from the table that most five popular systems among the respondents were 2A, 1A, 5A, 4A and 2C. The number of households who follows such systems was eighty-one, seventy-five, forty-three, forty and thirty-eight, respectively. It might be due to the fact that such systems are comprises those occupation sources which are easily available to most of the respondents and those have the more importance in their livelihood.

Table 3: Prevailing NTFPs based livelihood systems among the respondents

System No.	NTFPs based livelihood systems	Frequency and percentages of households*	Rank	Average income/ family/year (in Rs.)	Rank
1	1A. NTFPs (Mahua, Putu & Chhatani, Aam, Bihi, Tendu) + Crop (*Kharif* Rice)	75 (55.56%)	2	12870.25	9
	1B. NTFPs (Mahua, Putu & Chhatani,Aam, Bihi, Tendu) + Crop (*Kharif* Rice) + Wage earning (Agricultural labour)	34 (25.19%)	8	13314.47	7
	1C. NTFPs (Mahua, Putu & Chhatani, Aam, Bihi, Tendu) + Crop (*Kharif* Rice) + Wage earning (MGNREGA)	35 (25.93%)	7	25097.09	4
	1D. NTFPs (Mahua, Putu & Chhatani, Aam, Bihi, Tendu) + Crop (*Kharif* Rice) + Dairy	32 (23.70%)	10	15372.28	6
	1E. NTFPs (Mahua, Putu & Chhatani, Aam, Bihi, Tendu) + Crop (*Kharif*Rice) + Wage earning (MGNREGA+Agricultural labour)	33 (24.44%)	9	28763.24	2
2	2A. NTFPs (Mahua, Tendupatta, Jamun, Sitaphal, Putu & Chhatani) + Crop (*Kharif* Rice)	81 (60.00%)	1	11954.58	13
	2B. NTFPs (Mahua, Tendupatta, Jamun, Sitaphal, Putu & Chhatani) + Crop (*Kharif* Rice) + Wage earning (Agricultural labour)	36 (26.67%)	6	12466.67	12
	2C. NTFPs (Mahua, Tendupatta, Jamun, Sitaphal, Putu & Chhatani) + Crop (*Kharif* Rice) + Wage earning (MGNREGA)	38 (28.15%)	5	24067.11	5
	2D. NTFPs (Mahua, Tendupatta, Jamun, Sitaphal, Putu & Chhatani) + Crop (*Kharif* Rice) + Dairy	27 (20.00%)	13	48462.30	1
	2E. NTFPs (Mahua, Tendupatta, Jamun, Sitaphal, Putu & Chhatani) + Crop (*Kharif* Rice) + Wage earning (MGNREGA+Agricultural labour)	35 (25.93%)	7	27881.80	3
3	3A. NTFPs (Mahua, Aam, Sitaphal, Sal beej, Harra) + Crop (*Kharif* Rice)	29 (21.48%)	11	8654.83	15
4	4A. NTFPs (Mahua, Sitaphal, Bihi, Ber, Char beej) + Crop (*Kharif* Rice)	40 (29.63%)	4	12589.18	11
5	5A. NTFPs (Aam, Jamun, Bihi, Tendu, Putu & Chhatani, Ber, Sitaphal) + Crop (*Kharif*Rice)	43 (31.85%)	3	12638.63	10
6	6A. NTFPs (Mahua, Aam, Jamun, Bihi, harra, Sal beej, Tendupatta) + Crop (*Kharif* Rice)	28 (20.74%)	12	10353.00	14
7	7A. NTFPs (Mahua, Aam, Putu & Chhatani, Sitaphal, Jamun, Harra, Chaar beej) + Crop (*Kharif* Rice)	26 (19.26%)	14	13311.42	8

*Data are based on multiple responses

It was also found that these five popular systems mainly encompass the occupations viz., NTFPs collection and agriculture (*kharif* rice) because these two occupation sources have the greatest importance in the livelihood of the respondents than the other occupation sources. So it can be inferred from this data that popularity of these systems are directly related to their livelihood.

With regard to per family average annual income obtained from each individual system, the data describes that top five maximum earning systems were 2D, 1E, 2E, 1C and 2C. The obtained per family average annual income from these systems were as follows Rs. 48462.30, Rs. 28763.24, Rs. 27881.80, Rs. 25097.09 and Rs. 24067.11, respectively. It might be due to the fact that these systems comprise those occupation sources which are the major sources of their annual income. It was also found that these five systems were comprises mainly three occupations viz., NTFPs collection, agriculture (*kharif* rice) and wage earning. And among the wage earning the respondents were mainly involved in MGNREGA. Per family average annual income obtained from a particular system reflects the relative profitability of that particular system over the other systems.

SWOT analysis of prevailing NTFPs based livelihood systems: SWOT analysis is an acronym for strengths, weaknesses, opportunities, and threats. It is a structured planning method that evaluates the internal and external factors that are favorable and unfavorable to the given system. The internal factors consist of the strengths and weaknesses which are internal to that given system. Whereas the external factors includes the opportunities and threats which are external to that given system. Here an attempt has been to be made to carry out SWOT analysis of prevailing NTFPs based livelihood systems of the respondents and it is presented in Box 1.

Box 1: SWOT analysis of prevailing NTFPs based livelihood systems of the respondents on the basis of observations and discussions during data collection

Strengths	**Weaknesses**
Free of cost and year round availability of NTFPs	Lack of availability of timely market information and poor marketing linkages for NTFPs and rice crop
Employment generation	Lack of adequate skills related to collection, processing and marketing of NTFPs
Augmenting the annual income of the respondents	Poor and unsustainable management of available resources
Assisting the livelihood of the respondents	Lack of awareness about importance and profitability of such systems
Familiarity with various NTFPs	Poor livestock possession and small size of land holdings
Existence of Government support and policies for some selected NTFPs	Seasonal availability of NTFPs
Multidimensional use of NTFPs	Lack of knowledge about existing government support and policies related to NTFPs and rice crop
	Predominance of rainfed and monocropping (Rice) system
	Ownership on tree bearing the NTFPs
	Disenchantment of educated rural youth from NTFPs collection
	Lack of storage and transport facilities
Opportunities	**Threats**
Scope of Entrepreneurship development	Deforestation
Optimum utilization of available resources	Over collection of NTFPs by outsiders
Solving the problem of unemployment	Low and fluctuated market price of NTFPs
Improve the rural economy	Injury caused by attack of wild animals
Value addition of NTFPs and rice crop opens the scope for earning of high income	Existence of bad weather (like drought, excess rainfall etc.)
Potential tool for rural development	Poor producers share in consumer rupees
	Forest fire
	Unsustainable harvesting of NTFPs by the forest dwellers

SWOT analysis of such prevailing NTFPs based livelihood systems of the respondents reveals that such systems have the following strengths viz. free of cost and year round availability of NTFPs in the forest, employment generation, augmenting the annual income of the respondents, assisting the livelihood of the respondents, familiarity with various NTFPs, existence of Government support and policies for some selected NTFPs like tendupatta and multidimensional use of NTFPs. Such prevailing NTFPs based livelihood systems open the way for livelihood diversification among the forest dwellers. And this livelihood diversification helps in supporting the livelihoods of the respondent by reducing their livelihood vulnerability. Pal *et al.* (2017) found that diversified livelihood activities reduce the livelihood vulnerability of the respondents especially in this age of climate change. The following weaknesses of such systems are as follows lack of availability of timely market information on current prices, demands and supplies of various NTFPs and rice crop and poor marketing linkages due to presence of middle man, lack of adequate skills related to collection, processing and marketing of NTFPs, poor and unsustainable management of available resources, lack of awareness about importance and profitability of such systems, poor livestock possession and small size of land holdings, Seasonal availability of NTFPs, lack of knowledge about existing government support and policies related to NTFPs and rice crop, predominance of rainfed and monocropping (rice) system, ownership on tree bearing the NTFPs, disenchantment of educated rural youth from NTFPs collection and lack of storage and transport facilities. Whereas the opportunities related to such systems are as follows scope of entrepreneurship development, optimum utilization of available resources, solving the problem of unemployment by providing year round employment trough such systems, improve the rural economy, value addition of NTFPs and rice crop opens the scope to the forest dwellers for earning of high income and potential tool for rural development. Similarly, the threats linked with these systems are also identified. This threats are as follows deforestation, over collection of NTFPs by outsiders, low and fluctuated market price of NTFPs, Injury caused by attack of wild animals during the collection of NTFPs, existence of bad weather (like drought, excess rainfall etc.), poor producers share in consumer rupees, forest fire and unsustainable harvesting of NTFPs by the forest dwellers.

CONCLUSION

From the findings of this study it may be concluded that collection and marketing of NTFPs is one of the most important activity performed by the forest dwellers for sustaining their livelihood. Various NTFPs are available to the forest dwellers all-round the year in free of the cost. But the May month was found as the peak month of availability of various NTFPs. Among the all collected NTFPs, mahua, aam, jamun, tendupatta, sitaphal and bihi had shown the greater importance in the livelihood of the respondents. The findings of prevailing NTFPs based livelihood systems reflects that most of the respondents are involved in those systems which are less profitable than other systems. Hence there is a need to form groups of forest dwellers according to their popular practicing NTFPs based livelihood systems and training should be given to such groups on the efficient utilization of their practicing systems. The training domain should also involve the processing, value addition and marketing aspects of various NTFPs and rice crop, so that the profit ability from prevailing NTFPs based livelihood systems can be increased. Which will ultimately improves the livelihood and socio-economic status of the forest dwellers. From the SWOT analysis of prevailing NTFPs based livelihood systems it can be inferred that, if the weaknesses and threats related to such systems can be managed properly by formation of Self Help Group (SHG) or Commodity Interest Group and support through government initiative in marketing of NTFPs. Then the forest dwellers will get maximum productivity and profitability from prevailing NTFPs based livelihood systems for their food security and sustainable growth.

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Farm Size and Productivity Relationship in Smallholder Farms: Some empirical evidences from Bihar, India

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ABSTRACT

This article contributes to the limited literature on farm size and productivity in small land holder's agriculture in Bihar, India. Plot wise panel data of VDSA project are used to reach at precise conclusion. The results provide evidence for a positive relationship between farm size and productivity in case of small land holders' agriculture and hence, an inverse relationship does not seem to apply within small landholders' agriculture. A strong positive relationship between farm size and output per hectare is a result of higher use of fertilizer, modern seeds and irrigation sources on comparatively larger land holders than small land holders in Bihar, India. It is mainly due to more uneconomic land holdings of sub-marginal and marginal farmers to have limited access to water resources, quality input and credit. Access to resources and technology must be considered together for any agricultural development programmes for small land holder's agriculture. It is, therefore, needed to look for ways of improving their access to resources for farming through increased opportunities for earning off farms and off season income or through improved credit market. Hence, small size and land fragmentation are key bottlenecks for the growth of agriculture in Bihar, India. The crop productivity can be increased through improving their access to institutional financing system, agricultural extension network and farm technology centres. However, promotion of non-farm rural employment seems to be the most appropriate option for increasing crop productivity and improving livelihoods of small landholders in Bihar.

Keywords: Adoption, Farm size, Livelihood, Modern, Productivity, Smallholders

INTRODUCTION

Relationship between farm size and productivity in developing countries has been one of the oldest issues of the interest of researchers. The debate on farm size and productivity relationship intensified, when Sen (1962) observed inverse relationship between farm size and output per hectare in Indian agriculture, suggesting that small farms are more productive compared to large ones. Several studies confirmed the phenomenon in Indian agriculture and its statistical validity was adequately established (Mazumdar, 1965; Khusro, 1968; Rao, 1966 and Saini, 1971). Usha Rani's (1971) studies in Intensive Agricultural Development Programme (IADP) districts using farm level observations showed that neither cropping pattern nor inputs intensity nor even yield per acre differs across farms of different sizes. Krishna Bharadwaj (1974) also investigated the relationship between productivity and size of farm and found that in the majority of cases, an inverse relationship existed; however, it was not statistically significant. Jha *et al.* (2011) and Handral *et al.* (2017) while studying yield gap have also opined that productivity of different crops has increased over the year in Bihar in spite of continuous increase in small and marginal farms.

Chadha (1978) while studying farm level data for three agro-climatic regions in Punjab found that the inverse relationship had ceased to hold in the more dynamic zones. However, Rudra (1983) opined that there

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is no scope for propounding a general law for an inverse relationship or even for a positive relationship. A recent study by Chattopadhyay and Sengupta (1997), suggested that the inverse relation between farm size and productivity became stronger in the agriculturally developed regions of West Bengal compared to the relatively less developed regions.

Despite a number of studies favouring the inverse relationship, it has failed to reach a consensus. On the contrary, some studies concluded that the adoption of new agricultural technology by large farmers has reduced or even reversed the yield advantage of small farmers (Fan and Chang-Kang, 2005). Recent literature also shows that small farms are not as efficient as large farms in agriculturally developed regions but they could be more efficient in agriculturally backward regions (Toufique, 2005).

To sum up, it is often pointed out that the difference in the size of farms is one of the reasons for the difference in yields. It is argued that small cultivators increase cropping intensity on their farms or have multiple crops and that family labour works intensively on such farms thereby increasing output per unit of land. However, studies carried out on the relationship between size of farms and productivity show contradicting results.

The objective of this paper is to test the inverse relationship between farm size and productivity and identify the changes, if any, with the introduction of modern technology in agriculture, particularly in context of small holders' agriculture. We have estimated productivity and input use in all the crops grown by farmers on an annual basis and used them to compare performance of the entire sys-tem of land-based activities across various farm size categories. Agricultural development indicators like; cropping pattern, intensity of cropping, use of chemical fertilizers, modern seeds and irrigation resources have been also examined for different categories of farm households.

The paper investigates the farm size –productivity relationship amongst smallholder farms of Bihar province of India. Bihar is the most suitable region for studying farm size and productivity relationship on farms of small land holders because there is high population density (1102/sq. km.) and very small landholdings (0.39 ha). Marginal size of land holdings (< 1 ha) constitute 91 percent of total farm holdings and possess 57 per cent of cultivated land and their average size of landholdings is 0.25 hectare (Government of India, 2012).

MATERIALS AND METHODS

The data used in this study were collected under ICRISAT- ICAR collaborative project entitled "Tracking Changes in Rural Poverty in Households and Village Economies in South Asia." In the project, data are being solicited from the panel of 40 households in each of four sample villages in Bihar. Data are being collected by resident Investigators. For the selection of respondents, development indices of all the districts were worked out on the basis of per hectare agricultural GDP, infrastructure (density of rural roads, extent of electrification, density of PHC and bank branches) and education level. Districts were arranged in descending order on the basis of development indices. Data set of districts of the state was categorized in three quartiles. One district from lower quartile (consisting less developed districts) and another one from upper quartile (consisting of comparatively developed districts) were randomly selected for drawing sample of blocks. One block from each sample district, making two sample blocks were also selected randomly. List of villages were prepared for each sample block and two villages from each sample block were selected randomly. The census was conducted in four sample villages through the structured schedule containing questions about demographic characteristics, land ownership, livestock, and agricultural machineries possessed by households in the village, etc. Households of sample village were arranged in ascending order on the basis of their land area. Households owning land less than 0.20 hectare were categorised as labour households and quartile of remaining households of villages were formed, upper quartile was categorized as marginal households, middle as small households and lower as large households. Sample of 10 households from each category were randomly selected, making sample of 40 households in each village. Thus, a total of 160 sample households were selected in Bihar for detailed investigation.

In sample villages, farm holdings up to 1 hectare constitute 76 per cent of total farm holdings and there are only five farmers who were having more than 4 hectares of land and cannot be categorised as a group for analysis. Hence, analysis of data relating to farm size, productivity and other components were undertaken by re-categorizing of sample households in four groups that

is; sub-marginal (<0.40 ha), marginal (0.40-1 ha), small (1-2 ha) and medium farm households (2 ha and above).

RESULTS AND DISCUSSION

Cropping Intensity and Cropping pattern: Cropping intensity is a major source of agricultural growth in the country. There has been very slow growth of cropping intensity in most of Indian states and it varies widely from one region to another. The cropping intensity also varies with area of land operated by farm households. The inverse relationship between farm size and cropping intensity has been observed in various studied (Bharadwaj, 1974; Griffin, 1974; Berry and Cline 1976; Khan, 1979 and Chand *et al.,* 2011). Sau (1978) also observed low cropping intensity on large farms and concluded that there is an inverse relationship between farm size and cropping intensity in few Indian states. Sen (1964) argued that small farms being family enterprises had a lower cost of labour as compared to large farms. So small farms are cultivated more intensively and produce a higher level of output.

The cropping intensity of four categories of farms under study has been worked out to find cropping intensity on different categories of farm households in Bihar, India. The cropping intensity was comparatively high on marginal households (183) and low on medium households (163%). However, cropping intensity was identical on sub marginal and small households (Table 1). There is no clear cut trend of cropping intensity on different size of farm holdings but upper category of farm households had the lowest level of cropping intensity.

Table 1: Cropping Intensity on different category of households, Bihar, India

Land class	Cropping intensity
Sub Marginal	175
Marginal	183
Small	175
Medium	163
Total	**171**

The log linear form of the model was also applied to know the relationship between cropping intensity (CI) and farm size. The estimated regression coefficient is (-) 0.577. The negative values of b in the model clearly indicates the negative relationship between CI and farm size but the coefficient of the CI is not found significant at even 10 % level of significance (Table 2).

Table 2: Log linear regression of cropping intensity and farm size of study households

Independent variable	Cropping intensity (%)		
	Coefficient	Standard error	t-value
Operated land (ha)	-5.77	4.85	-1.19
Constant	191.59	9.29	20.61
No. of observation	118		
R-squares	0.012		
Adj R-Squared	0.0035		

Marginal farmers cultivated vegetables and spices on comparatively large area due to availability of family human labour for frequent inter culturing, irrigation, pest management and supervision of these crops. The upper (medium) categories of farm households cultivate wheat in larger proportion of area in *rabi* season whereas other categories of households cultivate two crops of vegetables and spices in almost same period. These crops are short duration crops which helped increasing cropping intensity on smaller size of farms.

Cropping Pattern: Cropping Pattern is the crop - mix grown in a particular piece of land in an agricultural year. Introduction of new agricultural technologies has introduced a new crop – mix, which is more prominent in agriculturally developed area. Cropping patterns are affected by a multiplicity of factors of which the resource position is one, which is mainly determined by size of land holdings and non-farm income. While analysing cropping pattern of households under study, food grain emerged as most important crops which were grown on about 95 per cent of gross cropped area of households under study. A comparatively large proportion of gross cropped area was put to food grains crops on medium size of farms (95.85) and lower on smaller categories of households (Table 3). Rice and wheat jointly cultivated on about 94 per cent of gross cropped area on upper category (medium) farms. None of category of households cultivated rice and wheat on less than 87 per cent of their gross cropped area. Sub-marginal and marginal households put comparatively larger proportion of area under spice and vegetables, mainly due to availability of more family labour on these households. These crops are also more remunerative and these categories of households try to earn more from

Table 3: Area under different crops on different categories of households, Bihar, India (%)

Particulars	Sub Marginal	Marginal	Small	Medium	Total
Paddy	51.2	49.5	49.5	50.8	50.2
Wheat	38.1	38.3	41.7	43.1	41.3
Maize	0.6	0.2	0.0	0.0	0.1
Pulses	4.7	4.8	4.3	2.0	3.4
Food Grains	94.6	92.8	95.5	95.8	95.0
Oilseed	2.4	3.6	2.3	1.8	2.4
spices	0.1	0.1	0.1	0.0	0.0
Vegetable	0.8	1.5	0.7	0.4	0.8
Others	2.1	2.0	1.4	1.9	1.8

their small piece of land. These results show that the production of staple food is a dominant consideration in all size categories of households. This is mainly due to consideration of family consumption requirements on all categories of households under study. It was also partly due to almost assured price of these crops through procurement centres. These crops are also less labour intensive than spices and vegetable crops.

The above discussion does not lead to clear conclusion that farm categories under study differ from each other with respect to their cropping pattern. Hence, Kendall's coefficient of concordance was used to test the compatibility of cropping pattern followed on different categories of farms under study. The calculated value of Chi square (28) is lower than table value of $\chi^2_{21, 0.05}$ indicating that the ranking of crops in the cropping pattern on four categories of households were compatible (Table 4).

Table 4: Kendall's coefficient of concordance for cropping pattern followed on different categories of households under study, Bihar, India

Particulars of Concordance Test	Value
Estimated coefficient of concordance (W)	0.98
Estimated χ^2	28.0
Table Value of $\chi^2_{21, 0.05}$	32.67

This finding clearly indicates that there has been a significant difference in cropping pattern followed by farm categories under study. The cropping patterns of all categories of households are dominated by food grains but upper category of households (medium and small households) put more area under rice and wheat whereas sub marginal and marginal categories of households (<1 ha.) cultivated spices and vegetables on comparatively large proportion of area. Upper category of households cultivated wheat on larger proportion of their land in *rabi* season but sub- marginal and marginal households preferred cultivation of spices and vegetables. However, categories of households under study do not differ significantly with respect to their cropping patterns.

Seed Replacement Rate: Seed is the most important critical determinant of crop production on which the performance and efficacy of other inputs depend. Sustained increase in crop production and productivity necessarily requires continuos development of new and improved crop varieties and efficient system of production and supply of seeds to farmers. An atempt has been also made to analyse the farm category wise seed replacement rate of rice and wheat because these two crops cover about 95 per cent of cropped area on farms under study.

In study villages, seed replacement rates of rice and wheat were 61.68 per cent and 71.76 per cent, respectively on households under study (Table 5). The seed replacement rates of the two principal crops were much higher because Government of Bihar made massive efforts for increasing rice and wheat seed replacement rates. But seed replacement rates in case of both crops were much higher on medium size of farms and it declined with decline in size of farm holdings.

The comparatively low level of seed replacement rats of both the principal crops on smaller size of farm households was mainly due to their poor access to subsidized seeds. Seed replacement rate was higher on small and medium households because more than 50 per cent of them could afford to purchase seeds from market also however, sub- marginal and marginal farmers could not afford to purchase seeds from market due to poor liquidity and high price of seeds in the market.

Table 5: Farm category wise seed replacement rate during last three years (%)

Farm size	Rice	Wheat
Sub- marginal	36.76	41.86
Marginal	43.59	54.83
Small	71.02	66.88
Medium	71.87	86.76
All	61.68	71.76

Fertilizer use: Use of chemical fertilizer helps increasing productivity and production of crops. Use of fertilizer in cultivation of various crops has been examined on different categories of households under study. Per hectare use of fertilizers in cultivation of all crops on households under study was 162 kilograms but medium category of households applied higher quantum of fertilizer (182 kg/ha), which declined with decline in size of land holding (Table 6).

Medium farmers used 72 per cent more chemical fertilizers than sub-marginal farmers in crop production. Per hectare use of fertilizer in rice, wheat, oilseeds and vegetables were also higher on medium farms which declined with decline in size of holdings. Sub-marginal farmers used about half of fertilizer in rice, 73 per cent in wheat, about one-fourth in oil seeds and less than half in vegetable production than the corresponding level of fertilizer use by medium farmers. Smaller categories of households are resource poor and they could not afford to buy required quantity of fertilizers, particularly phoshphatic and potassic fertilizers, which are costly in the market. They are also making unbalanced use of fertilizers in crop production, which is resulting in to comparatively low yield of crops.

Crop productivity: An attempt has been also made to examine the relationship between per hectare productivity of various crops cultivated on different categories of households under study. While examining the farm size crop -productivity relationship, the comparatively high productivity of all crops was observed on upper (medium) category farms and lower on smaller size of farm categories with some minor exception (Table 7).

Per hectare total value of crop output (main + by-product) was also worked out by multiplying with respective market prices. In this case also, medium farm households realized higher per hectare gross income than smaller categories of farms from various crops cultivated by them and the similar trend was observed. In other words, per hectare value of gross output declined with decline in farm size (Table 8).

Per hectare value of gross output was regressed with size of land holdings using log linear model. Estimates of per hectare value of gross output for different size

Table 6: Per hectare use of fertilizer (NPK) in various crops on different categories of farm households (kg/ha)

Crop	Sub Marginal	Marginal	Small	Medium	Total
Rice	81	112	151	166	145
Wheat	156	191	208	213	203
Maize	81	191	neg.	neg.	143
Pulses	47	68	37	14	45
Oilseed	56	116	88	194	122
Spices	158	125	128	neg.	131
Vegetable	80	168	145	285	182
All crops	106	137	165	182	162

Table 7: Productivity of different crops (kg/ha)

Crop	Sub Marginal	Marginal	Small	Medium	Total
Paddy	3485	3908	4641	4847	4493
Wheat	2450	2409	2847	3015	2805
Maize	5434	3242	neg.	neg.	4203
Pulses	384	382	445	771	485
Oilseed	229	238	447	960	442
Spices	473	206	91	neg.	192
Vegetable	9319	9276	12893	15438	11494

Table 8: Farm category wise value of output of all crops grown on farms ($/ha)

Crop	Sub Marginal	Marginal	Small	Medium	Total
Paddy	733.6	824.3	975.2	979.9	926.9
Wheat	724.7	709.2	765.4	761.4	748.6
Maize	1235.0	779.6	neg	neg	979.3
Pulses	184.9	270.9	343.2	616.8	357.9
Oilseed	161.6	226.8	311.7	644.5	331.9
Spices	404.8	180.9	117.0	neg	183.9
Vegetable	1112.6	1056.3	1407.3	1694.5	1284.4
All crops	669.3	693.9	833.3	867.6	803.4

Table 9: Linear regression

Dependent variable = Main output ($/ha)			
Parameters	**Coefficient**	**Standard error**	**t-value**
Operated land	0.09969	0.02404	4.15
Constant	0.45589	0.03954	11.53
No. of observation	160		
R-squared	0.0982		
Adj R-squared	0.0925		

of farm holdings suggest a positive relationship between farm size and productivity (Table 9).

The results of this analysis suggest that the positive relationship between farm size and crop productivity exists in case of small land holders with scarce resources. It was mainly due to comparatively high level of adoption of farm technology like; modern seeds and fertilizer and ownership of irrigation resources by larger categories of farm households. Smallholders failed to get benefits of modern agricultural technology due to their poor access to technology and institutional credit. Their tiny land holdings (<0.20 ha) also hindered the adoption of new technologies. Theories about disappearing advantages of marginal and small farmers and efficiency gains of comparatively large categories of farmers with economic development holds true in small land holders' agriculture in Bihar

CONCLUSION

The paper aims at examining the farm size-productivity relationship on small land holders' farms in resource scarce area in Bihar, India. Using regression analysis to household level panel data of farm households a positive relationship between farm size productivity is demonstrated. The higher productivity of various crops on upper category of households was mainly due to use of modern seed and fertilizers and ownership of water resources. Poor access to working capital to procure modern seeds, fertilizers and water resources for timely adequate irrigation to crops are major constraints for realizing higher crop productivity on tiny land holdings. This result is associated with prevalence of part time farmers cultivating on tiny and uneconomic land holdings. The size of medium category of households is also only 0.84 ha, but they have better access to technology and resources. The results also reflected the prevalence of poverty and lack of working capital for crop production in area of undeveloped infrastructure and non- existence of rural non-farm activities.

The crop productivity of tiny land holders can be increased through improving their access to institutional financing system, agricultural extension network and farm technology centres. However, promotion of non-farm rural employment seems to be most appropriate option for increasing crop productivity and improving livelihoods of small land holders in Bihar.

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Marketing Behaviour of Vegetable Growers in Uttarakhand hills

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ABSTRACT

Vegetable production has great economic importance in hills of Uttarakhand. For deriving optimum return from the production, marketing of green vegetables is very crucial. A study was conducted in Almora and Nainital districts of Uttarahand to find out marketing behaviour of the vegetable growers and constraints in marketing of vegetable produce. Results revealed that distant mandi was a major choice for sale of the produce. Majority of farmers sold their full produce by using private mode of transportation. They followed grading and standardization and spent more than six hours in a week for farm related activities. Relatives/friends and vegetable merchants were major sources of market preference. The major marketing constraints were higher commission rate of middlemen, fluctuating market rate, non-availability of nearby market, high transportation charges and high cost of packaging material. The solution lies in creation of horticulture based self-help group at village level, organization of weekly *Hat*, strict compliance of rules and regulation of regulated market, guidance on market avenues from time to time to the vegetable growers.

Keywords: Hill agriculture, Marketing constraints, Value chain, Vegetables

INTRODUCTION

Uttarakhand hills endowed with natural bounties and its unique agro climatic condition offers favourable climate for growing large number of horticultural crops including vegetable. Vegetable offers an unique opportunity to earn money not only for hill farmers but even the farmers of plain are gradually shifting to vegetable crops for better earning (Maity *et al.*, 2013). Production of vegetables in hills generates income as well as employment of farm families. One of the necessary conditions for these farmers to get maximum return for their produce is the provision of assured marketing. In this era of technological development several technologies such as protected cultivation using modern poly house technologies (Negi *et al.*, 2013), plug-tray nursery techniques (Shubha *et al.*, 2015), plastic mulching etc have emerged and adopted in some niche area of Himalaya. But it has not up scaled much due to lack of markets.

Hill farmers are key stakeholders of agricultural system and critical end users of technology. It is therefore, necessary to realise their needs, objectives and outlook. Apart from scarcity of water and weather vagaries, today's main issue in hill agriculture is lack of marketing infrastructure. Agriculture is still substantive no more remains as lucrative due to lack of entrepreneurial environment. Now a day, young and educated farmers rather than old and traditional are more associating with innovative modern technologies and extension systems delivered by private players (Mukherjee *et al.*, 2011, Mukherjee and Maitym, 2015). But it is also lagging behind in hills. A producer has to incur very low marketing cost due to low volume of produce to sell, grade, packing and transport it to the market. Thus the business of vegetable cultivation operates within these two extreme situations. Studies shows that farmers' profit orientation and market orientation are required factors (Mukherjee *et al.*, 2012a&b) for making agriculture profit oriented along with climate resilient particularly in hills (Mukherjee *et al.*, 2016). A very less studies have been carried out regarding the marketing behaviour and constraints faced by Hill farmers. In this backdrop, the study was framed with following objectives:

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1. To analyse the marketing behaviour of vegetable growers.
2. To know the perception and identify the constraints faced by the vegetable growers in marketing of vegetable produce.

MATERIALS AND METHODS

The study was conducted in Almora and Nainital districts of Kumaon Division of Uttrakhand state. These districts rank first and second respectively in terms of vegetable production and acreage (Uttarakhand state Horticultural database, 2014-15). The multi stage random sampling was used to select the respondents. Accordingly, a list of major vegetable growing development blocks was obtained from the District Horticulture Office of the selected district, where two villages from each development block having maximum area under vegetable cultivation were selected. Thus, finally eight villages namely Budhibana and Parwara (Dhari development block), Kafulta and Khalad (Betalghat development block) from Nainital district and Tunakot and Tipola (Tarikhet development block) and Natadol and Morpatyuri (Lamgara development block) from Almora district were chosen. A sample of 15 respondents from each village was selected randomly constituting a total 120 respondents for the study. Data were collected during 2007-08 as a part of Ph.D. degree programme through structured interview schedule at their field and residence. Suitable statistical tools were used to analyse the data.

RESULT AND DISCUSSIONS

In the state of Uttarakhand, out of 7,53,711 ha net sown area around 82,782 ha *i.e.* 10.98% (Govt. of Uttarakhand, 2014-15) is used for vegetable cultivation. Major vegetables grown are vegetable pea, potato, tomato, cabbage, cauliflower, French bean, capsicum, brinjal etc. Generally in hills a family of vegetable grower consists of 5-6 members with marginal land holding (2000-3000 m^2) and annual income of upto Rs. 50,000/-. Dairy as essential component of the system contributes 20-30% in agricultural income *i.e.* usually Rs. 20,000-30,000 / annum.

Entire effort of a vegetable grower of hills revolves around production as well as marketing of the vegetable produce. The produce is available round the year depending upon the time of sowing and growing condition. The behavioural skill *i.e.* marketing behaviour is helpful in the assessment of probable sale and formulating the desired marketing strategy. The marketing behaviour of a vegetable grower was studied with identified eleven component namely mode of transport, selling place, time of sale, marketed surplus, grading and standardization, weighing behaviour, sale agency, payment pattern, method of packing, sources of market preferences and time devoted. The data has been presented in Table 1. Majority of the respondents (78.33%) used private sources of transportation including mule and horse. Generally, a vegetable grower having head load of 20-30 kg walked to a distance of 2-3 km to reach at road- head. From road- head hired vehicles were used to transport the produce. Transportation facility through cooperative sector like *Dagri Samuh* (a self help group), Mother Dairy was availed by 19.16% respondents. Further, it showed that most of the respondents (69.16%) used to sell their farm produce at distant mandis (60-100 Km) located in foothills of Haldwani and nearby towns. Besides, few of them used to sell their produce at nearby market of Almora, Ranikhet, Bhawali, and Khairana (30-40 km). More than a quarter of the respondents (30.83%) used to sell their produce at village level.

The concept of sale at local hat was new to the vegetable growers. During the project Horticultural Mini Mission the district administration of Nainital and Almora had taken several initiatives. These activities were highlighted in local print media for creating awareness to the consumer as well as producers. With regard to time of sale, 95 per cent of the respondents sold the entire produce immediately after harvest due to perishability of the produce and lack of storage. Most of the respondents (85.83%) sold their full amount of marketable surplus to the retailers/merchants/ commission agents available at village. Normally, the amount of produce to an individual grower varied from 25-100 q. Only 14.13% respondents had farm produce more than 100 q. Grading is the best practice for higher market price and majority of the respondents (73.33%) followed it. Vegetables growers mostly followed eye-sight grade based upon size (big, small, medium), colour (pink, red, brown, yellow, light green etc.), shape (round, oval and oblong) and firmness (soft, hard) of vegetables like potato, capsicum, pea, cabbage and tomato. These vegetables were supplied to Mother Dairy, a Delhi based

Table 1: Distribution of vegetable growers as per their marketing behaviour (n=120)

S.No.	Marketing behaviour	Response			
		Private transport	**Cooperative transport**	**Government transport**	**Other transport**
1.	Mode of transport	94	23	-	03
		(78.33)	(19.16)		(2.5)
2.	Selling place	Village	Mandi	Hat	Others
		37	83	-	-
		(30.83)	(69.16)	-	-
3.	Time of sale	After initial storage	Immediately after harvest	-	-
		06	104	-	-
		(5)	(95)	-	-
4.	Marketed surplus	Full	Half	Partial	-
		107	-	14	-
		(85.83)	-	(14.13)	-
5.	Grading and standardization	Yes	No	-	-
		88	32	-	-
		(73.33)	(26.66)	-	-
6.	Weighing behaviour	Yes	No	-	-
		102	18	-	-
		(85)	(15)	-	-
7.	Sale agency*	Retailer	Merchants	Commission agents	Others
		16	73	43	-
		(13.33)	(60.83)	(35.63)	-
8.	Payment pattern	Full	Partial	-	-
		37	83	-	-
		(30.83)	(69.16)	-	-
9.	Method of packing*	Gunny bags	Wooden boxes	Baskets	Plastic crates
		113	77	63	53
		(94.16)	(64.16)	(52.50)	(44.16)
10.	Sources of market preferences*	Relatives/friends	Newspaper	Horticulture Mobile Team	Merchants
		103	8	28	73
		(85.83)	(6.66)	(23.33)	(60.83)
11.	Time devoted	<3 hours	3-6 hours	>6 hours	-
		16	39	65	-
		(13.33)	(32.51)	(54.16)	-
12.	Credit	Availed Financial	Not availed Non-financial	Self-management	-
		39	22	59	-
		(32.5)	(18.33)	(49.16)	-

*Multiple responses

organization. Less than a quarter (23.33%) approached Office of Horticulture Mobile Team for technical and advisory services. There are total 285 teams and operate under the administrative control of the state Govt. Few respondents followed value addition in case of cauliflower. They covered the head of cauliflower with leaves to protect it from bright sunlight resulting in better appearance of head.

The growers were conscious to accurate weight as most of the respondents (85.00%) were found to be checking the weights before selling their produce to retailers/merchants/commission agents. The status of marketing channel shows that more than half of the respondents (60.83%) sold their produce to merchants followed by commission agents (35.63%). More than one tenth (13.33%) respondents preferred them to sell

their produce to retailers because of their accessibility and proximity. It was worried because majority of the respondents (69.16%) reported for having partial payment. In hills, it is normal practice to give advance/ loan to growers for social/consumption/ agricultural purpose. The growers used to supply to the produce in lieu of advance/loan taken from retailers/merchants/ commission agents.

Packaging is an important issue as majority of the respondents (94.16%) preferred gunny bags over other materials due to cheap and easily availability. It was followed by wooden boxes (64.16%), baskets made of local weedy shrubs (52.50%) and plastic crates (44.16%). Wooden boxes were used for costly vegetables like capsicum and tomato. Use of plastic crates was restricted to the vegetable growers dealing with Mother Dairy. As for source of information channels concerns the relatives/ friends (85.83%) followed by vegetable merchant (60.83%) played a major role as sources of information on market preferences. This might be due to upper hand of these sources in terms of frequent interaction, easy access and credibility. They were aware of marketing criteria of Mother Dairy and retailers. Mother dairy preferred cabbage having head weight of 300 gm. Retailers demanded hybrid capsicum over local one due to thick skin. It did not shrivel in sun shine.

As for as time is concerned, more than half of the respondents (54.16%) devoted more than 6 hours in a week followed by 3-6 hours and less than 3 hours in a week during the month of May-September/October. The respondents were busy in arrangement of packing material, purchase of farm inputs, transportation and collection of money from creditors. Further, regarding credit majority of the respondent (49.16%) managed it from own source *i.e.* savings. Around one third (32.50%) respondents approached to the financial institutions like primary cooperative societies and commercial banks. Most of the respondent availed loan of Rs. 10,000/. One fourth of them took loan for Rs. more than Rs. 20,000/. For rest of the respondent amount varied in the range of Rs. 10,000-20,000. The nature of loan was short term (5-6 month). It was used to repay with the supply of vegetable produce to the financers.

Perception towards marketing of vegetables: Perception is a very personal thing which is related to relevant past experience of an individual. It is a process by which impressions, opinions, feelings about an object are formed by means of sensory operations. The average perception score of vegetable growers towards various aspects of marketing was measured by Likert's method of summated rating (1932) on 5 point continuum (*i.e.* Strongly agree, Agree, Undecided, Disagree and Strongly disagree).The weigheted mean perception score for each statement are presented in Table 2.

Mean perception score of 4.85 indicated that majority of the vegetable growers were strongly agree in hills vegetables realizes maximum market price. They were well aware of climatic advantages of hill for cultivation of off-season vegetables in comparison to plain. This venture could utilize their marginal land and family labour in more productive way than low value crop production. The finding were similar to the findings reported by UPAA; CDS:IDH (2000) that off season vegetable cultivation is profitable.

Around three fourth vegetable growers (74.16%) were strongly agreed that transaction cost was a major demotivating factor for taking vegetables in the market. These were located 80 to 100 km away from their villages. Major reasons cited by the respondents were difficult and undulated terrain, high cost of packaging material, high cost of transportation and lack of proper policy. As per them, providing of local transport, local made packaging material, better transportation and proper vegetable production policy would increase the marketing efficiency. A majority of vegetable growers (54.16%) agreed to statement that government support for marketing is not sufficient. They reported that out of 25 mandis only 20 were functional. These regulated/ principal market/sub market yards were mostly confined to plains *i.e.* Rudrapur, Haldwani and Dehradun. Majority of vegetable growers (67.50%) disagreed that storage facilities for vegetables were sufficient. The cold storage infrastructure was non- existent in hills. Similarly, majority of vegetable growers (63.33%) disagreed to the statement that route are good to carry the produce up to main road. Poor road consumed their more time and created physical problem in completion of marketing process. Even in the Kumaon hill wide variation in density of road has been reported *i.e.* 96 km in Pithoragarh district and 943 km in Nainital. All these required proper production policy.

Table 2: Perception of vegetable growers towards marketing of vegetables

Statements	SA(freq.)	A(freq.)	U(freq.)	D(freq.)	SD(freq.)	MPS
Transaction cost is the main factor for taking vegetables in the market	89(74.16)	31(25.83)	0	0	0	4.74
In hills vegetables realizes maximum market price	103(85.83)	17(14.16)	0	0	0	4.85
Marketing of vegetable crop is very simple	0	0	21(17.5)	72(60.00)	27(22.50)	1.95
Vegetable growers get due share in consumer price	0	0	28(23.33)	33(27.50)	59(40.83)	1.74
Institutional credit is easily available for growing vegetables	0	15(12.50)	0	88(73.33)	17(14.16)	2.10
Government support for marketing is not sufficient	74(54.16)	38(31.66)	8(6.66)	0	0	4.55
Pre and post harvest loss is high in vegetables	33(27.50)	87(72.50)	0	0	0	4.49
Setting up regulated purchase centre of vegetable in nearby localities will boost up the production of vegetable	46(38.33)	58(48.33)	22(18.33)	4(3.33)	0	4.21
Standardization and grading increases the burden of a vegetable grower	0	23(19.16)	0	97(80.83)	0	2.38
I am satisfied with role of marketing channels	0	0	0	76(63.33)	44(36.66)	4.36
A vegetable grower should apply the principle of business to run the enterprise successfully	21(17.50)	62(51.66)	28(23.33)	9(7.50)	0	3.79
ICT should be strengthened in hills	48(40.00)	57(47.50)	15(12.50)	0	0	4.27
There is a need of more co-operative agencies like Mother Dairy in hills	44(36.66)	54(45.00)	22(18.33)	0	0	4.18
I will increase area under vegetables for higher income	0	13(10.83)	17(14.16)	49(40.83)	41(34.16)	2.01
Storage facilities for vegetables are sufficient	0	0	0	81(67.50)	39(32.50)	1.67
Knowledge on preservation of vegetables is essential for exigencies	11(9.16)	73(60.83)	34(28.33)	0	0	3.74
The route are good to carry the produce up to main road	0	0	17 (14.16)	27(22.50)	76(63.33)	1.27
Farm women have lesser role in vegetable marketing than men	55(45.83)	42(35.00)	13(10.83)	0	0	3.58
Creation of vegetables based Self Help Groups will solve many inherent marketing problems	18(15.00)	71(59.16)	31(25.83)	0	0	3.85
Average						**3.35**

SA: Strongly Agree A; Agree U: Undecided D: Disagree SD: Strongly Disagree; MPS: Mean Perception Score

Constraints in marketing of vegetables: In hills particularly, the extremely perishable nature of vegetables makes marketing more difficult because of area of production and area of consumption are located at different places. Tough geographical terrain adds in the woo. At field level several reasons were identified ranging from high commission rate to damage of vegetables during transportation. Perusal of Table 3 indicated that most serious problem of the respondents (85.83%) were higher commission rate of middlemen.

It varied 8-12% of the produce subjected to place of sale and types of vegetable. It was followed by non-availability of nearby market (73.33%) to sell their vegetable produce. It was observed that during data collection the respondents were busy in transporting their produce to distant mandis. High cost of packing material (60.83%) was the next major bottleneck of vegetable growers. High cost of packing material such as paper cardboard (Rs. 40 for packing of 18 kg) and plastic crates (Rs. 100/unit for packing of 25 kg) deterred them to use it. Vegetables are perishable in nature and can not be stored for a longer period at vegetable grower's field. The price fluctuated day to day and even within a day. Thus they had no choice except disposing of the produce at price offered to them. High transportation charges (51.66%) reduced their consumer price. Even then, delay in arrival at mandis due to road blockage in rainy days and religious pilgrimage (*kanwar*) affected the marketing

Table 3: Marketing constraints as perceived by vegetable growers

Constraints	Frequency (n=120)	Percentage	Rank
Higher commission rate of middlemen	103	85.83	I
Non- availability of nearby market	88	73.33	II
High cost of packing material	73	60.83	III
Fluctuating market rate	67	55.83	IV
High transportation charges	62	51.66	V
Delay in sale	47	39.16	VI
Damage of vegetable during transport	37	30.83	VII

process seriously. Damage of vegetable during transport was experienced by 30.83% respondents. Uneven roads resulted in abrasions on the fresh vegetables and affected the appearance of the produce reduced profit margin due to low market price.

Above findings are in line with the observations made by Vinaygam and Gethakutty (2006); Verma (2007); Kumar and Sharma (2009); Sah *et al.* (2011); Mukherjee (2015); Yadav and Godara (2016) who reported these kinds of problems faced by the farmers regarding marketing of their produce. Vegetable growers suggested establishment of more regulated markets, government intervention in case of low price of vegetable produce, setting up mandis nearby villages, availability of low cost packing material, transportation facility and purchase of low grade vegetable for processing.

CONCLUSION

The study revealed that in hills vegetable growers cultivate vegetables under various kinds of problems ranging from distant location of mandis to high cost of packaging material as well as high commission rate. The positive perception of vegetable growers for vegetables showed that they wanted to transform their economy. They required more support from Union as well as State Government. Two types of approaches i.e. short and long term are urgently required to address the issue. Horticulture based self help group may tackle the problem of credit as well as transportation to some extent. Organization of weekly/bi weekly hats on regular basis may provide opportunity to have interaction with prospective buyers. On a long term basis strict compliance of rules and regulations of regulated market, guidance on market avenues may further improve the situation. In cumulative form all will have synergetic effect boosting the production as well as income of the vegetable growers of Uttarakhand hills in particular.

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Perception of the farming community regarding quality of articles published in Haryana Kheti

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ABSTRACT

Haryana Kheti is a monthly magazine published by Directorate of Extension Education, CCS Haryana Agricultural University, Hisar (Haryana) for more than fifty years. Every month approximately 3,500 copies of Haryana Kheti got printed and circulated all over the country. But 80 percent of it circulated within Haryana state. It covers all important aspects of agriculture that affects the day to day life of farming community like recent developments in the field of agriculture, animal husbandry, home sciences along with government schemes and programmes related to welfare of farming community. The study revealed the perception of the Haryana Kheti among farming community as; 'scientific nature of Haryana Kheti articles' was ranked first, closely followed by the 'accuracy of information and 'timeliness of the message'. The perceived utility in terms of 'daily agricultural field practices' and 'disease outbreaks & treatments' were the most affected issues covered in Haryana Kheti, followed by the 'information on seed varieties' and 'animal husbandry & dairy activities'.

Keywords: Perception, Perceived Utility, Haryana Kheti

INTRODUCTION

Extension education is one of the three major functions of the CCS Haryana Agricultural University, Hisar. The responsibility for planning, organizing, conducting and coordinating the extension education activities of the university in Haryana state lies with the Directorate of Extension Education.

Its main aim is to transfer the well proven/tested technology to the farmers (males and females), livestock owners, rural youth, field staff of State Govt. and other personnel engaged in developmental and professional agencies in the sphere of agriculture, animal husbandry, horticulture, home agencies and other allied areas through its well planned, skill-oriented and need-based programmes (Agwu and Elizabeth, 2013). An excellent collaboration/linkage is maintained with the Haryana State Government Department of Agriculture, Horticulture, Animal Husbandry, Social Welfare (Woman and Child Development), etc. and non-government organizations so that technologies may reach to the beneficiaries at their door steps (Behrans and Evans, 2002).

The approach is educational with major emphasis on whole farm and family development. Since its inception, the university has conceived and implemented a unique system of extension education for transfer of technology to its ultimate users (Sarkar, 1998). The Directorate acts as bridge between the research scientists and the farmers and other beneficiaries to provide feedback, therefore, the role of the Directorate is twofold i.e. transfer of technologies from scientists to the ultimate clients through field functionaries and to find out the problems of the field to be passed on to various research departments for working on a solution to the problem (Deepti, 2008).

For this purpose all modes and channels of communication and extension are being used by the Directorate like electronic media (Toll Free Numbers, Scientists talks on All India Radio and Doordarshan, Community Radio Station, SMS Services, Social Media etc.), print media (Publication of monthly agricultural magazine-Haryana Kheti, News/ success stories in leading news papers and magazines, leaflets, pamphlets etc) along

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with farm advisory services through Krishi Vigyan Kendras (Ganesan *et al.,* 2013).

One of the most important and powerfully tool of extension in the armory of Directorate of Extension Education is monthly agricultural magazine- Haryana Kheti, a magazine published by Directorate of Extension Education since last fifty years. It covers all important aspects of agriculture that affects the day to day life of farming community like recent developments in the field of agriculture, animal husbandry, home sciences, along with government schemes and programmes related to welfare of farming community (Cibbora, 2005). Approximately 3,500 copies of Haryana Kheti are printed every month and circulated all over the country and abroad every month. But 80 percent of it circulates within Haryana state. To study the farmers' perceptions and perceived utility of the magazine, a study was conducted on the subscribers of Haryana Kheti.

MATERIAL AND METHODS

The sample was selected by choosing 10 respondents randomly from Eastern, Western, Northern and Southern Haryana, respectively. Another 10 respondents were selected from neighboring states of Punjab and Rajasthan. Total sample size was 50.

For collection of data a questionnaire was designed to record observations of the subscribers/ farmers related to Preference, Perception and Perceived utility of the magazine. After pretesting and minor modification accordingly, it was mailed to the respondents on the address available in the list of subscribers in the O/o Associate Director (Publication), along with a dully stamped and addressed return-envelope. But the responses were very poor. The investigators received very poor responses. So, the subscribers were contacted telephonically and responses were filled in the interview schedule by the investigators. The collected data were analyzed and interpreted for drawing the conclusion. Total Weightage Score (TWS) was calculated by multiplying frequency with numbers 3, 2 and 1, respectively, of each variable and then dividing this TWS by total number of respondents (n=50) to calculate Weightage Mean Score (WMS). Finally, ranking was allotted to the perceptions of the readers based upon the value of WMS. In calculations, independent variables (age, gender, education background, mass media exposure, etc) and dependent variables (preference, perception and perceived utility) were also taken into consideration.

RESULTS AND DISCUSSION

Perception regarding quality of articles published in Haryana Kheti: Perception of subscribers/ farmers has been conceptualized in terms of language, appropriateness of content, time of circulation, timeliness of message and length of the articles published in Haryana Kheti. Table 1 depicted the perception of the respondents about the quality of articles being published in Haryana Kheti. It was clearly observed that respondents ranked 'scientific nature of Haryana Kheti articles' as 1st with 2.52 WMS closely followed by the 'accuracy of information as 2nd with 2.36 WMS. The 'timeliness of the message' was also appreciated and ranked 3rd with WMS of 2.32. The respondents' perception about the 'language & length of the articles' was ranked 4th and 5th.

The respondents' were not satisfied with the 'printing quality and visual/photographs printed' in Haryana Kheti. Nearly half of the respondents (46%) mentioned 'visuals and photographs of Haryana Kheti of 'poor quality' and ranked last (8th). Only 26% of the respondents considered the printing quality as 'very good' against the 36% considered it as 'poor' and printing quality got overall 6th ranking. 'Involvement of the readers was also highly missed by readers' and it got the second last rank (7th).

Perceived utility of articles published in Haryana Kheti: Perceived utility will be measured on the basis of knowledge gain, skill application and change in attitude on three point continuums. Table 2 revealed that the application part of recommendations given by university's experts in Haryana Kheti. When asked about the application of recommendations given in Haryana Kheti in their field practices, 46% of the farmers replied positively, closely followed by 'somewhat' (40%). Interestingly 14% of the farmers replied that they 'do not apply' the recommendations of Haryana Kheti in their field.

Data presented in Table 3 reveal that multiple responses were given by respondents when asked about the information which affects their agricultural practices the most. The majority of the farmers (84%) replied

Table 1: Perceptions about the articles published in Haryana Kheti (n=50)

S. No.	Variables	Eastern Haryana n=10		Western Haryana n=10		Northern Haryana n=10		Southern Haryana n=10		Outside Haryana n=10		Total n=50		TWS	WMS	Rank
		F	%	f	%	f	%	f	%	f	%	f	%			
A.	**Language**													**112**	**2.24**	**IV**
a.	Appropriate	04	40	05	50	04	40	04	40	03	30	**20**	**40**			
b.	Somewhat Appropriate	05	50	03	30	05	50	04	40	05	50	**22**	**44**			
c.	Not Appropriate	01	10	02	20	01	10	02	20	02	20	**08**	**16**			
B.	**Scientific Nature**													**126**	**2.52**	**I**
iii	Very Scientific	06	60	05	50	05	50	04	40	07	70	**27**	**54**			
b.	Scientific	04	40	04	40	05	50	06	60	03	30	**22**	**44**			
c.	Not Scientific	00	00	01	10	00	00	00	00	00	00	**01**	**02**			
C.	**Accuracy of Information**													**118**	**2.36**	**II**
a.	Very Accurate	06	60	04	40	03	30	O4	40	05	50	**22**	**44**			
b.	Accurate	03	30	05	50	05	50	06	60	05	50	**24**	**48**			
c.	Not A Accurate	01	10	01	10	02	20	00	00	00	00	**04**	**08**			
D.	**Timeliness of Message**													**116**	**2.32**	**III**
a.	Very timely	05	50	04	40	05	50	06	60	04	40	**24**	**48**			
b.	Timely	03	30	04	40	05	50	02	20	04	40	**18**	**36**			
c.	Not timely	02	20	02	20	00	00	02	20	02	20	**08**	**16**			
E.	**Length of articles**													**101**	**2.02**	**V**
a.	Appropriate	03	**30**	02	20	03	30	03	30	04		**15**	**30**			
b.	Somewhat Appropriate	04	40	04	40	04	40	04	40	05		**21**	**42**			
c.	Not Appropriate	03	30	04	40	03	30	03	30	01		**14**	**28**			
F.	**Printing Quality**													**93**	**1.86**	**VI**
a.	Very Good	02	20	03	30	03	30	04	40	02		**14**	**28**			
b.	Good	03	30	03	30	05	50	03	30	04		**18**	**36**			
c.	Poor	05	50	04	40	02	20	03	30	04		**18**	**36**			
G.	**Visuals/Photographs' Quality**													**85**	**1.70**	**VIII**
a.	Very Good	01	10	00	00	02	20	02	20	03		**08**	**16**			
b.	Good	04	40	05	50	03	30	04	40	03		**19**	**38**			
c.	Poor	05	50	05	50	05	50	04	40	04		**23**	**46**			
H.	**Readers' Involvement**													**91**	**1.82**	**VII**
a.	Involved	03	30	03	30	02	20	04	40	02		**14**	**28**			
b.	Partially Involved	04	40	03	30	03	30	02	20	01		**13**	**26**			
c.	Not Involved	03	30	04	40	05	50	04	40	07		**23**	**46**			

Table 2: Application of Haryana Kheti 's recommendations in field practices (n=50)

Variables	Eastern Haryana n=10		Western Haryana n=10		Northern Haryana n=10		Southern Haryana n=10		Outside Haryana n=10		Total n=50		Rank
	f	%	f	%	f	%	f	%	f	%	f	%	
Yes	03	30	06	60	05	50	07	70	02	20	23	46	I
Somewhat	07	70	03	30	04	40	03	30	03	30	20	40	II
No	00	00	01	10	01	10	00	00	05	50	07	14	III

Table 3: Perceived Utility of Articles Published in Haryana Kheti (n=50)

Variables	Eastern Haryana n=10		Western Haryana n=10		Northern Haryana n=10		Southern Haryana n=10		Outside Haryana n=10		Total n=50		Rank
	f	%	f	%	f	%	f	%	f	%	f	%	
Agricultural Field Practices	09	90	07	70	10	100	09	90	07	70	**42**	**84**	**I**
Information on Seed Verities	07	70	07	70	07	70	08	80	05	50	**34**	**68**	**II**
Disease outbreak and Treatments	10	100	08	80	09	90	09	90	06	60	**42**	**84**	**I**
Animal and Dairy activities	07	70	04	40	07	70	05	50	06	60	**29**	**58**	**III**
Home Sciences	04	40	02	20	03	30	01	10	00	00	**10**	**20**	**V**
Government Policies	05	50	05	50	04	40	05	50	02	20	**21**	**42**	**IV**
Others	01	10	02	20	00	00	00	00	00	00	**03**	**06**	**VI**

that 'Agricultural field practices' and 'Disease outbreaks & their treatments' were the most affected issues (Rank 1st). 'Information on seed varieties' and 'Animal husbandry and dairy activities' were also closely followed issues as ranked 2nd and 3rd, respectively, in the list. Issues on 'Home science' got the last ranking (5th) as all the respondents were male.

CONCLUSION

The data pertaining to the perceived utility revealed that even after more than 50 years of publication, Haryana Kheti enjoys a great credibility among the farming community as respondents still believe on scientific nature of Haryana Kheti articles, accuracy of information published and timeliness of the message. This shows the relevance of this old extension tool in this era of IT and social media. As far as, perceived utility is concerned, the magazine is of great practical relevance, as the majority of the farmers still depend upon it for their daily agricultural field practices, disease outbreaks and their treatments, information on seed varieties and animal husbandry & dairy activities'.

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Fisher's Outlook and Perception towards Fishery Resources of River Ib

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ABSTRACT

Rivers harbour a wide plethora of aquatic flora and fauna and are centres of great human activities. Ib, a tributary of Mahanadi River supports many fishing communities along its bank bringing challenges of sustainable use and short-term profits versus long-term gains. People's support and compliance is very important for conservation of aquatic biodiversity. In this context, the study was undertaken to document fisher folk's perception towards biodiversity conservation and outlook towards fishery resources in five villages along Ib River. The primary occupation of majority of the respondents was fishing (79%). The respondents feel that fishery resources are not adequate to sustain livelihood now and are plagued with bleak future. Reduction in water depth of the river, siltation, usage of small meshed nets and destructive methods has worsened the situation. The fishermen want government agencies to take centre stage in resolving these issues but are willing to join them in conservation efforts. The need is for the government agencies and fishermen to work hand in hand for co-management and conservation of fishery resources of river Ib.

Keywords: Fishermen, Perception, Fishery resources, Ib

INTRODUCTION

There are around 34,400 fish species in the world (Eschmeyer *et al.,* 2017) of which 3,398 have been reported in India (NBFGR, 2016). Water resources like rivers, streams, springs, headwaters, seas, etc harbour and support rich aquatic biodiversity. There is a complex dynamic relationship between accessing and utilizing these fishery resources for immediate human gain and the need to conserve them for prosperity. All the species are ecologically important and significant either as preferred food, ornamental value or in the production of value added products. A species insignificant in one place may be most relevant at another place. In recent years, the concept of resource sustainability and awareness about conserving biodiversity has received a lot of attention. River Ib, one of the important tributaries of the Mahanadi River basin is significant not only due to its rich aquatic biodiversity but also due to its importance as one of the most industrialized areas of Eastern India with lot of coalmines (Mishra, 2009; Mohapatra and Goswami, 2012; Sahu and Sahu, 2016). It originates in Raigarh district of Chhattisgarh and flows through Odisha state, before falling into the Hirakud reservoir on Mahanadi. It supports a large community of fishermen and traders involved in fishing along its bank. Conservation and protection of fishes is impractical without considering the perception and ground reality of the fishermen and other user groups. Understanding perceptions of fishermen 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 (Jefferson *et al.,* 2015; Bennet, 2016). Management programmes would perform significantly better if they are planned bearing in mind user perceptions.

In this background, a study was undertaken to analyse and document the perception of local fishing communities towards the status and conservation of fish resources in River Ib, along its stretches in Odisha and Chhattisgarh. The objectives of the study were:

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1) To study the socio-economic profile of fishermen involved in fishing in River Ib

2) To document and analyse the perception of fishermen towards the status and conservation of fishery resources of River Ib.

MATERIALS AND METHODS

Locale of the study: The data for the study was based on survey conducted in five villages along various stretches of River Ib during January, 2016 to February, 2017. Barghat and Katangidihi villages in Odisha along downstream river stretch; Lawakera and Samdama villages of Chhattisgarh along the middle stretch and Pamsala village in Chhattisgarh along the upper stretch were selected as representative villages where major fishing activity takes place.

Questionnaire design and procedure: Questionnaire for this study was designed based on earlier socio-economic fisheries-related studies (Tyagi *et al.,* 2007; Tyagi *et al.,* 2008 and Lal *et al.,* 2012). In addition to this, fishery development officers, fisheries scientists and other experts were also consulted. A total of 100 respondents comprising of local fishermen and traders were selected through random sampling. The respondents were interviewed face-to-face individually and necessary care was taken to collect the most reliable, relevant and exact ground level information from the fishers' level. Informal interactions with fishermen/fisherwomen and small traders at various fishing sites, further enriched the observations of interviews.

RESULT AND DISCUSSION

Socio-economic profile of fishermen: Majority (66 percent) of the respondents interviewed were middle aged (36-55 years) with education either up to primary (36 percent) or middle school (29 percent) level (Table 1). Fishing was recorded to be the primary occupation of the respondents (79 percent). Rest were involved in other occupations like small trading (13 percent). A few (8 percent) were also involved in aquaculture activities in ponds leased to them. 50 percent of the respondents were also involved in secondary occupations like labour work. It was seen that younger respondents were more educated and less involved in fishing activities. It was observed that even though around 60 percent had expertise in fishing for 10-20 years, they have had limited interaction with government or extension personnel with none of them having undergone any training or awareness programme on conservation or on other aspects of riverine fishing. According to them, little support has been provided by the government except for the asbestos roofed house given 25 years ago. There was absence of fishermen co-operatives or self help groups in these villages.

Table 1: Socio-economic profile of Fishermen

Profile	Percentage
Age (years)	
Young (18-35)	18
Middle (36-55)	66
Old (Above 56)	16
Education	
Illiterate	9
Primary	36
Middle	29
Metric	20
Above metric	6
Major Occupation	
Fishing	79
Trading	13
Aquaculture	8
Fishing Experience	
<10 years	24
10-20 years	60
>20 years	16
Extension Contact	
Low	100
Medium	0
High	0
Social participation	
Low	100
Medium	0
High	0

It was found that the participation of men was more than women in fishing activities (Table 2). Men play a key role in catching fish from the river. They usually fish in the morning and evening and hand over the catch to women. Though not directly involved in catching fishes, women play a significant role in marketing fish and processing activities like drying and smoking of fishes. Fifty five per cent of women were involved in fish, marketing while twenty per cent respondents occasionally marketed the fish. While women sell the fishes in market or dry the unsold fish, the men involve in labour work for secondary income. A few men (25 percent) were also found to be involved in marketing but neither they

Table 2: Roles played by men and women in fisheries resource management

Role	Men (%)			Women (%)		
	Always	Sometimes	Never	Always	Sometimes	Never
Catching of fish from rivers	79	21	0	0	0	100
Marketing of fishes in local market	25	20	55	55	20	25
Undertaking fish processing activities like fish drying, etc.	0	0	100	50	40	10
Net & Boat making & repairing	46	22	32	32	40	28

were involved nor interested in processing activities. Pre-harvest activities like net mending and boat repair works were shared by both men and women.

People's outlook with respect to fishery resources: Perception of the respondents about the status of the fishery resources of River Ib in the past, present and future time frame was sought, to understand the trend in the riverine fish diversity and catch (Table 3). Majority of the people did not have knowledge of any management strategy in place for conservation of aquatic biodiversity. Almost all the respondents opined that although there is no reduction in fish diversity as such when compared to the past, there has been a reduction in average size of fishes caught and duration of fishing season. It was felt that commercially important fishes like Bhakur (*Catla catla*), Rohi (*Labeo rohita*) and Mrigala (*Cirrhinus mrigala*) which were normally caught abundantly throughout the year in the past have declined and are now captured mostly during monsoon season only. The frequency of occurrence of many fishes like Gurai (*Channa* sp), Boalle (*Wallago attu*), Bami (*Anguilla* sp), Chital (*Notopterus notopterus*), Khussuah (*Colisa fasciata*), Tengri (*Mystus* sp), Patharchatta (*Garra* sp), Sarana (*Systomus sarana*), Kokia (*Rita chryzea*) and many others, though not completely unavailable have declined over time in this river. They are of the opinion that proportion of large fishes caught has steadily decreased over the years. As per the respondents, they have to go near Hirakud Reservoir (around 80 km) in search of fishes. Majority of the respondents remarked that the present catch was inadequate (75 percent) or just adequate (25 percent) to support their livelihood making, it is difficult to be completely dependent on fishing and thus they had to take up secondary occupations like labour and trading to meet their financial needs. As per the respondents, fishing trade was difficult and less remunerative due to which their children show little interest in carrying on their family occupation. Hence, most of the children of the fishermen are trying to take up business work or trading. All the respondents were worried that fishery resources would be grossly inadequate for the future unless proper conservation and management options are implemented.

Perceived causes for decline in fishery resources: Major cause for the declining fishery resources as perceived by the fishermen was destructive fishing practise of poisoning and dynamiting (Table 4). Poachers and migratory fishermen often employ these practises in the night. This indiscriminate fishing can have severe impact on the fishery resources (Eyo and Ahmed, 2005; Katikiro *et al.,* 2016) killing brood fishes and juveniles. Another cause for declining catch as reported by the

Table 4: Perceived causes for decline in fishery resources

Reason	Percentage
Destructive fishing	89
Usage of small meshed gear	84
Reduced water depth	40
Siltation	25
Reduced Rainfall	10

Table 3: People's outlook with respect to status of fishery resources

View	Status of Fishery Resources		
	In Past	At Present	Likely to be in Future
Fishery resources are abundant	100		
Just adequate to sustain livelihood		25	
Not adequate to sustain livelihood, but earlier they were adequate		75	
Grossly inadequate and in very poor condition			100

respondents was reduction in river depth. Sand mining activity along the shores of River Ib has widened the river, in turn reducing the depth. As bigger fishes are caught from deeper waters, lack of sufficient water and proper habitat for the fishes are resulting in small sized catch. Siltation in the river is further aggravating this problem. Fishermen believe that after monsoon, large sized fishes migrate from Hirakud reservoir to either Mahanadi or Ib rivers, based on the water availability. Hence, fishermen pray for good rainfall which would mean good catch. In addition to these, small mesh sized gears are employed for catching fishes which completely capture all fishes including the juveniles and fingerlings. Even though the fishermen know that using small meshed nets are harmful, they do it to sustain their livelihood. They also fear that they will lose out on catch when compared to a person using smaller mesh. The challenge here is to convince them as per the respondents, Government departments have not taken any initiatives to improve or enhance the fishery of River Ib.

Measures suggested for the enhancement of fishery resources: Respondents suggested a few measures which in their opinion can improve the status of fishery resources and thus, help in their conservation. Majority of the respondents felt that the government departments should carry out enhancement measures like fish ranching, increasing the water depth and reducing siltation in River Ib. This sentiment may be because of the fact that riverine fishery resource is common property resource. Other studies have also recorded similar expectation from fishing communities (Tyagi *et al.,* 2007). Respondents also felt that creating awareness among the fishermen about the ill effects of destructive fishing practises and usage of small meshed gears will also help improve the catch and fishery resources of River Ib. As State Fisheries Department are not adequately staffed to take up awareness programmes on a wider scale, fishing co-operative societies and non-government organizations can play a significant role here. Studies conducted at various places have shown that where fishing co-operative societies were active and functioning effectively, their performance contributed significantly towards conservation and sustainable management of fishery resources (Tyagi *et al.,* 2013; Tyagi *et al.,* 2014). Respondents opined that expecting poor fishermen, who are finding it difficult to make his ends meet, to undertake, enforce and follow conservation and regulatory measures is unfair. Effective implementations of these strategies are only possible if the government departments undertake measures to improve the fishery and provide support to their sustenance. Further these fishermen may be encouraged to form self-help groups or societies to strengthen them and help open dialogues with government agencies.

CONCLUSION

It is obvious from the current study that even though the fishermen employed in fishing in River Ib are poor and not well educated, they are aware about the current scenario of fishery resources and its causes. They are all so engaged in their daily efforts to sustain their livelihood that, they are unable to plan or execute conservation measures unless the government departments support them. Actions and strategies to improve the fishery resources of river Ib need to be initiated by the government departments. Planning bodies can sensitize and train these fishermen to access new fishery resources or enhance market access through value addition. The fishermen are more than willing to cooperate in such activities. Government departments and fishermen need to share the responsibility of conserving the fishery resources of River Ib and work hand in hand for its conservation and management.

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A Study on the Information System of Nature Fresh dairy Project in Kerala

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ABSTRACT

Information is considered as an essential input to agricultural education, research and development and extension activities. Agricultural information system is a system in which agricultural information is generated, transformed, consolidated, received and fed back to underpin knowledge utilisation by agricultural producers. The present study was framed with an objective to explore the information system of 2 *Panchayaths* in Kerala state, where the Nature Fresh Model (NFM), an innovative dairy value chain is operational. Various actors, associated with the project were identified and the farmers' preference for different information sources was quantified. A comparison of information scores of the project participants in the study areas in terms of z-scores shows that the information linkages are comparatively strong in Akathethara, where the project is institutionalized indicating the strong information system among the farmers with diverse actors.

Keywords: Dairying, Institutionalization, Knowledge, Linkage

INTRODUCTION

Information has an extensive and multifaceted role in agriculture (Mittal and Mehar, 2013). It is considered as a social good to be exchanged and discussed within social networks (Rolls *et al.,* 1999), one of the important inputs of livelihood sustenance (Haldar *et al*., 2016) or even as a production resource (Naidoo and Rolls, 2000) by the small scale farmers. Hence its efficient flow in a farming system ensures that social learning process in the community gets going, resulting in adoption of innovations. The potential users of agricultural information include government decision-makers, policy-makers, planners, researchers, teachers and students, program managers, field workers and farmers (Zaman, 2002). An agricultural information system consists of components (subsystems), information related processes (generation, transformation, storage, retrieval, integration, diffusion and utilization), system mechanisms (interfaces and networks) and system operations (control and management) (Vidanapathirana, 2012). It integrates vertical networks which is the extension network itself where the major information sources are formal extension agents (experts from any line departments) and horizontal network composed of peer network, community association network and marketing network where the informal sources like friends and neighbours dominate (Amalku, 2012; Hoang *et al*., 2007). More functional cooperation and professional communication between personal and institutional information sources are essential to enhance the diffusion of information and technology among the farmers (Demiryurek, 2010). So far agricultural information networks have been explored in a variety of contexts like information related to agriculture (Haldar *et al*., 2016), among the organic farmers (Demiryurek, 2010), in fisheries (Pretty and Smith, 2004) and agro forestry (Isaac, 2012; Warner, 2007). This study was an attempt to look the dairy information system of 2 *Panchayaths*, in Kerala state where the Nature Fresh Model projects are operational since three years.

An overview of the Nature Fresh Model (NFM): The Nature Fresh (NF) model is such an innovative dairy value chain model, emerged as an alternate way to the cooperative channel of milk marketing. The main objective is to ensure maximum return to the dairy producer while assuring supply of quality milk to the

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consumer. Unlike the large milk co-operatives marketing model, which source and bulk milk from different areas and supply it to the distant cities after processing, this simple and organized model looked for reducing the length of milk value chain (Sreeram and Gupta, 2016). Sale of bottled milk of a particular animal with an identification tag was the unique feature of this project. Two adjacent *Panchayaths* of Palakkad district, *viz.* Puduppariayam and Akathethara were identified by the Department of Animal Husbandry (DoAH) to roll out the project considering their nearness to the Palakkad town, where good demand for the fresh quality milk exist (Figure 1). Also the farmers in these *Panchyaths* had comparatively more access to Livestock Technology Management Centre (LMTC), Malampuzha, Regional Farm of Kerala Livestock Development Board (KLDB) at Dhoni and District Veterinary hospital, Palakkad, all within a distance of 10 km. While the LMTC is one of the identified training centres, for the project participants in the initial stages of the project, KLDB farm at Dhoni supports the cattle rearers with good quality fodder grass and legume seeds and houses the regional semen bank. Hence the access to credible information sources will be more compared to farmers in the other parts of the district.

The project participants were poor women from BPL families with an experience in dairying. They were

Figure 1: District map of Palakkad, Kerala

*Area within the inner rectangle corresponds to locale of the study

Source: Election commission of India, 2016

organized into Joint Liability Groups (JLGs) by the Kerala State Poverty Eradication Mission, the Kudumabshree. A total of 10 groups were formed with 5 members in each group, in both the *Panchayaths*. Under the Project all the members got financial assistance from DoAH to purchase two animals and construct a cattle shed according to the project norms under the supervision of the village veterinary surgeon, who is the implementing officer. A milk vendor was employed for each two groups, to collect milk at the farm gate in every morning and supply it to the consumer within 2 hours of milking. Milk was supplied in well sterilized sealed and tagged bottles (650 ml) to the consumers located in the nearby town area. A monitoring committee was formed for the smooth functioning of the project, comprising of officials from Dairy Department, Kudumbashree, Village Cooperative Bank, Village Panchayath and the veterinary Surgeon. While the Kudumbashree took the lead role in launching the project at Pudupperiayam, the veterinary surgeon was entrusted with implementing the project at Akathetahra. The project was commenced in both the Panchayaths in 2013. Later in 2015, the dairy farmers of NF project were organized as Nature Fresh Promotion Council (NFPC) with the support of veterinarian at Akthethara. Also a Guidnace and Advisory Committee (GAC) was constituted here, comprising of veterinary doctor, experienced male counterparts of project members (5 members) and all the project participants. Fortnightly group meetings and discussions are being organized on behalf of NFPC on various pertinent issues for smooth running of the project.

MATERIALS AND METHODS

The Study Area: The study area was purposively selected as the project is operational in both the *Panchayaths* and was initiated by DoAH in 2013. Though the project is same, its mode of implementation varied significantly in both these *Panchayaths*. The information system of the dairy farmers is hypothesized to be strong and diverse, with a blend of both the personal information sources (other project participants, progressive farmers, milk cooperative society staff) as well as the expert information sources (Veterinarian, Milma Extension agent). A detailed study on their information systems gave valuable insights regarding chief information sources of the farmers. Further a comparative study between the Panchayaths which differ in the project implementation mode, will give a clear picture of the information system operational in the study locales. As the combination and integration of different stakeholders very in both the *Panchayaths*, the study may augur well or drawing key inputs for strengthening and restructuring the dairy information system.

Sampling: To study the information networks among the NF project participating farmers, a complete enumeration was carried out by contacting all the farmers in the study areas. A complete list of the project participants was obtained from Kudumbashree District Mission office. (How many respondents were sampled from this list and by which sampling technique). Personal interviews using a well structured interview schedule was carried out to elicit the information from the farmers regarding the major information sources, frequency of contact and its perceived usefulness. Focussed group discussions and key informant meetings were also held as a part of the data collection. Also actor system mapping was done to delineate the diverse actors in the network in the study areas.

To explore the information system in a system Actor Linkage Matrix (ALM) is the tool commonly used by many researchers (Gupta, 1998; Mohammad, 2012). Though it is a handy tool to depict the strength, pattern and kind of information flow, it has limited scope in comparing two information systems. The information scores of each of the participant were calculated following the scoring method of Demiryurek (2010). Information scores for each component of the farmers' agricultural information system were calculated by multiplying the weights of information contact with degree of information usefulness. Total Information Score is formulated as:

$$TISij = FCij \times IUij$$

Where, FC is the number of contact with information sources for the i-th dairy farmer and IU is the usefulness of information for the i-th dairy farmer. It facilitates a comparative study of the information networks in the two *Panchayaths* based on the information scores.

RESULTS AND DISCUSSION

Based on the field survey and interviews, actor landscape of the study areas where the project is operational was explored. It is presented in the Table 1. The farmers' information sources were classified into 4

Table 1. Dairy actor landscape of the study areas

Actor domain	Pudupppariaram	Akathethara
Public	Department of Animal Husbandry (DoAH) Dairy Development Department (DDD) Kudumbashree (KDMS) Village Panchayath Livestock Management and Training Centre (LMTC) Kerala Livestock Development Board (KLDB) Kerala Feeds Ltd. New India Insurance Ltd.	Department of Animal Husbandry (DoAH) Dairy Development Department (DDD) Kudumbashree (KDMS) Village Panchayath Livestock Management and Training Centre (LMTC) Kerala Livestock Development Board (KLDB) Kerala Feeds Ltd. New India Insurance Ltd.
Private	Milk & dairy product Traders Cattle feed retailers Veterinary medical shop Union Bank of India Banana product traders*	Milk & dairy product Traders Cattle feed suppliers Veterinary medical shop Private banks Komrela Feeds Pvt. Ltd.
Cooperative	Milk cooperative society (Milma) Cooperative bank	Milk cooperative society (Milma) Cooperative bank
Independent	Dairy farmers	Nature Fresh Promotion Council (NFPC)

*Banana product sellers: Dairy farmers of Pudupppariaram are in agreement with these traders in the town area for collecting the left over banana stalks as cattle feed for a nominal charge.

components of information system based on their responses obtained during the field survey. They were peer network, extension network, community association network and mass media network based on their familiarity and degree of contact with the different sources. The results are presented in the Table 2.

In the peer network category, Akathethara farmers have more inclination towards progressive farmers as the chief information source. At both the places, the veterinary doctor has the role of key information source in the extension network. Unlike in the case of Pudupperiayarm where the information links with the Milk Cooperative Society staff were preferred more, Akathethara farmers had less preference for the same. This is because, only a few project participants are pouring milk at the cooperative society and most of them had no contact with the secretary of the milk cooperative. Also there is a clear cut preference for different sources in the extension network with a minimum inclination for the combination of different, at both the places. The community association network depicts an explicit difference with more strong interactions among the members in Akathethara. This is because the project member's organization, NFPC is a good platform for the farmers to meet and interact regularly (every fortnight) unlike the case of Pudupppariaram where the group meetings are irregular and minimum. Strengthening the alliance of both strong and weak ties in farmers' information networks could be beneficial in the implementation of agricultural programs (Thuo *et al.,* 2013). This is because interaction and networking among people with different skill sets is conducive for learning in a social system (Madzudzo, 2011). The NFPC meeting brings together a number of strong and weak information ties on board like the veterinary doctor, experienced dairy farmers (the members of GAC) as well as members of different JL groups. Also this platform is conducive for building new links, like the inking of feed supply contract with the Komerela feeds Pvt. Ltd. by the NFPC recently. Thus the fortnightly meetings of NFPC, in the presence of veterinarian and GAC members are conducive for strengthening the synergy between strong and weak information links at Akathethara.

Again farmers were asked to pick the most preferred information source regarding the dairy farming among these different information networks with the maximum choice limit set as three. The results are presented in the Table 3. Though the preference for formal information sources is more or less same, the farmers of Akathethara had shown more dependence on their personal information sources including members of GAC and

Table 2: Different combinations of information sources as reported by farmers of NF project

Different sources of Information combination	Pudupperiyaram (n=50)		Akathethara (n=52)	
	Frequency	Percentage	Frequency	Percentage
Peer Network				
Only progressive farmer	8	16.00	11	21.15
Only own family members	12	24.00	15	28.84
Milk vendors	4	8.00	8	15.38
A combination any of the above	26	52.00	18	34.61
Extension Network				
Only veterinary doctor	28	60.00	37	71.15
Only input dealer	6	12.00	5	9.62
Only staff of MCS	11	16.00	3	5.74
A combination of any of the above	5	12.00	7	13.46
Community association Network				
Only own JL group member	42	84.00	13	25.00
Only with members of other JL Groups	0	0.00	11	21.15
Only the members of GA committee (GAC)*	-	-	4	7.69
A combination of any of the above	8	16.00	24	46.15
Mass media Network				
TV/Radio/farm Magazine	40	80.00	36	69.23
Farm school/ Demonstration	2	4.00	4	7.69
A combination of any of the above	8	16.00	12	23.07

*Guidance and Advisory Committee (*GAC)* is unique to Akathethara Panchayath.

Table 3: The chief information sources as reported by the farmers regarding the dairy related information in 2 Panchayaths

Information source	Pudupperiyaram		Akathethara	
	WAN	Percentage	WAN	Percentage
Veterinary surgeon	17	34.00	16	31.03
MCS secretary	11	21.64	2	3.50
Input dealer	6	12.60	5	9.53
NF group members	8	15.62	12	23.32
Experienced family member (in dairying)	3	5.33	7	14.07
Milk Vendors	1	2.00	2	2.53
Milma Extension agent	5	9.62	-	-
GAC member**	-	-	8	15.63
Total	**50**	**100.00**	**52**	**100.00**

Note: Weighted Average Number of farmers (WAN): Number of farmers is weighted by the number of information sources highlighted by them, with three being maximum number of sources. For instance, if a farmer has listed three sources then each source is given a weight of 0.33 and if one farmer has listed only one source as the most important then that is given a weight as 1.

other JL groups. The Kerala Cooperative Milk Marketing Federation (Milma) extension agent was reported as an information source only at Puduppariyaram, as the NF farmers only there had a functional linkage with the milk cooperative society. But the other relevant institutions in dairying like KLDB, LMTC etc. have not been identified by the farmers as their information source at both the places. This may be due to their limited participation in improving the information scenario of the study areas. They had majorly acted as training institutions (LMTC), in the beginning of the project and for input supply (fodder seeds by KLDB farm). Preference for the veterinarian as the chief information source has its own merits and demerits. As a subject expert, his information support is credible and highly useful to the farmer. But inaccessibility of the veterinary doctor at needed times,

Table 4: Comparison of farmers of 2 Panchayaths in terms of socio economic variables and information system components as well as total information score

Variables	Puduppariaram		Akathethara		z test
	Mean	SD	Mean	SD	
Age	41.3	9.35	41.92	7.46	0.371
Education	9.52	3.10	9.42	3.52	0.178
Experience in dairying	23.06	11.32	19.00	9.52	1.94
Total land holding	29.42	43.95	40.55	42.42	1.30
Total Livestock Units (TLU)	4.66	1.973	5.09	1.96	1.12
Total milk production	25.48	14.04	32.74	22.22	1.98*
Training received	6.04	1.55	6.36	2.38	0.820
Peer Network	4.58	1.86	4.71	1.50	0.611
Extension network	5.00	0.422	4.16	2.51	3.63**
Community association network	2.91	2.94	5.64	0.36	11.19**
Mass media Network	2.75	0.183	2.75	0.081	9.57**
Total Information Score	43.02	8.06	49.03	7.18	3.97**

**Significant at 0.01 level of probability, *Significant at 0.05 level of probability

may deprive the farmers from getting crucial information, which happens at the field level many a times. Hence alternate credible information backup should be put in place to supplement the formal information sources (like *e-Vet connect* project of Kerala Veterinary and Animal Sciences University).

z test was performed so as to compare between some of the relevant variables and the components of agricultural information and communication network at both the study areas. The results are presented in the Table 4. The results of statistical analysis give a clear picture of the variables, which are significantly different in the study areas. Among the selected socio economic variables pertinent to dairying, only the total milk production was significant different with a higher mean value at Akthethara. Though not statistically different, mean experience in dairying of the Puduppariayaram farmers were slightly more. But in the case of components of information system, except the peer network, all other information networks were significantly different in the two Panchayaths. The extension, community association as well as the mass media networks was relatively strong at Akthethara, which can be inferred from the respective higher mean information scores. Finally the total information network score also differed significantly and the mean score was higher at Akthethara. Hence it may be concluded that the institutionalization by means of formation of NFPC has contributed in a big way in strengthening the information system at the Panchayath by regular face to face meetings, group discussions, knowledge exchanges and furthering more linkages among the farmers and their pertinent information sources. With these information in hand, the extension machinery can redesign the information network of the project areas (Raina *et al*., 2011) to strengthen it and to meet the emerging and diversified information needs of the farmers in a better way.

CONCLUSION

Access and use of information sources is a first step toward better targeting of extension programs and advisory services that facilitate information sharing (Nain *et al*., 2015). With a thorough information system study, the dynamics of flow, strength and diversity of information linkages within a social system can be mapped. It can be used as an effective tool by policy makers to make most prudent decisions for strengthening or modifying the existing information networks. Also there can be a differentiated information strategy by the different knowledge providers, to give more emphasis on specific areas, where their expertise is more. Finally the efforts should be made to blend the personal and formal information sources so that dairy information flow can be reinforced both vertically and horizontally in the system.

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Marketing Analysis of Meat Retailing in Jammu

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ABSTRACT

The rapid growth of Indian meat industry is driven by a combination of rising incomes, young and urbanization population and declining real poultry prices. The vertical integration in the meat industry and the retail boom in India are paving way to organized retailing. Although, many studies existed on meat consumption, most of them were focused on urban household. To collect the relevant information among the respondents in Jammu, the present study makes use of a descriptive type of research design. A purposive sampling procedure has been adopted for selecting sample households. To collect the data from the respondents in totally, 100 respondents were sampled from the four selected areas. In addition, 5 Retailers from four areas were also selected. For analysis of data, Garrett ranking technique and marketing cost method were used. The finding of the study revealed that among various factors responsible for making preference and consuming meat, the taste appears to be having first rank in Gandhi Nagar and Talabtillo whereas fat content the least. On the other hand nutritional value appears to be highest rank i.e., I in Gangyal and Janipur whereas price and easy availability appears to be least. While identifying the constraints faced by household and retailers the poor quality for chicken and high price for mutton appears to be the major hindrance or constraints faced by the households in four areas and on the other hand high cost of transportation appears to be major problem for retailers in Gangyal, Janipur and Gandhi Nagar. Whereas competition from other traders appears to be major problem for retailers in Talabtillo. The study depicted that marketing margin per kg is highest for mutton in Gandhi Nagar Rs. 26.00/kg and for chicken in Talabtillo Rs. 24.66/kg.

Keywords: Garret ranking, Retailing, Marketing margin, Meat retailing

INTRODUCTION

Food consumption is a basic action contributing to survival of human beings. Therefore, the understanding of the food culture creates a better understanding and more intimate relationship among countries and people (Koo, 2008). The improvement in agriculture, allowed some fundamental changes in the human way of life. Animal derived food goods are the most resource intensive foods (Chemnitz and Becheva, 2014; Connor and Mínguez, 2012; Marlow, 2009; Science News, 2010). Animal protein foods are at the top of the food chain in relation to the resources (Chemnitz and Becheva, 2014). In many developing nations, it is expected that global meat consumption will continue to rise (Buttriss, 2011; Connor and Mínguez, 2012). Fiala (2008) has suggested that if meat consumption patterns continue along the same path, then the consumption rates will be 7 2 per cent higher than 2000 levels in the year 2030. Demand for meat is growing rapidly in developing countries, particularly India, China and Brazil (Cheminitz and Becheva, 2014; OECD, 2011). Since 1970s, there was a reduction in intake of whole grain cereals, pulses, fruits and vegetables in India while intake of meat products have been increased (Misra, 2011; Popkin, 2002; Popkin, 2012).

The overall meat production in India appears to be 5.1 million tonnes during the year 2012-13 and the target for production of meat was 6.4 million tonnes during 2013-14 (Ministry of Agriculture, Govt. of India, 2014). The annual growth rate for production of meat was 7.87 per cent in 2012-13 (Krishi Jagran, 2015).

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As per the Integrated Sample Survey Report (ISS), 2012-13, total estimated meat production of Jammu and Kashmir (J&K) state was worked out to be 322.781 lakh kgs consisting of 80.79 per cent of (260.762 lakh kgs) Red Meat and 19.21 per cent (62.019 lakh kgs) of White Meat. The meat production in J&K registered a growth from 308.986 lakh kgs to 322.781 lakh kgs over the previous year resulting into 4.47 per cent growth (The Economic Survey of J&K, 2013-14). In addition, the estimated results of survey worked out the meat availability to be 2.701 kgs per person per year against 2.650 kgs for 2010-11.

Food retailing in India is predominantly a small-scale business. Small family-owned shops typically retail food products in urban residential areas, urban markets and in villages throughout India. These grocery stores mainly sell food commodities. Small independent general stores (similar to grocery stores) retail branded foods. Specialized food stores sell one or two product categories such as bakery products, dairy products, meat, fruits, vegetables, grains, pulses or spices. Specialized food stores are mainly located in shopping markets. Hawkers sell fresh fruits and vegetables on open stalls or handcarts in wet markets. The study was conducted to work out the marketing of meat retailing and to identify the constraints faced by the household in the purchase of meat and by the seller in its marketing.

MATERIALS AND METHODS

Although there were various types of research studies mentioned in literature for conducting study in different disciplines. To collect the relevant information among the respondents in Jammu the present study adopted descriptive type of research design.

Sample area: The present study was carried out in Jammu region. As it was not possible to cover up the entire Jammu regions, thus, conveniently four areas were taken into consideration. To collect the relevant information mentioned in four areas equal number of respondents were chosen in all the respective areas. The Table 1 elaborates the detail coverage structure of the respondents in the Jammu region of J&K state.

Area wise coverage of respondents

Areas	Respondents	Retailers
Gangyal	25	5
Gandhinagar	25	5
Janipur	25	5
Talabtillo	25	5

The study was based on primary and secondary sources of information. The research was conducted with the help of schedule and after collection of the required data, it was subjected for tabular and graphical analysis.

To work out the marketing of meat retailing, the present study incorporated the following variables- Marketing cost of the retailer in supply of chicken/ mutton. It involves the cost of variables like labour, salary, ice, transportation, loading/unloading, rent for shop and other items.

To identify the constraints faced by the household in the purchase of meat and by the seller in its marketing, the study utilized the statements in context to the retailer and consumers and their response were ascertained.

Marketing margin of retailers: To determine the marketing margin of retailers in different regions following steps have been involved in the study:

Quantity purchased (QP)

QP_i = Sale per day *30 days or Monthly sales (MS_i)

Purchase cost (PC)

$PC_i = MS_i$ *Retailers purchase price (RPP_i) or

$PC_i = MS_i$ *RPP_i

Total expenditure (TEi)

TEi = Purchase price (PP_i) + Total cost (TC_i) or

$TEi = PP_i + TC_i$

Total sales (TS_i)

TS_i = Retailers selling price (RSP_i) * (MS_i) or

$TS_i = RSP_i * MS_i$

Market margin (MM_i) of retailers

$MM_i = TS_i - TEi$

Where, i represent retailers selling the meat products in Gandhi Nagar, Janipur, Talabtillo and Gangyal.

Garret ranking technique

$$\text{Per cent position} = 100*(Rij - 0.5)/Nj$$

Where, Rij stands rank given for the i^{th} factor (i= 1, 2……8) by the j^{th} individual (j = 1, 2 …. for urban and rural) and N_j stands for number of factors ranked by j^{th} individual. Once the per cent positions were found, scores were determined for each per cent position by referring Garett's table. Then the scores for each factor were summed over the number of households who ranked that factor. In this way, total scores were arrived at for each of the eight factors and mean scores were calculated by dividing the total score by the number of respondents, who gave ranks. Finally, overall ranking of the eight factors was done by assigning rank 1, 2, 3…8 in the descending order of the mean scores. The same procedure was followed for four different areas of Jammu districts.

RESULTS AND DISCUSSIONS

The marketing cost of the retailers in supply of chicken and mutton in Table 1. It has been observed from the table that retailers' purchase price for chicken was Rs. 90 per kg in all the study area. Whereas, in the case of mutton, it was Rs.310 per kg in all the study areas, except in Gandhi Nagar area where it is found to be Rs. 300/kg.

The per month purchase cost of chicken was found to be highest (Rs. 35,000) in Talabtillo followed by Gandhi Nagar (Rs. 1,21,500), whereas, for Gangyal and Janipur it is found to be (Rs. 108000) each. The per month purchase cost of mutton is found to be the highest (Rs. 2,79,000) in Janipur and Talabtillo area followed by Gandhi Nagar (Rs. 2,25,000) and Gangyal (Rs. 186,000) each. The table further revealed that total marketing cost for chicken was found to be the highest (Rs. 9,000) in Gangyal followed by Janipur (Rs. 8500). Whereas, in case of mutton it is the highest in Tallabtillo (Rs. 20,100) followed by Gangyal (Rs. 19800), Gandhi Nagar (Rs. 18,000), Janipur (Rs. 17,500). Therefore, total per month expenditure for chicken was found to be highest in Talabtillo (Rs. 1,43,000) followed by Gandhi Nagar (Rs. 1,29,500), Gangyal (Rs. 1,17,000) and Janipur (Rs. 1,16,500). Whereas, the total per month expenditure for mutton was found to be the highest in Talabtillo (Rs. 2,99,100) followed by Janipur (Rs. 2,96,500), Gandhi Nagar (Rs. 2,43,000) and Gangyal (Rs. 2,05,800).

As per the retailer's sales price is concerned it is found to be (Rs. 120) per kg for chicken in all the areas whereas, in case of mutton it is found to be (Rs. 350) per kg in all the areas except in Gangyal it is (Rs. 360) per kg. The marketing margin per month for chicken was found to be the highest (Rs. 37,000) in Talabtillo followed by Gandhi Nagar (Rs. 32,500), Janipur (Rs. 27,500),Gangyal (Rs. 27,000), whereas in case of mutton it is the highest in Gandhi Nagar (Rs. 19,500) followed by Janipur (Rs. 18500), Talabtillo (Rs. 15,900), Gangyal (Rs. 10,200).

It has been observed from the Table 2 that the majority of the retailers in Gangyal felt that high cost of

Table 1: Marketing margin of the retailers in supply of chicken/mutton

Retailer's Level	Gangyal		Gandhi Nagar		Janipur		Talabtillo	
	Chicken (40 kg)	Mutton (20 kg)	Chicken (45 kg)	Mutton (25 kg)	Chicken (40kg)	Mutton (30 kg)	Chicken (50 kg)	Mutton (30 kg)
Retailer's purchase price Rs./kg	90	310	90	300	90	310	90	310
Quantity purchased (kg/mnth)	1200	600	1350	750	1200	900	1500	900
Purchase cost (Rs)	108000	186000	121500	225000	108000	279000	135000	279000
Retailer's expenses								
Salary per month	1500	1500	2000	2000	2000	2000	2000	2000
Ice/ Electricity charges (Rs)	3000	2400	3000	3000	3000	3000	2500	2500
Loading/ Unloading	1500	900	1000	1000	1500	1500	1500	1600
Transportation	—	12000	—	10000	—	9000	—	12000
Rent	3000	3000	2000	2000	2000	2000	2000	2000
Total cost	9000	19800	8000	18000	8500	17500	8000	20100
Total expenditure	117000	205800	129500	243000	116500	296500	143000	299100
Retailer's Sale price/Consumer purchase price per kg	120	360	120	350	120	350	120	350
Total sale per month (Rs)	144000	216000	162000	262500	144000	315000	180000	315000
Marketing Margin per month	27000	10200	32500	19500	27500	18500	37000	15900
Marketing Margin (per kg)	22.25	17.00	24.07	26.00	22.95	20.55	24.66	17.66

Table 2: Constraints faced by retailers in the marketing of meat

Constraints	Number of Respondent (N)				
	Gangyal (N=5)	Gandhi Nagar (N=5)	Janipur (N=5)	Talabtillo (N=5)	Overall (N=20)
Not getting remunerative price for the meat	3 (60.00)	3(60.00)	4(80.00)	3(60.00)	13(65.00)
High cost of transportation	4(80.00)	3(60.00)	4(80.00)	1(20.00)	12(60.00)
Losses due to spoilage and markets	1(20.00)	2(40.00)	2(40.00)	1(20.00)	6(30.00)
Dwindling consumer interest in meat	3(60.00)	1(20.00)	3(60.00)	4(80.00)	11(55.00)
Competition from other traders	4(80.00)	2(40.00)	2(40.00)	5(100.00)	13(65.00)

Note: Figure in parenthesis represent the percentage

transport and competition from other traders was a major constraint. Whereas in Gandhi Nagar 60 per cent of the retailers are of the opinion that high cost of transport and not getting remunerative price for the meat. As far as the retailers from Janipur area concerned that 80 per cent of the retailers reported that high cost of transportation and not getting remunerative price as an important problem. In Talabtillo area dwindling consumer interest in meat was found to be major problem as 80 per cent of retailers reported it. Finally, it has been concluded from the table that high cost of transportation appears to be major problem for retailers in Gangyal, Janipur and Gandhi Nagar, whereas, competition from other traders appears to be major problem for retailers in Talabtillo.

Table 3 depicted that the majority of the people (72 per cent) from Gandhi Nagar area felt that poor quality was a major problem for purchasing chicken followed by fear of diseases (64 per cent). Whereas, in the case of mutton (52 per cent) are of the opinion that high price was a major problem followed by fear of diseases (40 per cent). It can be revealed that the majority of the people (72 per cent) from Gangyal area felt that poor quality was a major problem for purchasing chicken followed by fear of diseases (64 per cent). Whereas, in the case of mutton (52 per cent) are of the opinion that high price was a major problem followed by fear of diseases (40 per cent). It can be revealed that the majority of the people (64 per cent) from Janipur area felt that fear of diseases was a major problem for purchasing chicken followed by poor quality (44 per cent). Whereas, in the case of mutton (72 per cent) are of the opinion that fear of diseases was a major problem followed by fear of diseases (52 per cent). It can be revealed that the majority of the people (64 per cent) from Talabtillo area felt that fear of diseases was a major problem for purchasing chicken followed by poor quality (48 per cent). Whereas, in the case of mutton (60 per cent) are of the opinion that fear of diseases was a major problem followed by Non-availability of desired portion of meat (52 per cent).

Furthermore, for identifying the raking of eight factors that are considered important ones by a majority of households in their meat purchases were first identified. These factors were identified in consultation with households and retailers. They included nutritive value, taste, freshness, tenderness, source of availability, price, fat content and easy availability. Each of the selected meat consuming households was asked to rank the above eight factors from rank 1 to rank 8. In this analysis, rank

Table 3: Problems faced by households in the purchase of meat

Problems	Gandhi Nagar		Gangyal		Janipur		Talabtillo	
	Chicken (N=25)	Mutton (N=25)	Chicken (N=25)	Mutton (N=25)	Chicken (N=25)	Mutton (N=25)	Chicken (N=25)	Mutton (N=25)
High price	-	13(52.00)	-	13(52.00)	10(40.00)	18(72.00)	-	12(48.00)
Lack of availability	-	9(36.00)	-	9(36.00)	-	-	-	-
Poor quality	18(72.00)	-	18(72.00)	-	11(44.00)	-	12(48.00)	10(40.00)
Non-availability of desired portion of meat	10(40.00)	7(28.00)	10(40.00)	7(28.00)	6(24.00)	18(72.00)	-	13(52.00)
Fear of diseases	16(64.00)	10(40.00)	16(64.00)	10(40.00)	16(64.00)	13(52.00)	16(64.00)	15(60.00)

1 meant most important factor and rank 8 meant least important factor. In the next stage, rank assigned to each factor by each individual was converted into per cent position using the formula mention in the methodology section. Once the per cent positions were found, scores were determined for each per cent position by referring Garett's table. Then the scores for each factor were summed over the number of households who ranked that factor. In this way, total scores were arrived at for each of the eight factors and mean scores were calculated by dividing the total score by the number of respondents, who gave ranks. Finally, overall ranking of the eight factors was done by assigning rank 1, 2, 3…8 in the descending order of the mean scores. The same procedure was followed for four different areas of Jammu districts. Table 4 and Figure 1 shows that in the purchase of meat, the Gangyal and Janipur households were concerned most about the nutritional value followed by taste, freshness and tenderness. The Gangyal and Janipur households bothered the least about price and easy

Table 4: Factors considered in meat purchase decision

Factors	Gandi Nagar		Gangyal		Janipur		Talabtillo	
	Mean Garrett's score	Rank	Mean Garrett's score	Rank	Mean Garrett's score	Rank	Mean Garrett's score	Rank
Nutritionalvalue	64.12	II	73.00	I	73.00	I	64.12	II
Taste	72.52	I	41.52	VI	64.12	II	72.52	I
Freshness	41.52	VI	56.96	III	56.96	III	49.24	IV
Tenderness	56.96	III	64.12	II	49.24	IV	56.96	III
Source ofavailability	49.24	IV	37.12	VII	47.08	V	41.52	VI
Price	37.12	VII	31.28	VIII	41.52	VI	47.08	V
Fat content	31.76	VIII	47.08	V	37.12	VII	31.28	VIII
Easy availability	47.08	V	49.24	IV	34.00	VIII	37.12	VII

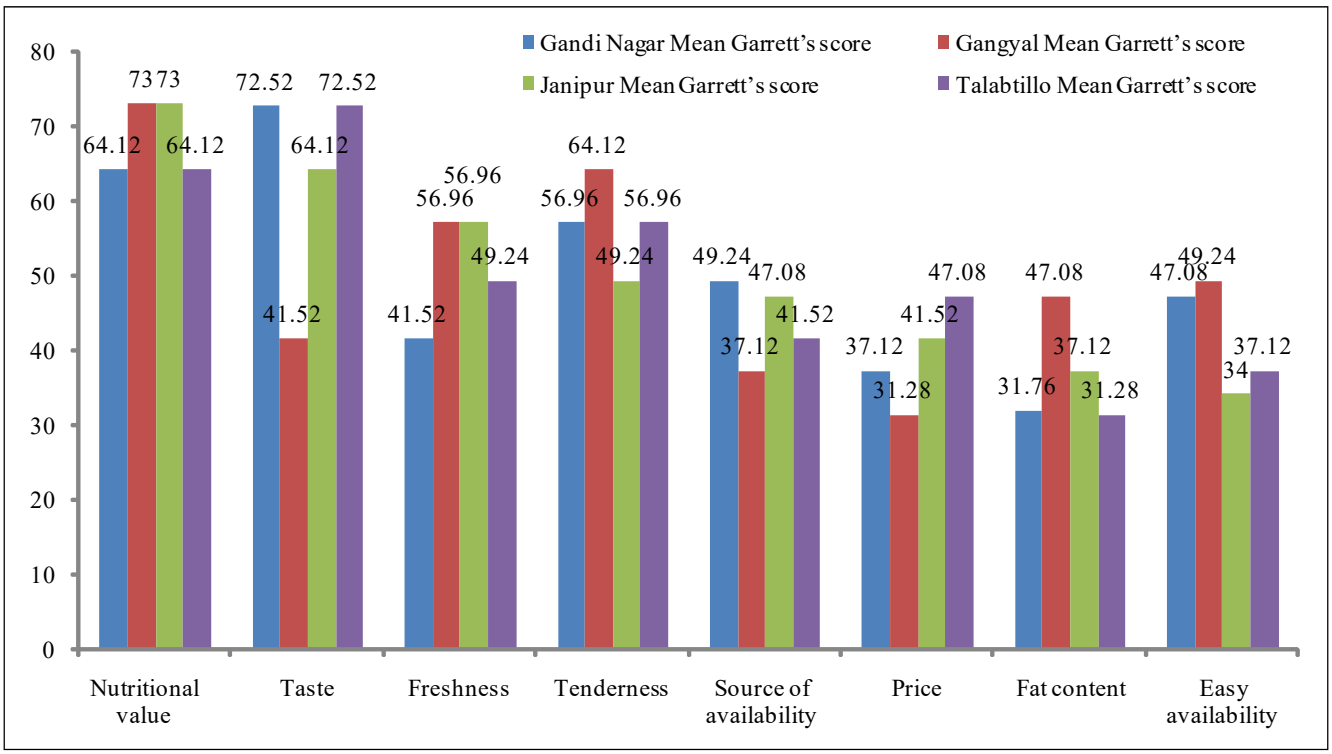

Figure 1: Factors considered in meat purchase decision

availability of meat. In respect of Gandhi Nagar and Talabtillo households, taste of meat, were ranked 1st and fat content was ranked last.

CONCLUSION

The present study concluded that Gangyal make expenditure on meat more than the other three areas in terms of consumer preference for different types of meat in four areas is concerned..It has been concluded from the study that leg in chicken and mutton followed by liver are in particularly consumed by the respondents in these areas. While determining the factors responsible for making preference and consuming meat, the taste appears to be having first rank in Gandhi Nagar and Talabtillo whereas fat content the least. On the other hand appears nutritional value appears to be highest rank i.e., I in Gangyal and Janipur whereas price and easy availability appears to be least. While identifying the constraints faced by household and retailers the poor quality for chicken and high price for mutton appears to be the major hindrance or constraints faced by the households in four areas and on the other hand high cost of transportation appears to be major problem for retailers in Gangyal, Janipur and Gandhi Nagar. Whereas competition from other traders appears to be major problem for retailers in Talabtillo. The study concluded that marketing margin per kg is highest for mutton in Gandhi Nagar Rs. 26.00/kg and for chicken in Talabtillo Rs. 24.66/kg respectively.

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Quality Status of Wheat Seed in Eastern India and the Early Vegetative Growth of Wheat (*Triticum aestivum* L.) in Relation to Size of Seed

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ABSTRACT

Wheat crop in the North Eastern Plain Zone (IGP) of India, is the part of one of the largest agricultural production systems viz., rice-wheat rotation, occupying more than 11 million ha. The yield potential of wheat in the North Eastern Plains Zone of India is about 4.5 tons per hectare but generally, farmers realize a yield of only 2.2 tons per hectare. Seed replacement rate of wheat in different eastern states has also been quite low. A study was initiated at the Indian Agricultural Research Institute, Regional Station, Pusa (Samastipur) in 2014-15 to evaluate germination and seedling growth parameters of wheat grown from seeds of varying size. Experiments were conducted on quality evaluation of different seed grades of bread wheat available to the farmers for sowing to study the status of quality vis-à-vis size grading and what is its effect on germination and early dry matter gain with two objectives of this investigation. First, to assess the physical quality of wheat seed available to farmers in North Eastern Plains Zone (which is also known as lower Gangetic plains) in terms of seed size and seed grading and second, to determine the relationships between seed size on one hand and germination and seedling developmental and biomass traits on the other. This paper presents the results of an enquiry into the status vis-à-vis seed grading, of seed lots of wheat which are available to farmers for sowing with the aim of estimating the extent to which the quality of wheat seed can be improved by merely grading and to establish the relation between seed size and crop establishment. From the results of this study, it can be inferred that 67.97% of area in North eastern plains zone (NEPZ) of India is sown with seed either saved by farmers or obtained locally. Use of sub-standard seed may be counted prime among many factors responsible for low productivity of wheat in lower Gangetic plains. Only seeds from authentic sources were found to be properly graded. It was also observed that wheat seed supplied by registered companies are as good in terms of grading and germination as seeds supplied by government organizations including national and state seed corporations. Graded seeds not only have higher germination ability but also higher seedling vigour in terms of dry matter gain in seedlings during early vegetative growth phase.

Keywords: Wheat, Seed, Vegetative, Relation

INTRODUCTION

In India, wheat covered about 30.23 million hectares area during 2015-16 *rabi* season and accounts for about 93.50 million tons production (Anonymous, 2016a). Wheat crop in the North Eastern Plain Zone (IGP) of India, is the part of one of the largest agricultural production systems viz., rice-wheat rotation, occupying more than 11 million ha (Ladha *et al.*, 2003). It accounts for more than 36% of the area of wheat grown in the region. The yield potential of wheat in the North Eastern Plains Zone of India is about 4.5 tons per hectare but generally, farmers realize a yield of only 2.2 tons per hectare (Anonymous, 2016b). Seed replacement rate of wheat in different eastern states has also been quite low as shown in Table 1 (Anonymous, 2016 a).

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Table 1: Seed replacement rate of wheat in different eastern states

States	Area (000'ha)	Production (000't)	Yield (kg/ha)	Increase in yield overcheck variety by use offront line varieties (%)	SRR
Assam	30	35	1167	24.40	28.6
Bihar	2156	4753	2205	25.36	25.7
Chhattisgarh	108	137	1270	16.74	26.5
Jharkhand	161	274	1701	37.51	22.9
Odisha	0.48	0.55	1146	-	32.7
Uttar Pradesh	9645	26874	2786	13.52	37.8
West Bengal	340	960	2825	22.30	40.1
Punjab	3499	16081	4596	6.06	34.4
INDIA	30228	93501	3093	-	-

IMPORTANCE OF SEED SIZE

Seed grading is useful in assortment of quality seed in a seed lot. It is also an important practice for ensuring better crop establishment and to improve efficiency of seeding rate in field. Grading of seed either mechanically or manually making use of the seed morphological features such as size, weight and colour is a regular post harvest management technique for all crops, although the specifications required for grading vary with crop (Agarwal, 1995). When the best plants are hoped for, seedling has to be strong and therefore seed must be stout. One of the main elements in production of a strong seedling is a sound seed.

Wheat certification standards ensure genetic purity, varietal identity, free from noxious weeds, minimal quantities of objectionable weeds and other crop seed, and a germination percentage of at least 85%. However, present certification standards do not address quality characteristics related to seed vigour. Seed quality, as used in this report, relates to those factors which are important in emergence and early crop establishment. The importance of seed size as a factor in the seedling growth has previously been demonstrated by several workers in wheat and other crops. However, this factor has failed to capture attention of certification authorities as well as those responsible for formulating legislations to regulate seed quality. It is generally accepted that seed size may influence seedling development and hence early vigour (Mian and Nafziger, 1994). Seeds of many horticultural crops have been separated by size, weight, and density Separation by seed weight and /or density, as well as seed size, have been reported to offer a means of improving seedling vigour and/or yield for many crops.

A study was initiated at the Indian Agricultural Research Institute, Regional Station, Pusa (Samastipur) in 2014-15 to evaluate germination and seedling growth parameters of wheat grown from seeds of varying size. Experiments were conducted on quality evaluation of different seed grades of bread wheat available to the farmers for sowing to study the status of quality vis-à-vis size grading and what is its effect on germination and early dry matter gain. There were two objectives of this investigation. First, to assess the physical quality of wheat seed available to farmers in North Eastern Plains Zone (which is also known as lower Gangetic plains) in terms of seed size and seed grading and second, to determine the relationships between seed size on one hand and germination and seedling developmental and biomass traits on the other. This paper presents the results of an enquiry into the status vis-à-vis seed grading, of seed lots of wheat which are available to farmers for sowing with the aim of estimating the extent to which the quality of wheat seed can be improved by merely grading and to establish the relation between seed size and crop establishment.

METERIALS AND METHODS

Investigation into comparatively lower productivity of wheat in NEPZ may entail a vast exercise. However, in order to understand the quality of wheat seed available to farmers for sowing and its possible impact on quality of crop, a study to ascertain the status of seed quality was carried out. Seed samples were collected from sporadic locations in Bihar, West Bengal, Jharkhand, Orissa, Chhattisgarh and eastern districts of Uttar Pradesh falling under North Eastern Plains Zone (NEPZ). Selection of locations as well as that of farmers

was random. Samples of seeds of wheat being sown for Rabi crop of 2014-15 during the months of November and December, 2014 were collected from randomly selected locations in fifteen districts of Bihar viz., Samastipur, Vaishali, Darbhanga, Saharsa, Madhubani, Purnia, Khagaria, Buxar, Madhepura, Katihar, Sasaram, Jehanabad, four districts of eastern Uttar Pradesh (Kaushambi, Gorakhpur, Ghazipur and Pratapgarh), four districts of West Bengal (Bolpur, Uttar Dinajpur, Malda and Bardhaman) and two districts of Jharkhand viz., Deoghar and Dumka during the preparation for sowing of *rabi* crop under the 'Project Area' of "IARI outreach programme for strengthening of wheat in North Eastern Plains Zone". A total of 231 samples of different varieties were collected. Only samples containing not less than 300 grams of seed were included in the study. Breeder and foundation seed samples were obtained from those farmers who were under contract with state or national seed corporations, state agricultural universities and ICAR institutes for seed production. A few samples of this category were also collected from *Krishi Vigyan Kendras* involved in seed production programme in this region.

Sources of seeds: The seeds were collected from farmers about to go for sowing, mostly undertaking field preparations or in some cases where sowing was underway. The source of seed was recorded on the basis of information given farmers' themselves.

Size grading and Seed recovery (%) in different component grades: Each sample so collected was divided into six component grades using top screen of 5.5 mm round perforations as recommended by Bureau of Indian Standards (earstwhile Indian Standards Institute) (IS 10892, 1984) and with bottom screen of different sizes with slotted perforations as shown in Table 2. The seeds were screened using a common top screen and varying bottom screens in successions. After separating grade I using 2.75 mm slotted screen (S1), the sample was graded using 2.5 mm slotted apertures (S2) for separating grade II seeds followed by 2.30 mm (S3) for grade III seed, 2.10 mm screen (S4) for grade IV and 1.8 mm screen (S5) for grade V seed from the lot.

Table 2: Screen aperture sizes of sieves used for size grading of samples

Grade	Top screen aperture		Bottom screen aperture		
	Size (mm)	Shape	Screen No.	Size (mm)	Shape
I	5.5	Round	S 1	2.75	Slotted
II	5.5	Round	S 2	2.5	Slotted
III	5.5	Round	S 3	2.3	Slotted
IV	5.5	Round	S 4	2.1	Slotted
V	5.5	Round	S 5	1.8	Slotted
Tailings	5.5	Round	Without perforations		

Aperture size of sieves were calculated using following formula:

$$a = (25.4/b)\text{-}c,$$

where, a = aperture i.e., the cut point (equal errors or partition size) at which a screening process operates in dividing the material screened into two size fractions [measured in mm].

b = mesh count i.e., the number of openings per lineal inch, measured by counting the number of openings from the centre of one wire to the centre of another wire one lineal inch away, and

c = distance between two successive perforations [measured in mm].

The screenings left after separating grade V seeds were weighed for calculating the percentage of the sixth grade. The sixth grade was made up of tailings which were weighed for recording data and immediately discarded. Different grades were stored for further studies and their proportion was calculated as percentage using the following formula:

$$\text{Seed recovery (\%)} = \frac{\text{Wt. of seeds retained in respective sieves}}{\text{Total weight of seeds}} \times 100$$

Samples were analysed for calculation of mean proportion of 'good seed' i.e., (grade I, II and III) and screenings, i.e., (grade IV, V and tailings).

Trueness to type: All the samples collected from farmers' fields were subject to grow out test for confirmation of trueness to type. Plants grown from each sample were examined against a reference plot of the corresponding variety grown from nucleus seed maintained at the station. Each sample was examined as to whether it belongs to the one stated by the concerned farmer, if not cent percent, at least predominantly. If so, it was recorded as belonging to the stated variety. In case the varietal characters did not confirm to the stated variety. Correct identity was established by matching the

diagnostic characters of the predominant types in the population to other standard samples, and if found correctly matching with any of them, identity was recorded as that of the corresponding standard sample.

Seed quality studies: Seeds collected during this survey belong to 18 identifiable varieties developed by different institutions in India. On account of varied pedigree, they incidentally represented wide range of genetic variability. Quality evaluation of different grades of seeds of these varieties was carried out. For this, equal portions of pure seed fraction from all samples belonging to a variety were drawn and composited to make one sufficiently large sample of that variety. Thereafter, samples of all varieties thus constituted were graded into six component grades using the same procedure as used for size grading of samples obtained from farmers' field. The sieves used were the same as mentioned in Table 2. The sixth grade consisted of tailings which were weighed for recording data and discarded thereafter.

Test weight: Thousand seed weight of ungraded sample as well as component grades of all varieties were recorded using an electronic balance.

Germination: Germination test was conducted for seeds of first five grades (Grade I to V) separately. Germination test of an ungraded but cleaned sample was also done side by side for comparison. Germination test of good seed fractions i.e., grade I, II and III taken together and 'screenings' i.e., grades IV and V taken together was conducted. Four replicates of hundred seeds were sown in paper towel medium and kept under the test conditions of 20° ±1°C and 95° ± 3 per cent relative humidity maintained in a germination chamber illuminated with fluorescent light. After the test period of eight days the normal seedlings were counted and the mean values expressed as percentage (ISTA, 1999) to the total number of seeds placed for germination.

Dry matter production (mg per 10 seedlings): After recording the data for germination test, ten normal seedlings from all the samples put for germination test were selected at random, dried in a hot air oven maintained at 85°C for 48 hr and cooled in a desiccators for 30 minutes, and weighed in an electronic digital balance. The mean weight was expressed as dry matter production per 10 seedlings in milligram.

Conditions in which the corresponding crops were grown, with respect to date of sowing, irrigation, fertilizer application and care in post-harvest operations, are not known. Therefore, to expect the resulting seeds to exhibit ideal characters like 1000 seed weight would not be fair. In light of these facts, the quality has been looked at here is only composition of seed lots in terms of proportion of bold, medium small, undersized, shrivelled and broken seeds and other useless material present in the samples collected and analyzed.

$$\text{Seedling dry weight} = Y/ [X- (a+b+c)]$$

Where, Y = Total dry weight of normal seedlings
X= Number of seeds kept for germination
a = Number of abnormal seedlings
b = Number of dead seeds
c= Number of fresh un-germinated seeds

Vigour index: The Vigour index values were computed, adopting the procedure of Abdul-Baki and Anderson (1973) as given below and expressed as whole number-

Vigour index II= Germination (%) x seedling dry weight (mg)

RESULTS AND DISCUSSION

Sources of seed: The sources have been classified into five categories for further tabulations.

Status of grading of seed available for sowing to farmers: From a total of 231, samples 157 samples were found to belong to farmers saved seeds which indicates as high as 67.96% of the samples were farmers' saved seed.

Table 3: Sources of samples of seed and classification of sources into congruent groups

Institutions	Group
State seed corporations, National Seed Corporation, Tarai Development Corporation and NGOs including KVKs run by NGOs.	Govt agencies
State Agricultural Universities and KVKs run by SAUs	SAUs
Breeder and Foundation seeds	Breeder and foundation seed
Private seed companies (Large as well as small)	Private companies
Seed Supplied by Local seed producers (unbranded) and Farmers' own saved seeds	Local and farm saved seed

The mean proportion of tailings and grade V seed in farm saved seed was 4.1 % and 1.7% respectively, making it obvious that such seed lots are subjected to minimal processing which restricts only to removal of broken shrivelled or undersize seeds. In most of the cases, the tailings included seeds of one or more of *Chenopodium sp.*, *Cannabis sp*, *Amaranthus spinosus* and *Phalaris minor*.

Comparison of quality of all purchased seeds: Seeds obtained from government agencies, research institutes, state agricultural universities, private companies with registered brands have been classified together as authentic source (Table 4). Farm saved seeds are not purchased, therefore they have not been taken in this comparison. The mean proportion of good seed (cumulative recovery over sieve with a= 2.3 mm) in seeds from certified sources (breeder and foundation seeds, seeds from seed corporations, KVKs, KRIBHCO, IFFCO etc.) is 93.24% that entails only 6.76% of screenings. The mean proportion of good seed in seeds purchased from non-certified seeds source is 81.80% suggesting 18.2% of screenings. Data analysis of certified class of seed brings out that it contains 92.68% of good seed and 7.32% of screenings. In further analysis it was found seeds from private companies (sold as truthfully labelled) contains 92.66% good seed i.e., 7.3% of screenings which is not very different from certified sources (including breeder and foundation classes of seeds). The truthfully labelled seed from companies are as good in quality as certified class of seed. It points to reliability of seeds from private sector and presents a strong case for public-private sector partnership, need of which is felt and expressed at many fora but concrete action plan on considerable scale is yet to be visible.

Presence of grade IV and V seed indicated towards incomplete removal of seeds with less than 2.3 mm diameter which in turn indicated that seed agencies are either using lower sieve with aperture size less than 2.3 mm or are unable to attain complete removal of grade IV and V material due to any reason concerned with functioning of processing machine (calibration of aspirator or fast run of seed over the sieve).

Identity of samples (testing for genuineness of varieties): In the investigation of trueness to type, it was found that as much as 13 samples were sold in the name of other varieties. The details are presented in Table 5.

Out of these 13 instances, 3 times PBW 343 was sold in the name of other varieties viz., UP 262 (3 times) and once as HUW 234. UP 262 was found to be sold in the name of PBW 343 once. PBW 373 was found to be sold as PBW 343 twice. In one instance CBW 38 has been found to be supplied in the name of UP 262. Lok 1 has been sold in the name of UP 262 twice, PBW 343 once and Sharbati once. This indicates that there is high demand of UP 262, Lok 1, PBW 343 and PBW 373, and that seed is available production in ample quantity with small-time local producers at the same time. In one

Table 4: Composition of seed samples on the basis of seed size

S. No.	Source of seed	Frequency	Proportion of different grades (%) of seed in ungraded samples						Good Seed (Grades I+II+III) (%)	Screen-ings (Grades IV+V+T) (%)	Grade V + Tailings (%)
			I	II	III	IV	V	T			
1	Seed Supplied by Local seed producers (unbranded)	84/231	21.1	24.3	33.5	15.5	3.9	1.7	78.9	21.1	5.6
2	Farmers' own saved seeds	73/231	17.33	23.55	34.47	18.37	4.57	1.71	75.4	24.6	6.3
3	Local and farm saved seed **[S. no. 1 +2]**	**157/231**	**19.23**	**23.92**	**33.99**	**16.94**	**4.23**	**1.68**	**77.14**	**22.9**	**5.9**
4	Private companies	21/231	43.95	27.57	21.05	4.76	2	0.67	92.6	7.4	2.7
5	State seed corporations, National Seed Corporation	31/231	41.27	29.39	21.77	5.21	1.65	0.71	92.4	7.6	2.4
6	SAUs	12/231	52.04	23.75	16.62	4.75	2	0.83	92.4	7.6	2.8
7	Breeder and foundation seed	10/231	49.1	30.7	15.95	3.15	1.1	0	95.75	4.3	1.1
8	**Seeds from authentic source [S. No. 4+5+6+7]**	**74/231**	**46.59**	**27.85**	**18.85**	**4.47**	**1.69**	**0.55**	**93.29**	**6.7**	**2.2**

Table 5: Details of samples sold with changed variety names

Particulars	Sold under variety name	Recognised in grow out test as variety	Frequency
Local supplier	UP 262	Lok 1	2
Farm saved	UP 262	PBW 343	3
Local supplier	UP 262	NW 2036	1
Farm saved	UP 262	CBW 38	1
Farm saved	PBW 343	Lok 1	1
Farm saved	PBW 343	UP 262	1
Local supplier	PBW 343	PBW 373	2
Farm saved	HUW 234	PBW 343	1
Farm saved	Sharbati	Lok 1	1

case NW 2036 was sold as UP 262. Popularity of these varieties, low awareness among farmers about varieties and readiness of non-descript vendors with abundant stocks of these seeds make the environment conducive for sale of seeds of these varieties interchangeably in the name of one another.

In addition, eight samples were reported un-named, referred generically by farmers as '*gharaiya* '(literally meaning home-sourced). The samples were subject to grow out test in order to identify as to whether they belong to varieties in vogue. The details are presented in Table 6.

It is notable that all of them are bold seeded varieties. The one at serial number 5 may possibly belong to one of the umpteen NL types which come from Nepal and are widely cultivated in foothills of Nepal and adjoining areas in Bihar and Uttar Pradesh. The mean good seed component was as high as 89.54% despite being saved in a layman fashion and minimal processing. Strong tendency of the concerned farmers to retain their own seeds for their sowing can be attributed to this fact. Thus, a total of 21 samples constituting 9.1% of the total were sold either in disguised identity or were grown devoid of any identity. It is also pertinent to mention that proportion of screenings on an average in these lots is 20.1% and that of tailings works out to be 1.5%. The average thousand grain weight was as high as 41.3 g. This holds the secret to popularity of these non-identified or non-descript varieties among farmers.

It is evident from Table 7 that seeds up to grade III i.e., seed retained over sieve with aperture size 2.3 mm exhibit germination ability over minimum seed certification standard i.e., 85%. It was found that status of grading of self saved seeds was less than satisfactory. The mean proportion of screenings was as high as 22.86% in 157 farmer saved samples and samples from local suppliers put together as compared to 6.74% in seeds from authentic sources put together. It was highest in farm saved seeds (24.6%) followed by seeds supplied by local producers (21.1%). It was lowest in breeder seed and foundation seed samples (4.4%). High proportion of grade V and tailings (6.3%) present in farmers 'saved seed pointed to lack of processing of seed lots.

Tailings were present in all seeds in varying proportions except in breeder and foundation seeds and highest in farm saved seed (1.71%) followed by samples from seed supplied by local producers (1.66%). In seeds supplied by seed corporations, it was 0.71%, in seed supplied by universities, it is (0.83%) and in seed sold by private companies, it was 0.67%.

Table 6: Details of samples found without variety names

Place from where sample collected	1000 seed weight (g)	Good seed (Grade I+ II+ III) (%)	Screenings (Grade IV+ V) (%)	Variety identified after grow out test
Sahebganj, Jharkhand	38	75	20	PBW 343
Vaishali, Bihar	42	78	21	PBW 343
Coochbehar, West Bengal	46	74	24.5	Sonalika
Gaya, Bihar	36	72.5	26	PBW 154
Darbhanga, Bihar	39	83	16.5	NL
Gorakhpur, U P	43	85	15	CBW 38
Gopalganj, Bihar	45	89	11	K 9107
Lakhisarai, Bihar	41	71	27	Lok 1
Mean	41.3	78.4	20.1	

Table 7: Germination and dry matter production by seeds of different sizes

Variety	Germination (%) of different grades of seed					Dry matter (mg) of different grades of seed				
	Grade I	II	III	IV	V	Grade I	II	III	IV	V
HI 1563	94	98	97	78	69	208	192	188	152	141
HD 2733	88	89	85	79	67	191	182	115	88	72
HD 2824	91	86	80	71	66	230	175	154	125	113
HD 2967	95	91	90	78	68	221	212	177	139	112
CBW 38	90	85	84	80	72	203	165	150	121	94
DBW 17	92	92	85	76	71	5277	220	208	113	72
DBW 39	96	94	98	82	71	214	199	176	101	65
K 9107	98	95	90	70	55	261	192	161	94	71
Lok 1	95	94	94	82	62	240	199	173	111	100
PBW 154	91	93	92	75	63	189	163	101	90	76
PBW 343	88	91	90	78	73	233	195	148	116	84
PBW 373	98	84	86	65	58	251	209	182	142	111
PBW 502	98	96	92	71	52	212	201	179	161	119
PBW 590	89	82	83	79	64	226	204	153	109	78
Raj 4120	96	97	88	71	64	187	162	124	98	71
UP 262	92	91	84	76	65	209	187	153	117	83
NL	90	81	77	63	57	239	215	176	130	96
NW 2036	94	93	94	85	73	226	207	179	129	100
Mean	93.06	90.67	88.28	75.5	65	500.94	193.28	160.94	118.67	92.11
C D at 5%	3.21	2.24	2.05	4.08	5.55	13.16	14.42	18.97	11.66	20.79

Table 8: Germination and seedling dry weight of ungraded seeds, graded seeds and screenings

Variety	Ungraded seed		Graded seeds (Grade I + II+ III)		Screenings (Grade IV + V)	
	Germination (%)	Seedling dry weight (mg)	Germination (%)	Seedling dry weight (mg)	Germination (%)	Seedling dry weight (mg)
HI 1563	91	175	95	194	73	148
HD 2733	75	133	86	169	74	82
HD 2824	77	147	85	181	68	109
HD 2967	83	160	92	199	73	119
CBW 38	79	254	87	198	76	96
DBW 17	82	214	89	248	72	87
DBW 39	81	179	93	201	75	86
K 9107	80	198	94	177	62	86
Lok 1	86	206	94	162	78	103
PBW 154	84	132	92	159	72	74
PBW 343	85	151	89	186	75	93
PBW 373	79	196	87	168	62	129
PBW 502	89	198	94	171	65	144
PBW 590	76	149	85	197	75	91
Raj 4120	78	190	84	229	51	66
UP 262	83	163	92	184	46	115
NL	85	201	85	211	84	194
NW 2036	81	158	85	198	63	57
Mean	81.89	178	89.33	190.67	69.11	104.39
CD at 5%	3.33	14.35	2.76	11.09	4.18	15.98

Proportion of grade I seed may be a good indicator of high vigour of any seed lot. It was highest in the seed supplied by universities where it constituted more than half of the lot (52.04%) followed by breeder and foundation seed lots from various sources (49.1%). Grade I seed formed only 17.3% in farm saved seed and 21.1% in locally produced seed. Preponderant share in farm saved seed and locally produced seed was of grade III seed (a mean of 33.99%) as opposed to only 18.85% of this grade in seeds from authentic source.

Therefore, best seed lots should contain seeds graded over a bottom screen with 2.3 mm aperture. Based on this observation, grades IV, V and tailings have been classified as 'screenings' in this report.

Fourteen out of 18 genotypes could not produce 85% normal seedlings when the ungraded (although cleaned) representative samples was tested for germination ability. Seed grading improved the mean germination from 81.9 to 90.1% while the 'screenings' exhibited a germination of 71% on an average. It implies that their presence in seed lots acts as a drag on germination ability of the seed lot. After analysis of germination, seedling dry weight and vigour index II, it was found that seed size was strongly associated with germination ability and initial dry matter production in seedlings. There is not much of difference in germination of grade I, II and II seeds. However, the differences in ability to produce initial dry matter are significant. Its direct effect on seedling vigour index is clear from Table 9. It points to declining planting value as the seed size decreases.

Table 9: Seedling vigour of seeds of different grades

Variety	Seedling vigour index II		
	Ungraded seed	Graded seeds (Grade I+II+III)	Screenings (Grade IV+V)
HI 1563	15925	18430	10804
HD 2733	9975	14534	6068
HD 2824	11319	15385	7412
HD 2967	13280	18308	8687
CBW 38	20066	17226	7296
DBW 17	17548	22072	6264
DBW 39	14499	18693	6450
K 9107	15840	16638	5332
Lok 1	17716	15228	8034
PBW 154	11088	14628	5328
PBW 343	12835	16554	6975
PBW 373	15484	14616	7998
PBW 502	17622	16074	9360
PBW 590	11324	16745	6825
Raj 4120	14820	19236	3366
UP 262	13529	16928	5290
NL	17085	17935	16296
NW 2036	12798	16830	3591
Mean	14597.39	17003.33	7298.67
CD at 5%	853.32	1027.15	556.94

DISCUSSION

In this context, it is deemed pertinent to reflect that the results revealed in the present study on the influence of size grading by using five sieves of aperture sizes 2.75, 2.5, 2.3, 2.1 and 1.8 mm, the quality of seeds retained in 2.3 mm aperture sized sieves (S3) was higher in terms of germination than the Minimum Seed Certification Standard level for germination. Seed recovered from 2.1 and 1.8 mm sized sieves (S3 and S4) had poorer germination than the minimum standard stipulated for certification i.e., 85%. Balamurugan *et al.* (2004) in sunflower reported a non significant difference in germination between the larger and medium sized seeds. There is a substantial proportion of substandard seed in ungraded lots the presence of which frequently leads to failure of lots from meeting the minimum certification standards for germination. It is possible to separate that part of seed lot which lowers the mean viability of the lot simply by size grading. Singh *et al.* (2016) have recommended use of oblong sieve with 2.3 mm aperture size for ensuring high quality and high recovery of wheat seed. However in this study the sieves used were of 2.3 mm aperture with round slots.

From the above observations, it can be inferred that 67.97% of area in North eastern plains zone (NEPZ) of India is sown with seed either saved by farmers or obtained locally. Use of sub-standard seed may be counted prime among many factors responsible for low productivity of wheat in lower Gangetic plains. Only seeds from authentic sources were found to be properly graded. It was also observed that wheat seed supplied by registered companies are as good in terms of grading and germination as seeds supplied by government organizations including national and state seed corporations. Graded seeds not only have higher germination ability but also higher seedling vigour in terms of dry matter gain in seedlings during early vegetative growth phase. There is a scope of enhancing the seed quality by simply including seed grading as one of the

preparatory steps before sowing of wheat in north eastern plains zone. It is therefore required that farmers may be made aware about concept of seed quality and seed grading.

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A Study of Migration Pattern in Kumaun Hills and Associated Socio-Economic Factors

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ABSTRACT

Migration is the physical movement of people from one place to another in search of improved livelihood and security. The hill and mountainous states of India are the worst sufferers of migration. Uttarakhand is one of the Indian hill states with 10 hill districts. The present study was conducted in Almora district of Kumaun Uttarakhand taking a random sample of 125 rural families from randomly selected 12 villages of six blocks. The objective of the study was to delineate the migration pattern in hills and associated socio-economic factors. Results showed that majority of the sampled families (31.20%) were having more than 3 migrant members. It was found that majority of the migrants (77%) were males. The study revealed that majority of the migrants (46%) were belonged to the age group of 15-30 years. It was also found that majority of the migration (83.33%) occurred from the households belonged to others castes. It was revealed that most of the migration (75%) occurred from the households having no land. It was also found that most of the migration (63.10%) occurred from the households having annual income of Rs 50000/- or less. It was exposed that males were mostly migrated for employment (38%) and females were mostly migrated for marriage (59.76%). The most important factor behind migration from hills was identified to be unemployment. The study suggests that more employment opportunities in terms of diversified farming, IT centres, agro-tourism etc. should be promoted in rural hill areas and it should be supported by infrastructural facilities for education, health, market, electricity, drinking water etc. to retain the rural youths in hills.

Keywords: Migration, Push factor, Pull factor, Hill people, Out migration, In migration

INTRODUCTION

United Nations defined migration as a move from one migration defining area to another, usually crossing administrative boundaries made during a given migration interval and involving a change of residence (UN, 1993). The change in residence can take place either permanent or semi-permanent or temporary basis (Premi, 1990). Migration in terms of physical movement from one place to another in search of improved livelihood and security is continued to be a major phenomenon in the history human kind. When a region or a sector fails to provide livelihood and security to its people, then the people of that region or sector tends to migrate to other regions or sectors which will provide them better livelihood and security. In the modern age of liberization, privatization and globalization, migration has become a global phenomenon. Further the pressure of industrialization adds salt to this incident because it widens the gap between rural and urban areas which results a major shift of the workforce from the rural areas to urban areas for better livelihood and other facilities. In developing and underdeveloped countries where country's economy is based on agriculture, the migration of people from villages to towns is very common. Internal migration is now recognized as an important factor in influencing social and economic development of the developing countries. Industrialization and economic development has another side on the coin which is mass-scale movements of people from villages to towns, from towns to cities, from cities to capitals and from one country to another country. Though the factors of migration are always a matter of debate and should not be made exhaustive but these can be categorized into

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two broad categories- push factors and pull factors. Push factors are those local factors which force an individual to migrate out, while pull factors are those foreign factors which attract an individual to migrate in. Push factors may be low agricultural productivity, lack of livelihood opportunities, poor infrastructural development, absence of basic necessities, lack of social securities etc. whereas pull factors may be the better solutions of these problems. As per as the demographic point is concerned, migration is one of the three basic components of population growth of any region besides fertility and mortality. Fertility and mortality operate within the biological framework and migration influences size, composition and distribution of population. It is an important factor which has a significant effect on the social, economic, cultural and political scenario of both the source and destination of migration.

The migration in India is characterized by temporary or permanent movement of population and workforce from "lag behind" areas to "leap forward" areas for being mostly absorbed in the unorganized sectors. In India, the no. of migrants persons based on the place of last residence was 309 million, which constitute about 30% of the total population of the country (Census of India, 2001). The Constitution of India provides basic freedom to her people to move to any part of the country for residing and earning livelihood as per their choice. Thus, migrants are not required to register themselves either at the place of origin or at the place of destination mentioning the economic, social, cultural and political factors which drive them to migrate. So the analysis of migration is important to understand the people's movement within the country as a response to changes in economic, political and cultural factors (Singh, 1998).

The hill and mountainous states of India are the worst sufferers of migration. Uttarakhand is one of the Indian hill states where 10 districts are hilly among 13 districts. Here large number of population is residing in the rural areas covered by hills. These hill rural areas offers most harsh working and living conditions for its inhabitants. Rural households in hilly areas of Uttarakhand are mostly dependent on subsistence farming. About 75-85 percent of the population of the state is dependent on agriculture for their livelihood (Malhotra, 2005). On the other hand, only a small per cent of geographical area in hills is available for cultivation. Thus, the availability of arable land per person is extremely low in hills even with a very low population density. Besides the burgeoning incidences of wildlife menaces and weather vagaries, the agriculture in hills is limited by sloppy marginal, fragmented and scattered lands and rainfed farming systems which are not suitable for practicing modern farming methods meant for income generation from agriculture (Mukherjee *et al.,* 2015, 2016). Majority of the farm families are unable to grow enough food grains to meet their annual household requirements. Difficult terrain and poor connectivity in hilly areas, unorganized farming community, lack of interest in farming due to uneconomic holding and poor financial condition of the farmers are the latent constraints faced by hill farming community (Paul *et al.,* 2015). Therefore many farm families have been thinking for migration by giving up farming. Due to difficult hilly terrains and lack of infrastructure, the area is also not conducive for industrialization and development of service sector or other alternative source of employment (Singh *et al.,* 2016). The poor status of agriculture, absence of industries and other source of income and employment generating activities have been pushing the rural inhabitants especially the youth for migration from these areas. Over the decades, the migration from the hill rural areas of Uttarakhand has been so substantial that the economy of the state has been started to coin as "Money Order Economy". The state faces the challenge of promoting livelihoods to retain people through local employment and income generation and to enhance their quality of life (Mittal *et al.,* 2008).

Considering the above causes and consequences of migration, there are needs to make this phenomenon a researchable issue and study it in a systematic manner by delineating its pattern and associated factors. The present paper attempts to gain insights on the migration pattern in hills and associated socio-economic factors. The first part of the paper focuses on the migration pattern in hills through categorizing it based on gender, age and purpose, social category, landholding, types of migration and income group, and reasons for migration. The later part of the paper deals with the socio-economic factors associated with the migration in hills.

MATERIALS AND METHODS

Multistage sampling method was followed for sample selection in this study. There are two administrative divisions in Uttarakhand-Kumaon and Garhwal. The

present study was conducted in Kumaon division which was selected purposively. There are 6 districts in Kumaon division. Amongst these districts, five districts *viz.* Almora, Bageshwar, Champawat, Nainital and Pithoragarh are predominantly hill districts and the remaining one *i.e.* Udham Singh Nagar is in plains. Since the present study was planned for the rural areas of hilly districts of Uttarakhand, the district Udham Singh Nagar was discarded at the initial stage of sampling. Amongst five hill districts of Kumaon division, Almora was selected randomly. Six blocks namely Hawalbagh, Lamgara, Dhauladevi, Bhaisiachhana, Chaukhutia and Dwarahat were selected randomly from 11 blocks of Almora district. Two villages from each selected block were selected randomly. Thus, a total of 12 villages *viz.* Matela and Sunaula from Hawalbagh block, Chaukuna and Chaumu from Lamgara block, Bajeli and Balikhet from Dhauladevi block, Kasan and Lweta from Bhaisiachhana block, Dhudalia and Chaukhutia from Chaukhutia block and Almia Gaon and Oliya Gaon from Dwarahat block were surveyed for the purpose of the study. A total of 125 farm families were selected randomly from these villages for focused group discussions to extract migration related information. The primary data obtained through focused group discussions were tabulated and analyzed using simple statistical tools like frequency, percentage and ranking.

RESULTS AND DISCUSSION

Family Members Migrated from Families Residing in Rural Hill Areas: Table 1 shows the percentage of migration from families residing in rural hill areas under study. It was found that majority of the families (31.20%) were having more than 3 migrant members followed by families with 1 migrant member (26.40%), families with 2 to 3 migrant members (24.80%) and families with no migrant member (17.60%).

Distribution of Migrants on Gender Basis: Table 2 depicts the distribution of migrants on gender basis in rural hill areas under report. It was revealed that majority of the migrants (77%) were males and only 23 per cent of the migrants were female.

Table 2: Distribution of migrants on gender basis

Name of Block	Male migrant	Female Migrant	Total
Hawalbagh	39	6	45
Lamgara	41	11	52
Dhauladevi	26	7	33
Bhaisiachhana	35	9	44
Chaukhutia	27	10	37
Dwarahat	29	16	45
Total	197(77%)	59(23%)	256

Distribution of Migrants on the Basis of Age and Purpose of Migration: Table 3 describes the distribution of migrants on the basis of age and purpose of migration in rural hill areas under investigation. It was exposed that majority of the migrants (46%) were belonged to the age group of 15-30 years followed by age group of 31-50 years (28%) and age group of above 50 years (17%). Only 9 per cent of the migrants were found to be fallen under the age group of 1-14 years. It was also identified that the major purpose of migration is employment for which 143 people out of total 256 migrants were reported to be migrated. The second most important purpose of migration covers many things such as business, marriage, natural calamities, treatment, safe drinking water, infrastructure facility, electricity etc. There were 75 people who were reported to be migrated for the aforesaid purposes. The third most important purpose of migration was identified to be education for which 38 people were reported to be migrated.

Table 1: Percentage of migration from families residing in rural hill areas

Name of Blocks	No. of families				
	Families with 1 migrant member	Families with 2-3 migrant members	Families with more than 3 migrant members	Families with no migrant member	Total (N)
Hawalbagh	07	08	04	01	20
Lamgara	03	04	11	03	21
Dhauladevi	09	02	05	05	21
Bhaisiachhana	03	05	07	05	20
Chaukhutia	09	06	03	03	21
Dwarahat	02	06	09	05	22
Total	33 (26.40%)	31(24.80%)	39 (31.20%)	22(17.60%)	125

Table 3: Distribution of migrants on the basis of age and purpose of migration

Purpose ofmigration	Age Distribution of Migrants				Total
	1-14 years	15-30 years	31 to 50 years	Above 50 years	
Employment	-	64	51	28	143
Education	6	21	4	7	38
Others*	16	33	17	9	75
Total	22 (9 %)	118 (46%)	72 (28%)	44 (17 %)	256

Households based on Social category Reporting Different Types of Migration: Table 4 indicates the percentage of households based on social category reporting different types of migration. It was found that majority of the migration (83.33%) occurred from the households belonged to others category followed by households of the ST category (82%), *Brahmins* (63.64%) and *Kshatriyas* (48.47%). The lowest incidences of migration were reported from SC households (38.89%). As far as the duration of migration is concerned, highest percentage (18%) of short term migration was reported from ST households where households of Brahmin and others showed no incidences of short term migration. Highest percentage (75%) of long term migration was reported from households belonged to others category while SC households showed least percentage (22.22%) of long term migration. Highest percentage (30.91%) of permanent migration was reported from *Brahmin* households followed by ST households (30%) whereas SC households showed least percentage (7.41%) of permanent migration.

Table 4: Percentage of households based on social category reporting different types of migration (N=125)

Household based on social category	Short term migration (%)	Long term migration (%)	Permanent migration (%)	Total (%)
Brahmin	0.00	32.73	30.91	63.64
Kshatriya	1.31	35.37	11.79	48.47
SC	9.26	22.22	7.41	38.89
ST	18.00	34.00	30.00	82.00
Others	0.00	75.00	8.33	83.33

Household category based on Landholding Reporting Different Types of Migration: Table 5 shows the percentage of household category based on landholding reporting different types of migration. It was found that most of the migration (75%) occurred from the households having no land followed by households having 1-10 *nali* of land (70%), households having 11-20 *nali* of land (55.93%) and households possessing 21-30 *nali* of land (49.63%). The lowest incidences of migration were reported from households possessing more than 30 *nali* of land (37.50%). As far as the duration of migration is concerned, highest percentage (12.50%) of short term migration was reported from households possessing more than 30 *nali* of land where households possessing no land showed no incidences of short term migration. Highest percentage (50%) of long term migration was reported from households having no land while households possessing more than 30 *nali* of land showed least percentage (25%) of long term migration. Highest percentage (40%) of permanent migration was reported from households having 1-10 *nali* of land followed by households having no land (25%) whereas households possessing more than 30 *nali* of land showed no permanent migration.

Table 5: Percentage of household category based on landholding reporting different types of migration (N=125)

Landholding (*Nali*)	Short term migration (%)	Long term migration (%)	Permanent migration (%)	Total (%)
No land	0.00	50.00	25.00	75.00
>0 <= 10	3.33	26.67	40.00	70.00
>10 <=20	1.90	35.07	18.96	55.93
>20 <= 30	7.19	34.53	7.91	49.63
>30	12.50	25.00	0.00	37.50

Households Category based on Income Group Reporting Different Types of Migration: Table 6 depicts the percentage of household category based on income group reporting different types of migration. It was found that most of the migration (63.10%) occurred from the households having annual income of Rs 50000/- followed by households having annual income of Rs 50001-100000/- (53.64 %) and households having annual income of more than Rs 150000/- (50%). There was no migration reported from households with annual

Table 6: Percentage of households category based on income group reporting different types of migration (N=125)

Income Group	Short term migration (%)	Long term migration (%)	Permanent migration (%)	Total (%)
Upto Rs. 50000	4.85	31.07	27.18	63.10
Rs. 50001-100000	2.73	41.82	9.09	53.64
Rs. 100001-150000	5.00	34.29	10.71	0.00
More than Rs. 150000	5.88	23.53	5.88	50.00

income of Rs. 100001-150000/-. As far as the duration of migration is concerned, highest percentage (5.88%) of short term migration was reported from households possessing annual income of more than Rs. 150000/- where households possessing annual income of Rs. 50001-100000/- showed least incidences of short term migration. Highest percentage (41.82%) of long term migration was reported from households having annual income of Rs. 50001-100000/- while households possessing annual income of more than Rs. 150000/- showed least percentage (23.53%) of long term migration. Highest percentage (27.18 %) of permanent migration was reported from households having annual income upto Rs. 50000/- followed by households having annual income of Rs. 100001-150000 (10.71%) whereas households possessing annual income of more than Rs. 150000/- showed least percentage (5.88%) of permanent migration.

Distribution of Migrants by Reasons for Migration: Table 7 describes the distribution of migrants on the basis of sex and reason for migration from rural hill areas under investigation. It was exposed that males were mostly migrated for employment (38%) followed by permanent shift of the family (21.98%) and education (11.31%). On the other hand, the major reasons behind female migration were found to be marriage (59.76%) followed by permanent shift of the family (21.64 %). Natural calamities in both the cases of male and female migration were identified to be most minor reason for migration.

Table 7: Percentage distribution of migrants by reasons for migration (N=125)

Reasons for migration	Male (%)	Female (%)
Employment	38.00	3.67
Education	11.31	2.54
Business	6.33	0.98
Marriage	2.2	59.76
Natural calamities	0.80	0.33
Moved with household	21.98	21.64
Others	19.38	11.08

Socio-economic factors Associated with Migration as Perceived by the Respondents: Table 8 depicts the factors associated with migration as perceived by the respondents. There are 12 factors identified through focused group discussion with the respondents and these are ranked as per their gravity. The factor behind migration which ranked first was "Unemployment". Other factors forcing migration were as follows: lack of interest of the educated youth in agriculture (rank II),

Table 8: Socio-economic factors associated with migration as perceived by the respondents (N=125)

S.No.	Socio-economic factor	Frequency	Percentage	Rank
1.	Unemployment	120	96.00	I
2.	Lack of interest of the educated youth in agriculture	110	88.00	II
3.	Employment/business opportunities outside the village	95	76.00	III
4.	Lack of health and education facilities	89	71.20	IV
5.	Lack of transport and communication infrastructure	87	69.60	V
6.	Poor agricultural productivity	83	66.40	VI
7.	Shrinkage in land holding due to divisions in family	77	61.60	VII
8.	Unavailability of irrigated land	75	60.00	VIII
9.	Marriage	73	58.40	IX
10.	Natural calamities	73	58.40	IX
11.	Lack of safe drinking water	71	56.80	X
12.	Lack of electricity	71	56.80	X

employment/business opportunities outside the village (rank III), lack of health and education facilities (rank IV), lack of transport and communication infrastructure (rank V), poor agricultural productivity (rank VI), shrinkage in land holding due to divisions in family (rank VII), unavailability of irrigated land (rank VIII), marriage (rank IX), natural calamities (rank IX), lack of safe drinking water (rank X) and lack of electricity (rank X). The study indicates that economic factors are more dominating followed by medical and educational factors.

CONCLUSION

The study deals with the migration pattern in hills covering various aspects of migration. It also identifies some factor which are directly associated with migration from hill as perceived by the villagers. It was evidenced from the present study that majority of the rural hill families were having more than 3 migrant members, majority of the migrants were males, most of the migrants were belonged to the age group of 15-30 years, majority of the migration occurred from the households belonged to others category followed by households of the ST category, most of the migration occurred from the households having no land followed by households having 1-10 *nali* of land, most of the migration occurred from the households having annual income of Rs 50000/-, males were mostly migrated for employment, the major reasons behind female migration were found to be marriage and the most important factor behind migration from hills is unemployment. The study suggests that more employment opportunities in terms of diversified farming, IT centres, agro-tourism etc. should be promoted in rural hill areas with supportive infrastructural facilities for education, health, market, electricity, drinking water etc. to retain the rural youths in hills. Effectiveness of existing agency should have to be enhanced. Reaching higher level of effectiveness and to accelerate the growth, the hindrance in the form of constraints that have emerged must be minimised or removed. To retain youths in agriculture, hill agriculture needs to be more attractive and hassle free. The convergence of agricultural delivery services can be another option to make it possible for the farmers. Increase in farm income and provision of urban facilities in hilly area may help better to retain youth from hills.

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Income Generation by Women Self Help Groups

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ABSTARCT

SHG is a group of 10-20 people from a homogeneous class having common problems, they thrift on a regular basis making small interest bearing loans to their members with the main aim of empowering women. Data collected from 400 SHG's from nine districts represented by different agro-climatic zones revealed that only 277 were sustaining and the remaining had discontinued. Only half of these groups were involved in income generating activities less than half of income generating group members were participating. Further 59.37% were involved in income generating activities even before becoming the member of SHG. There were only 5.78% entrepreneurial groups with only 31.25% with all member involvement. In all the groups outsiders were engaged in entrepreneurial activity beside the SHG members. In 100.0% cases these were family members of group members and in 25.00% non-family members. Half of groups had availed the facility of loan and it was distributed among 90.94% of their members but less than 12.0% amount used for the purpose it was taken. Further, it was found that the entire total amount invested was taken as loan from the banks. It was found that entrepreneurial groups reported higher income per member than from individual income generating activities. Trainings undertaken by the members was found to be useful. Male participation in women group activity indicates that mixed family groups can be more effective in entrepreneurial activities. Mandatory investment from the group savings at initial stages of income generation can help to ensure appropriate utilization of loan and also avoid membership for the purpose of only seeking loans.

Keywords: Entrepreneurial, Income generating, Loan, Training

INTRODUCTION

Self-help group is a self-governed, peer controlled small and informal association of the people with a similar socio-economic background, voluntarily coming through to save regular small sums of money, mutually agreeing and contribute to a common found and to meet their emergency need through self help funds for credit activities has been collected through regular savings deposited by the members of SHGs on the weekly or fortnightly basis.

Self-help group origin in contemporary times can be seen with the efforts of Mohammad Yonus in1983 with the formation of *Grameen* Bank of Bangladesh. He came up with the idea to formally organizing women into groups to start saving money at regular intervals. A group of 10-20 homogeneous people come together, they thrift on a regular basis making small interest bearing loans to their members with the main aim of empowering women.

In India, SHGs are linked to banks for delivery of micro credit and they charge flat interest rates for loan calculations. SHG networks have access to different institutional credit in India. SHG have full support of Government as well as Non-Government organizations. Groups maintain simple records and documents, which exhibit meetings, savings, expenditures and other extracurricular activities. This system eliminates the need for collateral and is closely related to that of solidarity lending widely used by microfinance institutions. To make the bookkeeping simple enough to be handled by the members, flat interest rates are used for most loan calculations. Members make small regular savings contributions over a few months until there is enough capital in the group to begin lending. Funds may then be lent back to the members or to others in the village for

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any purpose. In India, SHGs are 'linked' to banks for the delivery of microcredit.

Self-help groups are seen as instruments for a variety of goals including empowering women, developing leadership abilities among poor people, increasing school enrolments, and improving nutrition and the use of birth control. Financial intermediation is generally seen more as an entry point to these other goals, rather than as a primary objective.

MATERIALS AND METHODS

The study was conducted in the state of Punjab. Out of 22 districts of the state, nine districts were selected to represent different agro-climatic zones of the state. Secondary data regarding the Women.

Number of districts		Number of blocks		Sample	
In the state	Sample	In the state	Sample	Villages	SHGs
22	9	142	60	333	400

Self Help Groups formed by different agencies in the selected districts was collected. From the list of SHG's, the groups registered in 2008-09 were identified. The year of formation was kept consistent to reduce error and bring uniformity in measurement of sustainability period. From these groups a sample of 400 SHGs was selected for data collection. To ensure wider representation, care was taken to select not more than 2-3 SHG from one village. Interview schedule was developed which consisted of items to profile the group. The officials record, personal interviews secondary data from banks/lending institutions was taken.

The groups were classified into dormant and active categories and active groups were further categorized into two groups as follows:

- Individual income generation and micro-financing groups: Those groups in which different members were engaged individually in generating income. Activity was performed either individually or with their family member and in some cases some nonmember.
- Entrepreneurial and micro-financing groups: The groups, which were engaged in an entrepreneurial activity as a group together. Members were jointly engaged in one income generating activity in which different members were performing different activities and in some cases, were even engaging nonmembers.

Data was collected personally through interview method and was tabulated. It was further statistically analyzed to interpret the results.

RESULTS AND DISCUSSIONS

Individual income generation and micro-financing groups: It was found that out of 400 SHG's only 277 were sustaining and the remaining had discontinued.

The perusal of data presented in Table 1 revealed that only 51 (18.41%) groups were involved in income generating activities out of the sustaining groups. There was total 528 members in these 51 groups, but only 256 (48.48%), were involved in any income generating activities. This shows that more than half of the group members were dormant and might had been added to fulfill group formation criteria.

Among the members involved in income generating activities 152 (59.37%), more than half were involved in income generating activities even before becoming the member of any SHG, while only 104 (40.63%) started income generating activity after becoming the member by SHG. The data in the above-discussed table clearly

Table 1: Percentage distribution of members/ groups involved in income generating

Groups/members	f	%
Groups whose members are involved in income generation (n=277 number of sustaining groups)	51	18.41
Members involved in income generation among income generating groups (n=528: Members of groups involved in income generation)	256	48.48
Members involved in income generation before and after becoming members(n=members involved in income generation)		
Were doing it before membership	152	59.37
Started after becoming member	104	40.63

shows that the involvement of the members of SHG in income generating activities after the formation or becoming a member of a SHG is low.

Reena *et al.* (2014) in her study on SHG found that group membership led to economic gain. SIDBI (2008) study also revealed the role of microfinance programme in poverty reduction and in increasing the standard of living of the people. It also increases various opportunities of income generation and people can easily access to bank credit. Sorokhaibain (2014) reported increase in income and employment as a result of group membership.

Entrepreneurial and micro-financing groups: The data presented in Table 2 show the percentage distribution of groups involved in entrepreneurial activities. It was found that out of total 277 sustaining groups, members of only 16(5.78%) groups were involved in income generation at group level.

However, more than half of these groups (68.75%) were engaged in some entrepreneurial activity in which only few members were involved. All members of the group were engaged in one common enterprise in the remaining 31.25% groups. Further analysis revealed that all the entrepreneurial groups had nonmembers engaged in the enterprise. In all the cases family members of some group members were engaged and in 25.00 per cent these nonmembers were the outsiders. This shows that women involve their family members in economic activities of the group. The qualitative data point towards one member and her family taking the lead in entrepreneurial activity and the remaining members involved in production activities. Hence, it became more of family enterprise for which loans from financial institutions could be easily secured in name of SHG and few more women of the groups were provided employment in production activities if the family was not able to produce sufficient quantity on its own. It was concluded from the above discussed table that the number of entrepreneurial groups were very less. Involvement of family members particularly the male members point towards lack of women empowerment in terms of handling different aspects of entrepreneurial activity. It can also be concluded that the groups might had been formed only to convert a family enterprise into a group enterprise for securing loans/credit.

Singh *et al.* (2009) also observed that group activity was limited to very few groups as majority of members were doing the activity individually.

Loan and its utilization: The data presented in Table 3 indicate that out of 277 sustaining groups more than half of groups (53.07%) had availed the facility of loan. The others cited procedural delays and lack of cooperation of the bank officials as major reason reasons for not availing the loan. Singh (2012) also reported that main problems in bank linkages were lack of cooperation, lack of government support, procedural delay, apathetic attitude of bank officials and poor saving rates.

Table 2: Percentage distribution of groups involved in entrepreneurial activities

	f	%
Entrepreneurial groups (n=277 number of sustaining groups)	16	5.77
• Groups with all members involved in entrepreneurial activity (n=16 number of entrepreneurial groups)	5	31.25
• Groups with few members involved in entrepreneurial activity (n=16 number of entrepreneurial groups)	11	68.75
Groups with nonmembers involved in entrepreneurship	16	100
• Family member	16	100
• Non-family members	4	25.00

Table 3: Loan and its use by the group members

	f	%
Groups who took loan (n=277 sustaining groups)	147	53.07
Members distributed among (n=1645: members of sustaining groups who took loan)	1496	90.94
Amount of total loan taken in rupees	31327500	
Average loan per group in rupees (n=147: groups who took loan)	213112.00	
Percentage of balance amount to be returned in rupees	43.91	
Average percentage used for the activity for which loan was taken	11.29	

Out of total 1645 members, the loan was distributed among 1496 (90.94%) of their members. Total amount of loan (Rs. 31,32,7500) was distributed with an average of Rs. 2,13,112 to each group. Further it was revealed that 43.91 percent of total loan amount was still to be returned after five years. Only 11.29 percent of the amount (as reported by SHG members) was used for the activity for which it was taken. This percentage can fall further, if analyzed seeking details of expenses. The above-discussed table gives the clear picture of the use of loan by SHGs members. As reported by SHG members, they put it to use for personal activities.

Table 4: Source of investment for entrepreneurial activities by groups

Source of investment for entrepreneurial activities by groups	
No. of entrepreneurial groups	16
Amount invested (Rs.)	895000
Source wise percentage of amount invested	
From personal savings of members	0
Group saving	0
Bank loan	100.0
Any other	0

Source of investment: The personal information presented in table 4 shows the of amount invested for entrepreneurial activities by groups. It was revealed that in total, all the 16 entrepreneurial groups had invested the amount of Rs. 8,95,000. Further, it was found that the entire total amount invested was taken as loan from the banks. There was no investment from personal savings of members or group savings.

The above-discussed data clearly show that most of people become member of SHG just to avail loan facility from banks at lower interest rates. They merely use this loan for their personal purposes.

Income of members: The data presented in Table 5 indicate that the annual income of members from income generating activity/entrepreneurial comparison. It was found that entrepreneurial groups reported higher income of Rs. 13,438 as compare to an average income from income generating activities per member (Rs. 3,077). It shows that group activity is more beneficial than activities undertaken at individual level. Therefore the above-presented data concluded that working in-group increases the productivity and performance of the group. Kaur (2014) reported an increase in income in the range of Rs.1000-1500 per month.

Training and its usefulness: The data presented in Table 6 indicate that only 8.41 per cent members of the sustaining groups underwent training. Of these, 20.28 percent had undertaken training on group formation. Training on income generating activity/entrepreneurial activity was undertaken by all of them. However, they were not involved in income generation/entrepreneurial activity in which they had undertaken the training. Trainees found the training very useful as shown by the high mean score of 2.74 on the range of 1-3.

Hemalatha (2012) found that majority of the members attended the training offered and all the members who attended training show the initiative to engage in income generating activity. Kaur (2014) found

Table 5: Annual income of members from income generating activity/ entrepreneurial comparison

Income generating activity/ entrepreneurial	**Annual income**
Average income per member from income generating activities (Rs.) (n=total members engaged in income generating)	3077
Average income per member from entrepreneurial activity (n=total members engaged entrepreneurial activity)	13438

Table 6: Percentage distribution of members according to training undertaken and its usefulness

	f	**%**
Total members who took training (n=members of sustaining groups)	249	8.41
• Percentage of members who took x training related to group formation (n=total members who took training)	50	20.28
• Percentage of members who took training related to income generating/entrepreneurial (n=total members who took training)	249	100.0
Usefulness of training (Mean score 1-3)	2.74	

that most of the respondents availed training opportunities provided to them by different agencies for capacity building. On the contrary, Randhawa and Mann 2007 revealed that all the NGO promoted SHGs had received training on SHG orientation as well as training on income generating activities but bank promoted SHGs and government organization promoted SHGs performed badly in terms of capacity building of SHG member. Sorokhaibain (2014) stressed upon efforts on part of the Government, NGOs as well as the banking sector to promote SHGs in the state.

CONCLUSION

Only half of the groups were involved in income generating activities out of the sustaining groups. Among the members involved in income generating activities more than half were involved in income generating activities even before becoming the member of any SHG. Women who were already involved in income generation either became the member of the SHG to avail benefit of group membership such as easy loans from the group / banks or were enrolled as members to project their income generation activity as an outcome of the group membership. It was observed that only half of the members of the groups were involved in income generating activities, were doing these activities individually. Out of these, majority were involved in the activities before becoming the member of SHG. Among the sustaining groups, members of less than 6.0 % were involved in income generating activity in a group as an enterprise, 68.75 per cent of them had very few members involved in the enterprise. The average income in individual activities was found to be very low but income increased in case of entrepreneurial activities. Half of the sustaining groups had availed loan and more than 90. 0 percent of their members had used this loan but very few (less than 12.00%) had used it for the purpose it was availed. Trainings organized for the members were found to be useful. Capacity building of SHG members through vigorous training plays an important role in empowering women for future sustainability of SHGs. There is a crucial need to focus on awareness programme imparting training and developing skills. Focus should be on entrepreneurial development rather than income generation by individual members. Male participation in women group activity indicate that mixed family groups can effectively pursue entrepreneurial activities. Mandatory investment from the group savings at initial stages of income generation can help to ensure appropriate utilization of loan and also avoid membership for the purpose of seeking loans.

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Reaction and Viewing behaviour of Farmer's towards *"Mera Pind Mere Khet"* Programme of Doordarshan Kendra Jalandhar

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ABSTRACT

The study entitled Reaction and Viewing behaviour of Farmer's towards *"Mera Pind Mere Khet"* Programme of Doordarshan Kendra Jalandhar was under taken with the objectives to study viewing behaviour and level of satisfaction of respondents for different aspects and subject matters related to this programme. Three districts namely Ludhiana, Gurdaspur and Muktsar were selected, two blocks were selected from each district, from each block three villages were then selected and ten MPMK viewing farming families were selected from each village. Adult member of each farming family were then selected purposely for study. Thus the total sample comprised of 180 farmers for the present study. The data were collected by personal interview approach method, tabulated and analyzed using appropriate statistical tools. The findings of the study revealed that more than half of the respondents were satisfied from summer and winter timings of the programme. In case of mass media exposure, 42.78% respondents were reading newspaper every day. All the 180 respondents had subscribed farm literature. Study shows positive relationship between age of the farmers and their interest in reading farm literature.

Keywords: Impact, Reaction, Satisfaction level, Viewing behaviour

INTRODUCTION

India is an agrarian country. Most of the people in this country are dependent of agriculture in direct or indirect ways. For the development in Agriculture there is need of providing first hand information to farmers. Television is one of the cheap and quick methods to dissimilate information to farmers (Hansra, 1981). The quick dissimilation of information and knowledge helps to change the farmers attitude, provide technical knowledge and help in the adoption of new technologies. The mass media should be put to service for national development. Among the different mass media radio and television are considered as powerful media, as an institutionalized source of information for creating awareness about the innovation existent with additional information (Bellurkar, 2000). There are numerous of programmes telecasted by Doordarshan in regional languages for providing knowledge and information to farmers. *Mera Pind Mere Khet* is telecasted by Doordashan Kendra Jalandhar in Punjabi language. This programme was started in 1974. Now, this programme is telecasted 5 days a week.

MATERIALS AND METHODS

Data for study were collected personally by interviewing the respondents. The information given by respondents were tabulated by using statistical tools such as coefficient of correlation, frequency, percentage etc.

RESULTS AND DISCUSSIONS

The results in Table 1 shows that from 180 respondents 10.56 per cent respondents were in the age group of 20-30 years, 33.89 per cent respondents were in the age group of 30-40 years, 22.22 per cent respondents were in the age group of 40-50 years and rest 33.33 per cent respondents were in age group of above 50 years. In case of Educational qualification 36.67 per cent of the respondents were middle passed, 27.22 per cent of the

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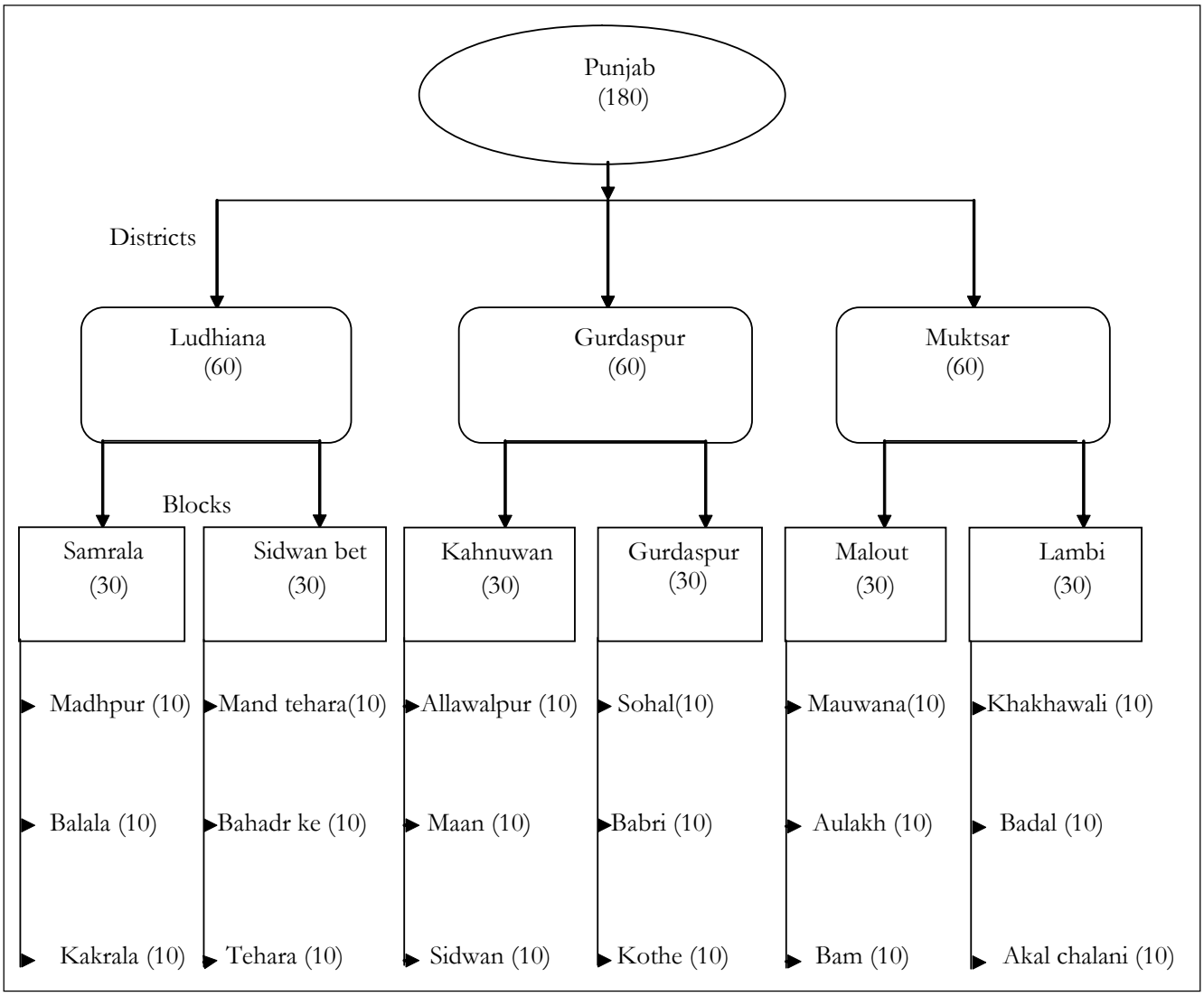

Figure 1: Distribution of respondents according to area of sampling for the study
Note: Figures in parenthesis shows number of respondents

respondents were matric and 17.22 per cent were illiterate. While 12.22 per cent respondents were graduates and rest 6.67 percent were post-graduates. Majority of the respondents (59.34%) belonged to joint families and were married. It is clear that 72.22 per cent of the respondents had no membership with any organization, 15.56 per cent of the respondents had membership of an organization and 7.22 per cent were office holders. Same study was conducted by Bhullar (1987); Kaur and Mathur (1984); Asrani and Kaushik (2008); Singh *et al.* (2014).

It is clear from the Table 2 that 50.00 per cent of the respondents were fully satisfied for timing of MPMK in summer, 44.44 per cent were partially satisfied and 5.56 per cent were not satisfied for timing of MPMK programme in summer. In winter 55.56 per cent were fully satisfied for timing of MPMK programme, 36.11 per cent were partially satisfied and 8.33 per cent were not satisfied for timing of MPMK programme. However 33.33 per cent were fully satisfied about duration of MPMK programme, 62.22 per cent were partially satisfied and 4.44 were not satisfied about duration of MPMK programme. As far as frequency of programme is concerned, 43.89 per cent were fully satisfied, 50.00 per cent were partially satisfied and 6.11 were not satisfied. Sinha (2001) found that the majority of the respondents expressed that the content were 'fully

Table 1: Distribution of respondents according to socio-personal characteristics (n=180)

Socio-personal characteristics	Category	Number of Respondents	Percentage
Age	20-30	19	10.56
	30-40	61	33.89
	40-50	40	22.22
	50 above	60	33.33
Educational Qualification	Illiterate	31	17.22
	Middle	66	36.67
	Matric	49	27.22
	Graduate	22	12.22
	Post-Graduate	12	6.67
Social Participation	No Membership	139	77.22
	Member of An Organization	28	15.56
	Office Holder	13	7.22
	Distinctive Feature	0	0.00

Table 2: Distribution of respondents according to satisfaction level with telecasting timing and frequency of MPMK programme

Satisfaction of viewers with telecasting timing and frequency of MPMK programme	Satisfaction of respondents					
	Satisfied		Partially		Not Satisfied	
	Frequencey	Percentage	Frequencey	Percentage	Frequencey	Percentage
Summer timing	90	50.00	80	44.44	10	5.56
Winter timing	100	55.56	65	36.11	15	8.33
Duration of the programme	60	33.33	112	62.22	8	4.44
Frequency of the programme	79	43.89	90	50.00	11	6.11

Table 3: Distribution of respondents according to their mass media exposure about different mass media

Different mass media	Category	Number of Respondents	Percentage
Newspaper	Everyday	77	42.78
	Some days of week (2-3 days of week)	33	18.33
	Once a week	41	22.78
	Occasionally (2-3 days of month)	7	3.89
	Never	22	12.22
Other T.V. Programme	Everyday	58	32.22
	Some days of week (2-3 days of week)	33	18.33
	Once a week	47	26.11
	Occasionally (2-3 days of month)	38	21.11
	Never	4	2.22
Farm Literature	Package of practice for *Rabi* crops	52	28.89
	Package of practice for *Kharif* crops	56	31.11
	Progressive farming	34	18.89
	Changi Kheti	38	21.11

understandable' with 'easy language' and 'moderately' used technical terms. They also felt that volume and periodicity of the magazine should be increased.

It is clear from the Table 3 that 42.78 per cent of the respondents read newspaper everyday, 18.33 per cent of the respondents read some days of week, 22.78 percent read once a week, 3.89 per cent read occasionally and 12.22 per cent had never read the newspaper. In case of mass media exposure about viewing TV programme 32.22 per cent of the respondents viewed TV programme everyday, 18.33 per cent of the respondents viewed TV programme some days of week, 26.11 percent had viewed once a week, 21.11 per cent occasionally and 2.22 per cent had never viewed the TV

programme. It is clear that 28.89 per cent of the respondents read package practice (*Rabi*), 31.11 per cent of the respondents had read package practice (*Kharif*), 18.89 percent read Progressive farming, 11.67 per cent read Changi Kheti and 9.44 per cent had read all literature. Salem *et al.* (2008) mass media have a great influence on people's awareness, attitude and behavior for reproductive health through different entertainment and educational programmes.

Table 4: Coefficient of correlation between various aspects

Socio-economic characteristics	'r' value
Age and Interest in farm literature	-0.0883
Social participation and mass media exposure	0.5593
Education and exposure about newspaper	0.2259
Educational qualification and exposure about TV programme	0.3901

The results in Table 4 shows that the correlation between age and interest in farm literature was found to be negative. It can be concluded that age and interest in farm literature were weakly uncorrelated and the social participation decrease with the increase in the age and vice-versa. In case of Social participation and mass media exposure the result was found to be positive this shows that that age and utility of programme were moderately correlated and the mass media exposure increase with the increase in the social participation and vice-versa. In case of Education and exposure about newspaper result was found positive. It can be concluded that Education and exposure about newspaper were weakly correlated and the exposure about newspaper increase with the increase in the educational qualification and vice-versa. In case of Educational qualification and exposure about TV programme result was found positive. It can be concluded that Educational qualification and exposure about TV programme were weakly correlated and the exposure about TV programme increase with the increase in the educational qualification and vice-versa. Momi (1980) found that age, education, operational land holding were positively correlated with awareness, liking and utility of farm broadcasts. Ozor and Madukwe (2005) reported a positive relationship between years of experience and technology adoption. Vinayak (1987) reported that age and land holding status were not correlated whereas education level, extension contact status, print media exposure, TV viewing status and farm broad casting listening was found to be correlated with viewers reaction towards *Mera Pind Mere Khet* programme, a telecast of Jalandhar Doordarshan.

CONCLUSION

In this study it is concluded that *Mera Pind Mere Khet* showed effective results on farmers. Half of the respondents were fully satisfied from summer timing and 55.56 per cent were fully satisfied from timing in winter, this show that respondets had high level of satisfaction about the programme. This study shows that farmers also used other methods like farm literature, newspaper to enhance their knowledge. The information provided in the programme found important and farmers were satisfied from duration of the programme. It was found that the education of the farmer play significant role in utilizing the information provided by MPMK.

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Opinion and Satisfaction of Students Regarding Experiential Learning Programme

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ABSTRACT

The present study was undertaken with the objectives to study the opinion and satisfaction level of the students regarding experiential learning programme. One hundred and fifty students who had undergone RAWE during the year 2014 and 2015 were selected randomly for the purpose of study. Experiential learning programme I was organized at campus and Experiential Learning II was organized outside the campus. Data were collected by questionnaire approach. Findings of the study revealed that majority of the students were in agreement to different aspects of experiential learning programme. Overall satisfaction level was found to be high with score range of 12-15 and 10-12 in case of experiential learning programme I and experiential learning programme II respectively.

Keywords: Experiential learning programme, Opinion, Satisfaction

INTRODUCTION

Indian Council of Agricultural Research introduced a programme in 2006 named Experiential Learning Programme aimed at equipping undergraduates with entrepreneurial skills (Lekang *et al.,* 2016). The experiential learning approach is a learner-centered approach and allows an individual student to manage and share responsibility for learning with teachers and farmers. Effective work experience training strategies incorporating rural agricultural experiential learning approach provide opportunities to a student to engage in fieldwork activity and to review and analyze critically this work experience activity so that they prove to be useful in their real-life situations (Anonymous, 2011). The students are attached to the research stations of particular zone and to stay in villages with farm families, agro-based industries, co-operatives NGOs and high-tech cell during different phases of RAWE Programme (Anonymous, 2013). The expected outcomes from the students after this programme are learning new experiences, managing relationships, observe problems, art of negotiation, understand the real life, time management, practicing methods, develop teamwork, feedback, developing art of creative thinking, art of listening, conflict management, understanding recommended technology, understanding real world, money management, working style of local institution, working with local organizations/leaders and confidence building (Chauhan, 2004).The present investigation was undertaken with the objectives to study opinion and satisfaction level of students regarding experiential learning programme.

MATERIALS AND METHODS

The present study was conducted at Punjab Agricultural University (PAU), Ludhiana. A sample of 150 students was randomly selected from the students who had undergone RAWE programme during the year 2014 and 2015. Distributed questionnaire approach was followed to collect the data from the students of Punjab Agricultural University. Data were analyzed with the help of common statistical tools, appropriate to the nature of data and for the purpose of the study.

RESULTS AND DISCUSSION

Opinion of students regarding Experiential Learning Programme I: An opinion is a belief, impression, judgment or prevailing view held by a person.

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For taking the opinion of students regarding experiential learning programme I, different statements were prepared regarding various aspects of experiential learning programme I and the response was taken from the students as agree and disagree.

From the data in Table 1, it was observed that 82 per cent of the students were agreed with the duration of ELP I while 96 per cent of the students felt that content of the exercises were beneficial to them. Large majority of the students that is 95 per cent perceived that ELP I leads to skill development and confidence building. These findings are in agreement with those of (Gowda and Sajeev, 2013). About ninety one per cent of the students felt that ELP I leads to development of entrepreneurial qualities and acquisition of skills helps in earning**.** The findings of the study are in line with (Anonymous, 1999) who reported that experiential learning programme had positively influenced the development level of entrepreneurial competencies of students. Further it was observed that about 78 per cent of the students were of the view that time management for different activities was difficult, about 23 per cent of the students felt that field visits were not sufficient enough, and that it should be organized more in future. About 87 per cent of the students perceived that task allotted to them were useful enough, while majority of the students (89 %) felt that laboratory work being done by them was application of theory. Eleven per cent of the students perceived that laboratory work did not provide them sufficient skills as it was time consuming and hectic. Large majority of the students (95 %) felt that proper documentation was learnt through maintenance of records.

Satisfaction of students regarding Experiential Learning Programme I: Satisfaction is fulfillment of one's wishes, expectations or needs. For measuring the satisfaction of students regarding experiential learning programme I, different statements were prepared regarding various aspects of Experiential Learning Programme I and response was taken as satisfied, somewhat satisfied and not satisfied.

It was observed from data given in Table 2 that 59 per cent of the students were satisfied, about 17 per cent were somewhat satisfied and 24 per cent were not satisfied at all with the duration of ELP I while for the quantity of lab work, about 49 per cent of the students were satisfied, 27 per cent were somewhat satisfied and

Table 1: Distribution of students according to their opinion regarding Experiential Learning Programme I (n=150)

Statements	Agree f (%)	Disagree f (%)
Duration of two months is sufficient	123 (82.00)	27 (18.00)
Laboratory work provides sufficient skills	133(88.66)	16 (10.66)
Theoretical knowledge gained during degree is the basis for laboratory work	137 (91.33)	13(8.66)
Content of exercises are beneficial	144(96.00)	6 (4.00)
Field visits are an application of theoretical knowledge	133 (88.66)	17(11.33)
Field visits are sufficient enough	116 (77.33)	34 (22.66)
Lab work is the application of theory	133 (88.66)	16 (10.66)
Task allotted are useful enough	130(86.66)	20 (13.33)
It leads to skill development and builds confidence	143(95.33)	7 (4.66)
Proper documentation is learnt through maintenance of record	143(95.33)	7 (4.66)
Managing time for different activities is difficult	117 (78.00)	33 (22.00)
Helps in developing entrepreneurial qualities	137 (91.33)	13 (8.66)
Skills acquired helps in earning	137(91.33)	13 (8.66)

Table 2: Distribution of students according to their satisfaction regarding Experiential Learning Programme I (n=150)

Statements	Satisfied f (%)	Some what satisfied f (%)	Not satisfied f (%)
Duration of two months	89 (59.33)	25 (16.67)	36 (24.00)
Quantity of Lab work	73 (48.67)	41 (27.33)	36 (24.00)
Task allotted under ELP1	117 (78.00)	21 (14.00)	12 (8.00)
Maintenance of records	92 (61.33)	35 (23.33)	23 (15.33)
Managing time of different activities	106 (70.67)	13 (8.67)	31 (20.67)

remaining 24 per cent of the students were not satisfied. Majority of the students (78 %) were satisfied with the tasks allotted under ELP I, 14 per cent of the students were somewhat satisfied and rest 8 per cent were not satisfied. It indicated that majority of the students were satisfied with the maintenance of records while 23 per cent of the students were somewhat satisfied and remaining 23 per cent were not satisfied. Further it was revealed that about 71 per cent of the students were satisfied with the time management of different activities, about 21 per cent of the students were not satisfied and remaining 9 per cent were somewhat satisfied.

Level of satisfaction of students regarding Experiential Learning Programme: For measuring the level of satisfaction of students regarding experiential learning programme I response was taken on 3 point continuum that is satisfied, somewhat satisfied and not satisfied and scores were allotted as 3, 2 and 1 respectively. On the basis of the obtained scores the level of satisfaction of students regarding Experiential Learning Programme was classified into 3 categories i.e. low (6-9), medium (9-12) and high (12-15). Data presented in Table 3 indicates that majority of the students (68%) had high satisfaction level while 28 per cent of the students had medium satisfaction level and only 4 per cent of the students were found to be in the category of low level of satisfaction.

Table 3: Distribution of students according to their level of satisfaction regarding Experiential Learning Programme I (n=150)

Level of satisfaction (Scores)	Frequency	Percentage
Low (6-9)	6	4.00
Medium (9-12)	42	28.00
High (12-15)	102	68.00

Opinion of students regarding Experiential Learning Programme II: For taking the opinion of students regarding experiential learning programme II, different statements were prepared regarding various aspects of experiential learning programme II. The response was taken on two point continuum that is agree and disagree.

It is inferred from the data given in Table 4 that about 65 per cent of the students were agreed with the duration of one month, 92 per cent of the students felt that visits to different institutes were important while only 3 per cent of the students felt that interaction with extension personnel does not contribute to confidence building and motivation. Majority of the students (98 %) agreed with the statement that exposure visits develop some qualities among students.

Satisfaction of students regarding Experiential Learning Programme II: For measuring the satisfaction of students regarding experiential learning programme II, different statements were prepared regarding various aspects of Experiential Learning Programme II and response was taken as satisfied, somewhat satisfied and not satisfied. It is clear from the Table 4 that about 61 per cent of the students were satisfied, 17 per cent were

Table 4: Distribution of students according to their opinion regarding Experiential Learning Programme II (n=150)

Statements	Agree f (%)	Disagree f (%)
Duration of one month is sufficient	97 (64.66)	53 (35.33)
Visits to institutes (KVKs, KRIBHCO, Seed production unit etc.) are important	138 (92.00)	12 (8.00)
Interaction with extension personnel helps in boosting knowledge	148 (98.66)	2 (1.33)
Interaction with extension personnel builds confidence	146 (97.33)	4 (2.66)
Interaction with extension personnel motivates for extension work	145 (96.66)	5 (3.33)
Presentations are essential	132 (88.00)	18(12.00)
Exposure visits develop some qualities (of extension worker, trainees) among students	147 (98.00)	3(2.00)

Table 5: Distribution of students according to their satisfaction regarding Experiential Learning Programme II (n=150)

Statements	Satisfied f (%)	Some what satisfied f (%)	Not satisfied f (%)
Duration of one month	92 (61.33)	25 (16.67)	33 (22.00)
Institutes visited (KVKs, KRIBHCO etc.)	130 (86.67)	17 (11.33)	3 (2.00)
Interaction with extension personnel	122 (81.33)	11 (7.33)	17 (11.33)
Presentations of work done	111 (74.00)	20 (13..33)	19 (12.67)

Table 6: Distribution of students according to their level of satisfaction regarding Experiential Learning Programme II (n=150)

Level of satisfaction (scores)	Frequency	Percentage
Low (6-8)	15	10.00
Medium (8-10)	53	35.33
High (10-12)	82	54.66

having somewhat satisfaction and 22 per cent of the students were not satisfied at all with the duration of ELP II.

Regarding visits to institutes about 87 per cent of the students were satisfied while only 11 per cent of the students were somewhat satisfied and it was also found that majority of the students (81%) were satisfied with their interaction with extension personnel, 7 per cent of them were somewhat satisfied and rest 11 per cent were not satisfied at all. Seventy four per cent of the students were satisfied with the presentations, and about 13 per cent of them were having somewhat satisfaction and remaining 13 per cent were not satisfied at all.

Level of satisfaction of students regarding Experiential Learning Programme: For measuring the level of satisfaction regarding Experiential Learning Programme II, response was taken on 3 point continuum that is satisfied, somewhat satisfied and not satisfied and scores were allotted as 3, 2 1 respectively. On the basis of the obtained scores the satisfaction level were classified into 3 categories that is low, medium and high. Data in Table 6 revealed that more than half of the students (54.66%) had high satisfaction level while about 35 per cent of the students were found to be in the category of medium satisfaction level and only 10 per cent of the students had low level of satisfaction.

CONCLUSION

It was concluded that experiential learning programme was highly successful in providing new experiences, understanding the real life situations, art of management to the students. Most of the students were agreed with the various aspects of experiential learning programme. It was concluded that majority of the students was having higher satisfaction level with various aspects of experiential learning programme.

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Extent and Scope of Agriculture Diversification in Baghpat District of Uttar Pradesh

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ABSTRACT

The study was conducted during 2015-17 in Baghpat district of western Uttar Pradesh falling in upper doaba region of Ganga and Yamuna river and represents the agro-eco-socio situation of western Uttar Pradesh 200 respondents were taken for the study. The major problem in diversification perceived and expressed by the farmers were low level of investment, supporting price, technical guidance, transportation of produce, non availability of inputs, improper credit system and lack of developed marketing infrastructure. Animal husbandry & dairy, vegetable production, floriculture were the main choices of the farmers for diversification, however spices, medicinal plants, poultry and pulse were also focused by the sufficient number of farmers for diversification. Farmers suggested that relatively more trainings are required in field of medicinal plants, flowers, vegetables and spices with special reference to plant protection measures, marketing intelligence and post harvest management. However, some of the farmers also suggested requirement of regular training on veterinary aspects for animal and poultry.

Keywords: Diversification, Support price, Backyard poultry, Crop intensification, Credit system & Market-led extension

INTRODUCTION

Diversification refers to increasing the alternative farm production pattern and basket of choice so that farmers can get stability in their farm income, regularity in employment throughout the year and minimizing the risk factor in agriculture production. Commercially, the decision of the farmers to grow a particular crop or go for particular farm enterprises depends on the price, yields, infrastructure and availability of marketing opportunity with their farming situation. Thus, cropping pattern prevailing at a point of time is a reflection of farmers' decision as directed by facilities, available technology and market. Farmers have different views about diversification on crop level as well as enterprises level like dairy, poultry and other. But they have a common view that diversification can play a vital role to increase the productivity per unit area with employment generation. Farmers household with diversified source of income have higher agriculture productivity, input management and human capital like education, communication and social participation which influence for more participation in nonfarm activities (Saha, 2012). These factors play active role in decision making support to diversified agriculture. Diversification is not only important to increase the income and employment generation but it is highly relevant to sustainability of agriculture production system and environment Gill *et al.* (2009).

MATERIALS AND METHODS

The study was conducted in Baghpat district of Uttar Pradesh, 200 respondents were selected from 26 villages falling under all 6 blocks to get the wider representation. Thus farmers whose are cultivating 5-10 hectare land comprised as respondents for the study. A well structured schedule was used to collect the information and opinion of the farmers. The trend of diversification was operationalised according to deviation from the base year 1995-96 for measuring the trend and direction of diversification, the data between 1995-96 to 2005-06 and 2005-06 to 2015-16 were compared to draw the conclusion. The choice of diversification of farmers was

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opertionlised as an expression about selected diversified component by them like dairy, vegetable, floriculture, poultry etc. It was measured in terms of change in area and percentage. Internal diversification towards existing cropping pattern was also quantified. Crop wise area was calculated to measure the trend and extent of diversification with in cropping pattern, the methodology used by Yadav *et al.* (2000) was adopted and to quantify the trend and extent of diversification through changing area in different cropping system the methodology of Kumar *et al.* (2015) was adopted . Simple arithmetic mean and percentage value was the statically tools used to analyze the data.

RESULTS AND DISCUSSION

The cropping pattern of Baghpat district by and large is sugarcane based followed by wheat and fooder, all the three crops occupies three fourth of total cultivable area. The area under sugarcane increased 76000 to 78500 ha and in wheat 22000 to 22230. However, in case of fodder, area slightly decreased 16500 to 16230 between 1995-96 to 2015-16 (Sankhayakhi Patrika of Baghpat district) other crops like jawar, bajara, pulses and millets too have lost their relevance in the cropping pattern. The farmers are not interested to shift towards orchard even some of the case they are felling down their established orchard for cultivation purpose because of management problem and low return from orchard resulting decreased area under orchard upto 7.55% and 24.86% during 1995-96 to 2005-06 and 2005-06 to 2015-16 respectively. However, they are shifting towards vegetable followed by floriculture. Spices and medicinal plant are the new emerging crops where farmers are focusing due to suitability of these crops in existing cropping system and ruminative price. The data presented in Table 1 and 2 reveals that the farmers tried to diversify towards vegetable and flowers during the last two decade. The area under these crops increased up to significant extent. Area under spices and medicinal plants is increasing slowly, however there is slightly increase in agro forestry while area under orchard especially mango orchard decreased drastically. Table 3 and 4 reveals that area under sugarcane and wheat are almost constant during last two decades but significant increase were noticed in area of rice because of popularization of basmati varieties with charming market price. Area under jawar, bajra and other millets decreased drastically while area under potato and other vegetable crops increased up to significant level. In case of oilseed and pulses it is almost constant. Some of the farmers successfully adopted more than one component at a time; many of them put their view as requirement of multiple choices for diversification, so that they can choose better option as per their resources, interest and availability of market. Importance of multioption diversification was also suggested by Singh *et al.* (2010) and highlighted that Integrated Farming

Table 1: Area and percentage under different direction of diversification between 1995-56 to 2005-06

Crop/diversification	Total cultivated area (ha) 1995-96	Total cultivated area (ha) 2005-06	% increase
Vegetable	5.05	13.96	176.43
Fruits	11.75	7.02	-67.37
Flower	0.19	1.45	663.00
Medicinal plants	0.03	0.12	400.00
Spices	0.05	0.25	500.00

Table 2: Area and percentage increased under different direction of diversification between 2005-06 to 2015-16

Crop/diversification	Total cultivated area (ha) 1995-96	Total cultivated area (ha) 2005-06	% increase
Vegetable	13.96	22.24	59.31
Fruits	7.02	7.52	7.12
Flower	1.45	1.98	36.55
Medicinal plants	0.12	0.15	25.00
Spices	0.25	0.55	120.00

Table 3: Area and percentage increased under different crop through diversification/intensification between 1995-96 to 2005-06

Crop/diversification	Total cultivated area (ha) 1995-96	Total cultivated area (ha) 2005-06	% increase
Sugarcane	44.20	52.50	18.18
Wheat	23.00	22.75	-01.08
Rice	08.20	17.50	134.41
Fooder	21.80	17.00	-10.58
Potato	5.25	11.20	113.33
Mustard	04.55	4.35	-04.59
Pulses	04.32	4.85	12.26
Any other crop	10.50	12.50	19.04
Total	**121.82**	**42.65**	**17.09**

Table 4: Area and percentage increased under different crop through diversification/intensification between 2005-06 to 2015-16

Crop/diversification	Total cultivated area (ha) 1995-96	Total cultivated area (ha) 2005-06	% increase
Sugarcane	52.50	39.80	31.91
Wheat	22.75	20.45	-11.24
Rice	17.50	18.50	05.71
Fooder	17.00	15.65	-08.62
Potato	11.20	10.50	-06.66
Mustard	04.35	05.50	26.43
Pulses	04.85	06.25	28.86
Any other crop	12.50	21.55	72.4
Total	**142.65**	**138.2**	**03.22**

system model is a basket of option and farmers can choose appropriate combination of enterprises as per their resources and family need. It was also highlighted that marginal and small farmers can integrate less land required enterprises such as mushroom, backyard poultry and bee keeping in their farming system

Regarding farmers' choice for diversification, it was revealed that farmers are mostly interested in diversification towards dairy followed by vegetable, floriculture and poultry. Cultivation of spices and medicinal plants is the other choice for diversification. In pulses, farmers were growing green gram and black gram as a catch crop between the main crop of *kharif* and *rabi* season. Farmers were very much interested to grow medicinal plant and spices but due to lack of knowledge, procurement facility and assured market they are hesitant. During last two decades some farmers showed the interest in agro-forestry as popular plantation with their existing cropping system. Choice of farmers varied for diversification as per their resources and availability of market. Most of them had preference for dairy and animal husbandry being a traditional occupation. Vegetable cultivation and floriculture are another preferable area for diversification. Land less farmers shown keen interest in less land required occupation like backyard poultry. Importance of backyard poultry for land less farmers was also found by Aahirer *et al.* (2015) and suggested that diversification in agriculture with component like backyard poultry can help enhance the family income, employment generation with insured rich diet for family member and gender equity.

Diversification and mechanization in agriculture had directly and indirectly affected number of livestock. During last four decades the population of buffaloes was almost same as before. But the population of cattle declined from 1915 to 2016, the population of poultry and pig had just increased. The reason behind decreasing the number of cattle is mechanization in agriculture; due to mechanization farmers are frequently replacing the bullock power by tractor. Numbers of buffalos are all most constant because of their utility to draw the bullock cart and high yielding milk capacity as compare of cattle.

Table 6: Position of livestock

Livestock	Year				
	1975	1985	1995	2005	2015
Cattle	1210	905	811	404	312
Buffalo	1205	1109	1280	1303	1327
Piggery	32	42	39	48	31
Goat	102	86	72	88	81
Sheep	36	32	27	31	33
Poultry	54	76	102	108	285

Table 5: Trend of crop diversification through various agronomic mechanism between 1995-96 to 2005-06 and 2005-06 to 2015-16

Crop/diversification	Total diversified area (ha) 1995-96 to 2005-06	% share in diversification	Total diversified area (ha) 2005-06 to 2015-16	% share in diversification
Complete Diversification	42.50	09.34	76.00	17.63
Through Intensification	07.00	1.53	28.00	06.49
Through Intercropping	03.80	0.83	08.50	01.97
ThroughAgro forestry	1.15	0.25	2.50	00.58
Through Multicropping	1.70	0.37	2.80	00.65
Total diversified area	**56.15**	**12.34**	**117.80**	**27.33**

Total area in (1995-96)-455 hectare, total area-(2005-2006))-431 hectare, total area- (2015-2016)-417 hectare

Table 7: Choice of farmers for diversification (N=200)

Kind of diversification	Frequency	Percentage	Ranking
Vegetable	142	17.04	II
Fruit	27	03.24	VII
Mushroom	20	02.40	X
Flower	67	08.04	III
Spice	49	05.88	VI
Medicinal plants	47	05.64	VII
Pulses	6I	07.32	V
Dairy	292	35.05	I
Fisheries	16	01.92	XI
Beekeeping	07	00.84	XIII
Piggery	12	01.44	XI
Poultry	62	07.44	IX
Seed production	22	02.64	VI
Agro forestry	09	01.08	XII
Sericulture	-	-	-
Total	**833**	**100**	

Farmers are using many ways ranging from complete diversification, intensification, intercropping and multicropping. Among those agronomic techniques complete diversification covered maximum, diversified area that was 9.34% during 1995-96 to 2005-06 increased to 17.63 during 2005-06 to 2015-16. Now intensification and intercropping through ruminative crops with main crop are becoming popular. Same was noticed by Kumar *et al.* (2014) and concluded that intercropping of onion with autom planting sugarcane provided more than one lakh additional monitory gain without any extra cost of cultivation.

In reference to training needs, Table 8 reveals that farmers indicated need of training in cultivation of vegetable crops, floriculture, medicinal plants, spices and post harvest technology. They required relatively more emphasis on the aspect of plant protection, input management and marketing intelligence especially in case of flower, vegetable, spices and medicinal plants. Farmers who were associated with animal husbandry and poultry were highly interested for training on veterinary aspect and vaccination. Kumar *et al.* (2011) concluded that every component of farming system has necessity of specific training so that diversified component can take place as an economically viable and sustainable enterprise. Some of the farmers showed keen interest in training on mushroom production as well as production of non conventional and off season vegetable production. Few farmers want to start seed production on commercial level as an agriculture based enterprises, but they do not have sufficient technical and legal update about it and required intensive training. Skill oriented training not only required for farmers but also has to be arrange for extension personal so that they can equip them self with new advancement for further transfer of gained knowledge. The importance of training for extension workers was highlighted by Sodengi *et al.* (1991), Bhagat and Nain (2005); Nain *et al.* (2006); Kumar *et al.* (2007); Raina *et al.* (2011)

Farmers were convinced by advantage of diversification but they were not in action mode because of certain constraints. Lack of financial and marketing support was the major hurdle in diversification. However lack of sufficient knowledge about desirable diversified area and extension support were also identified by most of the farmers as another serious problem followed by

Table 8: Training needs of farmers in different diversified area (N=200)

Kind of diversification	Frequency	Percentage	Ranking
Vegetable and Fruit	102	15.52	II
Dairy and animal husbandry	72	10.95	III
Crop based technology	65	09.89	IV
Flower and ornamental plants	58	08.82	V
Spice and medicinal plants	49	0745	VII
Seed production and procurement			
Poultry and Fisheries	26	03.95	X
Marketing Intelligence Application of ICT in marketing	42	06.39	VIII
Procurement and post harvest management of produced	109	16.59	I
Integration of various component in a single farming system	49	07.45	VII
Vaxination in animals and birds	34	05.17	IX
Mechanization part of agriculture	51	07.76	VI
Total	**657**	**100**	

Table 9: Constraint facing by farmers in diversification (N=200)

Kind of Constraint	Frequency	Percentage	Ranking
Financial	212	20.09	I
Technical	141	13.36	III
Extension	102	09.66	IV
Transportation	32	01.08	XI
Marketing	176	06.68	II
Storage Grading and packaging	76	07.20	V
Application of ICT in information and marketing management	45	04.26	IX
Input Management	23	02.18	XII
Wild Animal	72	06.82	VI
Initiation	64	06.06	VII
Theft and any other kind of damage	41	03.88	X
Risk	62	05.87	VIII
Total	**1055**	**100**	

lack of sufficient number of go downs and chain of cold storage. It was also noticed by Udai *et al.* (2012) and Kumar *et al.* (2015). Majority of the farmers are convinced about necessity of the diversification especially farmers who are having commercial attitude in present challenging scenario, most of them feel that diversification is only way to increase the productivity per unit area with opportunity of employment generation. Most of the farmers thought that being a part of NCR they have bright opportunity for diversification, same time they feel that they are not utilizing that opportunity because of system based constraint and lack of proper marketing infrastructure and low level of investment. The same perception of the farmers were noticed by Kumar *et al.* (2011) and suggested to strengthen market-led extension with specific and commodity based extension service to speed-up of diversification.

Based on the results some suggestion like; Promotion of organized market system and developing marketing hub in rural area, strengthening of market-led extension, organisation of need based skill oriented training, risk covering policy for crop and animal insurance, availability of credit and promotion of integrated farming system approach can be made to promote the diversification in addition to promotion of the post-harvest technology at grass root level.

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Perceived Constraints in Production of Bt cotton by the Growers in Haryana

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ABSTRACT

Cotton is a major fiber crop and used for textile purpose by about 75 per cent of world's population. The present study was conducted in Haryana state to find out the seriousness of the constraints related to input, marketing, technical guidance, production and financial aspects. The most serious constraints perceived by the majority of the farmers among all were failure of crop due to unfavorable weather conditions and high cost of seed. Other constraints related to technical guidance, marketing and financial constraints faced by the respondents were lack of demonstration and trial of Bt Cotton production, low price of farm produce at the time of harvesting and high rate of interest by money lenders.

Keywords: Constraints, Bt cotton, Growers and production technology

INTRODUCTION

Bt cotton has the pride to be the first transgenic crop approved for commercial cultivation in India. Approval of the first Genetically Engineered (GE) cotton (Bt cotton) being an important development was applauded by the scientific community both in India and outside, as a landmark decision paving way for more GE crops in India. According to International Cotton Advisory Committee numerous benefits of this technology accrue to the grower (Anonymous, 2014). The benefits associated with the use of transgenic crops were a dramatic decrease in the use of conventional and broad-spectrum insecticides, target pest specificity, improved yield, lower production costs and compatibility with other biological control agents. As an example, the growing of transgenic modified cotton that expresses insecticidal protein derived from Bacillus thuringiensis Berliner (Bt) is revolutionizing cotton production on a global scale (Head *et al*., 2005).

Bt-cotton was introduced in India in 2002 for commercial production in Southern states followed by Northern states (Haryana, Punjab and Rajasthan) in 2005. Presently, 1340 Bt cotton hybrids have been released and recommended for cultivation in India (Bharud, 2014), which has created a confusing situation for the farmers for choosing the appropriate hybrid. With adoption of Bt cotton, there must be a change in package of practices of cotton as Bt cotton required more crop management than non Bt cotton like usage of micro nutrient (Sulphur, Zinc and Boron), use of refugia crop, use of Plant Growth Regulators or nipping operations and high density planting etc. Studies reveal that only 3% of the farmers reported using refugia crop 1.75 % in Haryana to protect development of resistance in insects. Although Cotton farmers have reaped the benefit of Bt cotton due to decreased number of pesticide spray for bollworm resulting in lower cultivation cost but still are vulnerable to risk in reduction of yield due to several constraints. The present study aims to identify them in detail from farmers' perspective.

MATERIALS AND METHODS

The present study was conducted in two districts *Sirsa* and *Hisar* of Haryana state which have largest area and production under Bt cotton among all the district of Haryana. Multistage sampling technique was adopted for the selection of district, block, village and the ultimate respondents. There are nine blocks in *Hisar* district and six blocks in *Sirsa* district out of these two blocks from

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each district were selected randomly. A list of all the village of the two selected blocks was prepared and two villages from each block were again selected randomly. Thus the eight villages were selected for the study. A village-wise list of Bt cotton growers, was prepared and from that list of 20 farmers were selected randomly. Therefore, 160 Bt cotton respondents from 8 villages were selected for the present study.

To find out the probable constraints which hinder the adoption of improved practices in Bt cotton, an inventory of constraints was prepared on the basis of available literature, personal experience, discussion with experts and farmers growing Bt cotton. A list of constraints was prepared and the farmers were asked to list out their responses against each constraint against the categories 'very serious', 'serious' and 'not so serious' and accordingly weightage given to these response categories were 3, 2, and 1 respectively. Aggregate total was calculated for each constraint separately and on the basis of calculated scores, mean scores, mean score percentage were obtained which were ranked according to their maximum to minimum mean score percentage for assessing the seriousness of constraints. The maximum mean score percentage so obtained was given the rank 1st and the next subsequent one was given the rank 2nd and soon the descending order.

RESULTS AND DISCUSSION

The constraints were studied under five major categories viz.; input related constraints, production related, Technical guidance related, financial aspect and marketing related constraints. The results have been presented in preceding section.

Input related constraints: Majorly, eight constraints related to inputs, faced by the farmers were enlisted and ranked on the basis of weighted mean scores. Table 1 reveals that 'high cost of seeds' was observed as the most serious constraint and it was ranked first with a weighed mean score of 2.78. The constraint; inadequate availability of quality seeds was ranked second with a weighted mean score of 2.63. While other constraints like 'Non availability of inputs on proper time at village level', 'Inadequate credit facilities for the purchase of inputs',' lack of agricultural labour during peak seasons', 'Lack of timely availability of micro-nutrient bearing fertilizers' and 'Lack of availability and high price of quality fertilizers' found place in descending order. The finding also supported with the finding of Godara *et al.* (2012), Visawadia *et al.* (2006).

Production related constraints: The results presented in table 2 highlights that the 'failure of crop due to unfavourable weather conditions' was observed as the most serious constraint and was ranked first with a mean score of 2.72, followed by 'inadequate knowledge regarding insect pest control' with a means core of 2.28, Arshad *et al.* (2007) also found that inadequate knowledge regarding insect pest control and failure of crop due to weather condition. Farmers were very much affected by 'non availability of labour',' lack of irrigation facilities',' lack of knowledge about area specific recommended package of practices', 'Rain immediate after spraying', which were ranked 3rd, 4th, 5th and6th, respectively. The findings are in line with the finding of Shashikant *et al.* (2011) and Singh *et al.* (2013).

Marketing related constraints: Table 3 reveals various constraints faced by the farmers related to marketing of their produce. Among these 'low price of farm produce at the time of harvesting' was ranked 1st with highest mean score of 2.77 followed by 'lack of guidance for proper marketing' with mean score of 1.87. The results are in consonance with Das *et al.* (2014). 'Lack of marketing facilities at village level' was rated as a serious constraint at third rank followed by 'lack of grading system' and 'lack of marketing knowledge' Rani and Selvaraj (2015) also reported lack of marketing knowledge and 'delay in payment by the marketing agencies' as major constraints in their study.

Table 1: Input related constraints perceived by Bt cotton growers

Constraints related to input	VS	S	NSS	Mean score	Rank order
High cost of seed	131	24	5	2.78	I
Inadequate availability of quality seeds	109	43	8	2.63	II
Non availability of inputs on proper time at village level	93	57	10	2.52	III
Inadequate credit facilities for the purchase of inputs	47	101	12	2.21	IV
Lack of agricultural labour during peak seasons	44	79	37	2.04	V
Lack of timely availability of micro-nutrient fertilizers	31	41	88	1.64	VI
Lack of availability and high price of quality fertilizers	19	37	104	1.47	VII

Table 2: Production related constraints perceived by farmers

Constraints related to Production	VS	S	NSS	Mean score	Rank order
Failure of crop due to unfavorable weather conditions	118	39	3	2.72	I
Inadequate knowledge regarding insect pest control	53	98	9	2.28	II
Non availability of labour	57	73	40	2.23	III
Lack of irrigation Facilities	27	92	41	1.72	IV
Lack of knowledge about area specific recommended package of practices (by agencies)	26	51	83	1.64	V
Rain immediate after spraying	19	69	72	1.54	VI

Table 3: Marketing related constraints perceived by Bt cotton growers

Constraints related to Marketing	VS	S	NSS	Mean score	Rank order
Low price of farm produce at the time of harvesting	123	37	0	2.77	I
Lack of guidance for proper marketing	31	76	53	1.87	II
Lack of marketing facilities at village level	52	77	31	1.80	III
Delay in payment by the marketing agencies	17	82	61	1.60	IV
Lack of marketing knowledge	13	73	74	1.62	V
Lack of grading system	34	51	75	1.74	VI

Technical guidance related constraints: The results pertaining to the technical guidance related constraints encountered by the respondents in Bt cotton production are presented in Table 4. The data in table reveals that 'lack of demonstration and trial of Bt cotton production' found 1st place with mean score of 2.76 followed by 'lack of technical guidance of application of pesticides' with mean score 2.37. Hosmath *et al.* (2012) observed that the Bt cotton growers need to be educated through demonstrations. Third rank was secured by the constraint 'lack of knowledge of current advances in Bt cotton production technology' with mean score 2.21. The constraints 'lack of knowledge about fertilizer application' (mean score 2.12), 'lack of Bt cotton specific package of practices' (mean score 1.97), 'lack of knowledge about new farm equipment and machinery' (mean score 1.89), 'lack of knowledge regarding gap filling practice in Bt cotton production' (mean score 1.82) and 'lack of knowledge about the Bt cotton hybrid specific sowing time' (mean score 1.39) followed in order respectively. The finding finds support from the finding of Bondarwad *et al.* (2010).

Financial constraints: It is apparent from Table 5 that among problems related to financial aspects in Bt cotton production the constraint 'high rate of interest by money lender' ranked at top with mean score 2.74, followed by 'lack of knowledge about loan processing system of the bank'. Rai and Singh (2010) also reported similarly and found unstructured bank loan policy. 'Lack of knowledge about bank loan facilities available for the farmers' (mean score 2.40), 'Complicated bank loan processing procedure' (mean score 2.02) and 'lack of finance for purchase of input' (mean score 2.1) were also among major constraints. 'Repeated sowing due to rain at the time of sowing' (mean score 1.63) was reported as constraint in lower order. The finding are in consonance

Table 4: Technical guidance related constraints perceived by Bt cotton growers

Constraints related to technical guidance	VS	S	NSS	Mean score	Rank order
Lack of demonstration and trial of Bt Cotton production	124	34	2	2.76	I
Lack of technical guidance regarding application of pesticides	78	63	19	2.37	II
Lack of knowledge of current advances in Bt Cotton production technology	57	79	24	2.21	III
Lack of knowledge about fertilizer application	63	57	40	2.12	IV
Lack of Bt Cotton specific package of practices	43	69	48	1.97	V
Lack of knowledge in operating new farm equipment and machinery	49	43	68	1.89	VI
Lack of knowledge of gap filling practice in Bt cotton production	37	58	65	1.82	VII
Lack of knowledge about the Bt cotton hybrid specific sowing time	17	29	114	1.39	VIII

Table 5: Constraints perceived by Bt cotton growers related to financial aspect

Constraints related to finance	VS	S	NSS	Mean score	Rank order
High rate of interest by money lenders	128	23	9	2.74	I
Lack of knowledge about loan processing system of the bank	39	83	38	2.52	II
Lack of knowledge about bank loan facilities available for the farmers	93	38	29	2.40	III
Lack of finance for purchase of input	63	58	39	2.15	IV
Complicated bank loan processing procedure	37	89	34	2.02	V
Repeated sowing due to rain at the time of sowing	23	56	81	1.63	VI

with the findings of Visawadia *et al.* (2006) and Ramasundaram *et al.* (2007).

CONCLUSION

On the basis of the findings, therefore, it may be concluded that the most serious constraints perceived by the farmers were high cost of seed, failure of crop due to unfavourable weather condition, low price of farm produce at the time of harvesting, lack of demonstration trail of Bt cotton production and high rate of interest by money lenders. Bt cotton cultivation can be increased by providing quality seeds at affordable price, ensuring input supply at a competitive rate and creation of knowledge regarding institutional credit facilities available at cheaper interest rate. This requires that extension system to reorient their programmes according to the expressed constraints. Special arrangement for research farm visit, support of weather related advisories, arrangement of bankers- farmers-scientists interface, creation of awareness regarding e-NAM and other market linkages are some of the grey areas need to be focused in extension programmes so that Bt cotton growers can harvest benefits in term of higher yield and income.

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Occupational Status of Home Science Graduates and Post graduates of Punjab Agricultural University, Ludhiana, Punjab

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ABSTRACT

Home Science education offers excellent opportunities for women to be efficient manager and dedicated employer. But due to lack of linkages among educational institution and industry there is a mismatch between supply and demand. The present study was planned to identify the educational and employment status of Home science graduates and Post graduates of Punjab Agricultural University, Ludhiana. Result of the study indicated that 45.40 per cent and 30.27 per cent of the total respondents were having the highest qualification of M.Sc. and PhD in Home Science respectively. Majority of the respondents after graduation (63.04%) and after post graduation (30.88%) opted for higher studies and 26.08 per cent respondents after B.Sc., 23.52 and 32 per cent after M.Sc. and Ph.D. respectively were home makers. The main reason for doing job was economic independence (49.42%). Majority of B.Sc. and M.Sc. students reported that they did not opt for job because they continued further studies (44.89%). Besides, lack of opportunities (32.65%) was the other reasons for not doing job.

Keywords: Home Science, Education, Employment and Occupational status

INTRODUCTION

In today's economy, there is greater emphasis on knowledge and skill rather than labour, capital or land. The former provides an individual not only with the competencies but also modifies forces in the environment for the attainment of the desired goals. In the new millennium, a knowledgeable society will play a vital role in constructing a new history of humanity. A knowledgeable and skilled society can be one of the underpinnings to understand the vision for the developed India. The prime mover of prosperity and power is knowledge, whose efficient use can create wealth and improve the quality of life.

Education is a powerful and pervasive driving force for enhancing knowledge and for overall development of individual and social transformation. This alone can sustain culture and civilization. Education enables individuals to discharge their economic, social, political, cultural, and spiritual, functions efficiently, thereby enhancing their status, position in the society, prestige and quality of life.

According to Swaminathan (1997), education is one of the five energies of human resource development; the others are health and nutrition, environment, employment, and political and economic freedom. These five energies are interlinked and independent, but education is the key for the rest.

Home Science Education offers excellent opportunities for students to be good home maker, efficient manager and dedicated employer. Till 1997, the Home Science programme in SAU's was of general nature having three years duration of Bachelor's degree. Later as per the recommendations of third and fourth Dean's committee of ICAR, it was decided to have B.Sc. Home Science degree programme of four years duration with thrust on entrepreneurial skills, In-plant training and rural awareness work experience. Therefore, it was planned to know up to what extent this programme is helpful in preparing students for various employment and self- employment opportunities."Home Science develops necessary competence required for the better home making and family living among the students. It prepares the students for gainful employment and worthy

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citizenship which is a requirement of any democratic society.

MATERIALS AND METHODS

The study was carried on graduates and post graduates of College of Home Science, Punjab Agricultural University (PAU), Ludhiana. All the Home Science graduates and post graduates who had completed their B.Sc. /M.Sc. / PhD. in field of Home Science from college of Home Science, Punjab Agricultural University during the period 2011-2014 were selected for the purpose of the study. Present contact numbers and e-mail id's of Home Science graduates and post graduates would be obtained from different sources (office of Dean College of Home Science, PAU, Ludhiana), friends and parents of the pass out students. Total number of students pass out during these years was 207. Questionnaire was mailed to all 207 students but response of 185 students was received. So, the sample size for the present study was 185 respondents B.Sc. (92), M.Sc. (68) and Ph.D. (25).

RESULT AND DISCUSSION

Admission criteria and reasons for opting B.Sc H.Sc. programme: It is evident from the Table 1 that majority of the respondents took admission through open category (78.91%) while the remaining respondents took admission through reserved (9.72%), ICAR nominee (6.48%) and sports category (4.86%). Further, 23.78 per cent of respondents said that they had taken admission in Home Science by their own interest and nearly 22 per cent of the respondents reported that easy accessibility of PAU was the reason for opting B.Sc. Home Science and 6.48 per cent took admission in Home Science because there was no other option available.

Table 1: Distribution of respondents according to their admission category and reasons for opting B.Sc H.Sc programme (n=185)

Category & reasons of admission	Total No. of Respondents f (%)
Category	
Open	146 (78.91)
Reserved	18 (9.72)
Sports	9 (4.86)
ICAR nominee	12 (6.48)
Reasons for opting B.Sc Home Science	
My own interest in field of the study	44 (23.78)
Applicability of the course of study in real life situation	38 (20.54)
There was no other option	12 (6.48)
Parents interest	22 (11.89)
More job opportunities	29 (15.67)
Easy accessibility of educational institution	40 (21.62)

Level of Education: The current level of education of the respondents was also studied and Table 2 reveals that 45.40 per cent and 30.27 per cent of the total respondents were having the degrees of M.Sc. and Ph.D. in Home Science respectively. Only few of the respondents i.e.1.62 per cent deviate from the field of Home Science to other fields after graduation.

Table 2: Level of Education of the respondents (n=185)

Level of Education	Total no. of Respondents f (%)
B.Sc. Home Science only	21 (11.35)
B.Sc & B.Ed	13 (7.02)
B.Sc.+Diploma	8 (4.32)
M.Sc Home Science	84 (45.40)
MBA	2 (1.08)
PhD	56(30.27)
D. Pharmacy	1 (0.54)

Reasons for not opting higher studies: The data regarding reasons for not opting higher studies were recorded through multiple response in table, findings revealed that from all the reasons for not opting for higher studies, family not interested (85%) was the major reasons followed by marriage of the respondents (82.50%). So, it can be concluded that respondents were not able to continue/ opt for higher studies due to their family obligations. Findings of the study are in conformity with the findings of Godawat (2004) who also found that due to family problems respondents were not able to opt for higher studies.

Table 3: Distribution of respondents according to the reasons for not opting higher studies

Reasons	B.Sc. (n_1=24) f (%)	M.Sc. (n_2=16) f (%)	Total (n=40) f (%)
Not interested	12 (50.00)	9 (56.25)	21 (52.50)
Marriage	21 (87.50)	12 (75.00)	33 (82.50)
Inconvenience	14 (58.33)	5 (31.25)	19 (47.50)
Economic problems	18 (75.00)	11 (68.75)	29 (72.50)
Family not interested	20 (83.33)	14 (87.5)	34 (85.00)
Lack of opportunities	15 (62.50)	13 (81.25)	28 (70.00)

Multiple response

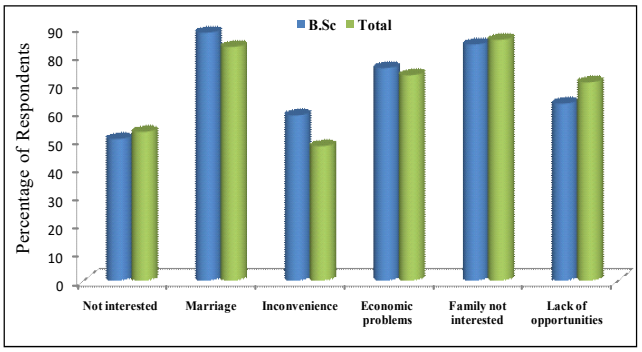

Figure 1: Distribution of respondents according to Reason for not opting higher studies

Employment and occupational status: Further an endeavour was made to find out the type of employment, occupation and vocation in which Home Science graduates and post graduates were enrolled. An inspection of table 4 revealed that majority of the respondents after graduation (63.04%) and after post graduation (30.88%) opted for higher studies. The findings also revealed that 26.08 per cent respondents after graduation, 23.52 and 32 per cent after M.Sc. and PhD respectively were home makers. As for as teaching is concerned 1.08, 20.58 and 68 per cent of the respondents after B.Sc., M.Sc. and PhD respectively were engaged in University, College or school teaching jobs. Negligible numbers of respondents were enrolled in bank, extension officer, police department etc. Findings are also similar to the result of Kaur (1996) and Anonymous (1988).

So, it can be analyzed that 10.86, 45.58 and 68 per cent of respondents were employed after B.Sc., M.Sc. and PhD respectively. Self employment status of respondents was not found to be encouraging as only 2.17 per cent after B.Sc., 4.41 per cent after M.Sc. and none of the student after Ph.D. was self-employed. Findings are also in tune with Maya *et al.* (2009) in which they found that 5.33 per cent of the respondents were engaged in independent profession So, it can be concluded that even after introduction of In-plant training and experiential learning. Students were not able to utilize their skills in self employment activities.

Reasons for doing and not doing job: As revealed from Table 5, amongst all the respondents, more than half were doing job due to economic independence (51.19%), followed by improvement in social status (33.33%), professional growth (29.76%), addition to the family income (22.62%), utilization of talent/ capabilities for the benefit of the nation (20.24%), cover the risk of life (20.24%) and use of leisure time (17.86%) being the other reasons for doing job. Findings of the study are in tune with the those of Kaur (1996), Sandhu (1985) and Kaur (1994) that women wanted to be economically independent which was the major reason for doing job.

Amongst those who did not go for job majority reported that they did not opt for job because they continued their studies (43.56%). Besides, lack of opportunities (31.68%), parents/ husband did not allow

Table 4: Employment and occupational status of Home Science Graduates and Post graduates

Employment and occupational status	After B.Sc. (n_1=92) f (%)	After M.Sc. (n_2=68) f (%)	After PhD (n_3=25) f (%)
Homemaker	24 (26.08)	16 (23.52)	8 (32.00)
Dietician	2 (2.17)	4 (5.88)	-
Teaching			
University	-	1 (1.47)	6 (24.00)
College	-	7 (10.29)	5 (20.00)
School	1 (1.08)	6 (8.82)	3 (12.00)
Research job	-	6 (8.82)	3 (12.00)
Entrepreneur/ Self employment	2 (2.17)	3 (4.41)	-
Further study	58(63.04)	21 (30.88)	-
Stock exchange	1 (1.08)	1 (1.47)	-
Bank	2 (2.17)	1(1.47)	-
Continental chef	1(1.08)	-	-
Working in police department	1 (1.08)	-	-
CDPO	-	1 (1.47)	-
Women extension officer	-	1 (1.47)	-

Percentage of Respondents

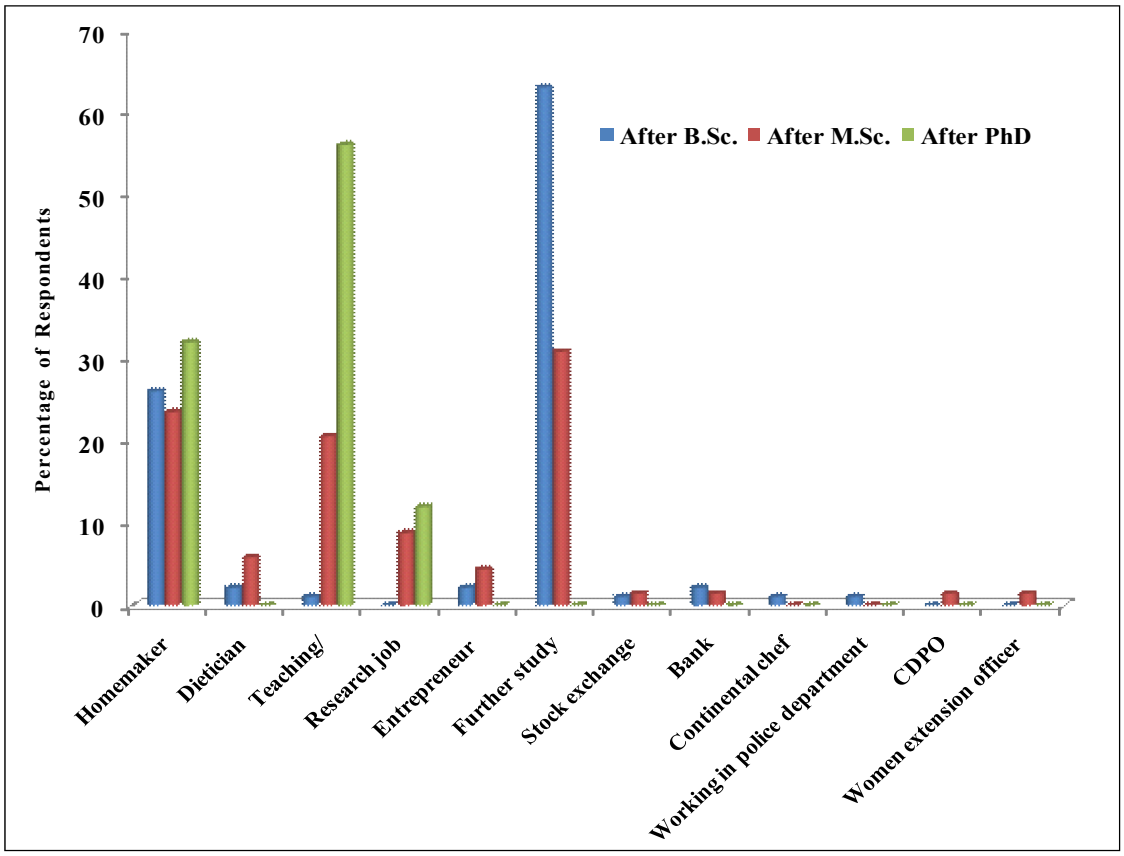

Figure 2: Distribution of respondents according to employment and occupational status

Table 5: Distribution of respondents according to their reasons for doing and not doing job

Statement	B.Sc (n_1=39) f (%)	M.Sc (n_2=31) f (%)	PhD (n_3=14) f (%)	Total (n=84) f (%)
Reasons For doing Job				
Economic independence	16 (41.03)	18 (58.06)	9 (64.28)	43 (51.19)
Professional growth	11 (28.21)	9 (29.03)	5 (35.11)	25 (29.76)
Addition to the family income	7 (17.95)	5 (16.13)	7 (50)	19 (22.62)
Improvement in social status	9 (23.08)	11 (35.48)	8 (57.14)	28 (33.33)
Utilization of talent/ capabilities	6 (15.38)	7 (22.58)	4 (28.57)	17 (20.24)
Use of leisure time	7 (17.94)	4 (12.90)	4 (28.57)	15 (17.86)
Cover the risk of life	8 (20.51)	6 (19.35)	3 (21.43)	17 (20.24)
Reasons for not doing Job				
Continue study	26 (49.05)	18 (48.64)	-	44 (43.56)
Not interested/ By own choice	4(7.54)	-	3(37.50)	7(6.93)
Family responsibilities	12(22.64)	8(21.62)	6(75.00)	26(25.74)
Lack of opportunities	16(30.18)	11(29.72)	5(62.50)	32(31.68)
Parents/ husband did not allow	14(26.41)	9(24.32)	6(75.00)	29(28.71)
Good economic status	8(15.09)	10(27.02)	4(50.00)	22(21.78)
Salary not attractive	6(11.32)	8(21.62)	7(87.50)	21(20.79)

Multiple response

(28.71%), family responsibilities (25.74%), good economic status (21.78%), salary not attractive (20.79%) and not interested/ by own choice (6.93%) were the other reasons for not doing job. Maithi *et al.* also reported that majority of the respondents were moderately satisfied with their job. The main reason for their dissatisfaction was non-availability of resources.

CONCLUSION

On the basis of major outcomes of the study it can be concluded that majority of the respondents took admission through open category and only few percentage of respondents deviate from the field of Home Science after their graduation. Further findings revealed that majority of the respondents were not able to continue higher studies due to family obligations.As far as employment and occupational status was concerned, majority of the respondents were engaged in teaching and negligible number was found to be engaged in self employment activities.

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Vocational Education of Academically Backward Rural Adolescents: A Step towards Furtherance

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ABSTRACT

The lives of rural adolescents are characterized by limited resources, minimum exposure lack of education and awareness as well as opportunities affecting their lives. The objective of present study was to assess vocational interest of rural adolescents (both girls and boys) and make them vocationally aligned by providing intensive interventions so as to improve their living standards. Adolescents who scored less than 50% marks in their last exams were considered academically backward. 10-15% of adolescents who scored least in the 7th, 8th and 9th standard were taken as the sample for study. Vocational interest of respondents was assessed using standardized Vocational Interest Record (VIR). Thereafter respondents were provided intensive interventions exposing them to various vocations and assisting them in selecting vocations as per their interest, aptitude and skills. The data were analyzed with the help of frequency, percentage and z-test. Results revealed that intervention had significant impact on their knowledge about the vocations and their choice of vocation according to their skills and interest.

Keywords: Intervention, Literary, Executive and constructive skills, Vocational education

INTRODUCTION

According to National Policy for skill development and entrepreneurship (2015), India is one of the youngest nations in the world with more than 62% of its population into the working age group (15-59 years), and more than 54% of its total population below 25 years of age. To reap this demographic dividend which is expected to last for next 25 years, India needs to equip its workforce with employable skills and knowledge so that they can contribute substantively to the economic growth of the country.

The situation of urban India is much better and under control. The population has wide exposure and access to knowledge and skills pertaining to all aspects of life especially the different vocations and opportunities for training and establishment. However, rural people are disadvantaged in these terms due to lack of education, adversity, as well as poor connectivity and mode of transmission between rural and urban areas. Hence, it is necessary to give an intervention to the rural people to enhance their knowledge in desirable aspects. The findings of Gupta and Goel (2015) shows that there exist a vast scope of intervention that can be taken up through services of counseling, employment, educational programs and capacity building for the welfare of the respondents. According to Singh *et al.* (2015), training plays an important role to improve the knowledge. Knowledge is the cognitive component of the individual's mind and plays an important role in covert as well as overt behavior and individuals with a greater knowledge of the technical nature of improved practices would lead to a high adoption. It is evident from their findings that training and guidance given to respondents have played prime role in influencing technological changes, besides management orientation.

Since, India is majority a rural country any change in country can be brought only by including the rural population. We need to tag the skilled knowledge of rural areas and for that there is a necessity of focused specific interventions on vocational education so as to hone their opportunities of being better placed and paid/ earned. The most necessary demand of our country is to have vocationalization and to provide more and more

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vocational courses after primary education according to the interest of adolescents (Soundaravalli, 2006). The term interest has been defined as a favorable attitude towards objects. It is a tendency to become absorbed in an experience and to continue with it (Mangat, 2008). Vocational interest is defined as one's own pattern of preferences, attitudes, likes and dislikes, preferred in any manner, wisely or unwisely by self or by another sources for a given vocational area or vocation. Measuring vocational interest aims at assessing the inclinations of the young person so that he may be assisted in the choice of an occupation that will sustain his interests, be personally satisfying, and keep him usefully employed throughout his working life (Kulshrestha, 2005). The term 'Vocational Interest' may mean pleasure in the activities of the occupation or it may even mean satisfaction in the job (Mohanty, 2006).

Earlier the adolescents had no interest in selecting vocations for their own as the adolescents preferred going in the vocation, their parents wished them to go in. This trend has changed and now adolescents wish to select their own vocations and have their own vocational interests. But many adolescents have neither the understanding of themselves nor the diversity of vocations that are available as well as the necessary prerequisites for those vocations. Usually in schools where no vocational guidance program exists, adolescents choose such vocations which have no or little relationship with their vocational aptitude and skills with the results they get traumatic shock when they find that they have not prepared themselves for the vocation which they wanted to enter. Therefore it is necessary to find out the interests and abilities of the adolescents by the time they finished their schooling so as to provide enough vocational subjects of their choice at the secondary level schools which will facilitate them in finding suitable employment. Sababa (2010) stated that most parents are illiterates who do not know anything about vocational interest or the vocations available. These create problems to most adolescents. Keeping this in view, the present study focused to study the vocational interests of rural adolescents, provide vocational education and study the impact of vocational education on vocational knowledge and interest of selected rural adolescents.

MATERIALS AND METHODS

The study was part of All India Coordinated Research Project on 'Capacity Building of Agrarian Families' of G.B. Pant University of Agriculture & Technology, Pantnagar, Uttarakhand. The six adopted villages of University viz. Turkagauri, Gokulnagar, Kanakpur, Chandipur, Pantpura village of Udham Singh Nagar district and Dogra village of Nainital district were purposively selected. From these villages, rural government schools were selected as a research base for the present study. The total sample for the present study comprised of 112 adolescents randomly drawn from academically backward adolescents studying in 7th, 8th & 9th standard of each selected rural government school. Adolescents who have scored less than 50% marks in the last exams were considered as academically backward. The list of academically backward adolescents was prepared from each selected class of each school and from that list bottom 10-15% of adolescents were taken as the sample for present study. Vocational Interest Record (VIR) of Kulshrestha (1971) was used to identify the vocational interests of respondents. This test includes ten vocational areas: Literary (L), Scientific (Sc), Executive (E), Commercial (C), Constructive (Co), Artistic (A), Agriculture (AG), Persuasive (P), Social (S) and Household (H). Each of these areas has twenty Jobs/Vocation/ Assignments on the record, 10 in horizontal and 10 on vertical side. Thus, this record contains 200 vocations belonging to the 10 different vocational interest areas.

The randomly selected respondents were administered VIR. After pre test, intervention on vocational education was given with the help of an educational package as well as individual and group counseling. After this the adolescents were post tested. The pre test and post test data was analyzed by calculating mean & standard deviation and further z-test was applied to find the significance of results.

RESULTS AND DISCUSSION

Firstly, the sample of the present study was assessed for their socio-demographic and socio-economic status. The data in Table 1 shows socio-demographic and socio-economic status of respondents in terms of gender, religion, parents' education, parents' occupation and total monthly income of the family. Out of 112 adolescents, 34%, 35% and 31% were academically backward adolescents from 7th, 8th and 9th standard, respectively in which 56% were boys and 44% were girls. Among all, 79%, 16% and 05% were Hindu, Muslim and Sikh, respectively. Besides this, high rate of illiteracy had been seen among their parents (both mother and father) but

Table 1: Socio-demographic and socio-economic profile of respondents

Category		Villages						
		Kanakpur n_1=19 (17%)	**Gokulnagar n_2=18 (16%)**	**Chandipur n_3=15 (13%)**	**Pantpura n_4=25 (22%)**	**Turkagauri n_5=21 (19%)**	**Dogra n_6=14 (13%)**	**Total n=112 (100%)**
Standard	7th	05(04%)	05(04%)	06(05%)	09(08%)	08(07%)	05(04%)	38(34%)
	8th	07(06%)	06(05%)	05(04%)	08(07%)	08(07%)	05(04%)	39(35%)
	9th	07(06%)	07(06%)	04(04%)	08(07%)	05(04%)	04(04%)	35(31%)
Gender	Boys	08(07%)	15(13%)	07(06%)	14(13%)	10(09%)	09(08%)	63(56%)
	Girls	11(10%)	03(03%)	08(07%)	11(10%)	11(10%)	05(04%)	49(44%)
Religion	Hindu	17(15%)	16(14%)	14(13%)	18(16%)	11(10%)	13(12%)	89(79%)
	Muslim	01(01%)	02(02%)	0(0%)	04(04%)	10(09%)	01(01%)	18(16%)
	Sikh	01(01%)	0(0%)	01(01%)	03(03%)	0(0%)	0(0%)	05(05%)
Father's Education	Graduation	0(0%)	01(01%)	01(01%)	01(01%)	0(0%)	0(0%)	03(03%)
	Intermediate	0(0%)	02(02%)	0(0%)	03(03%)	0(0%)	0(0%)	05(05%)
	High School	03(03%)	04(03%)	03(03%)	02(02%)	04(03%)	03(03%)	19(17%)
	Upto Primary	07(06%)	06(05%)	05(04%)	11(10%)	06(05%)	05(04%)	40(36%)
	Illiterate	09(08%)	05(04%)	06(05%)	08(07%)	11(10%)	06(05%)	45(39%)
Mother's Education	Intermediate	0(0%)	01(01%)	01(01%)	01(01%)	0(0%)	0(0%)	03(03%)
	High School	01(01%)	02(02%)	0(0%)	03(03%)	01(01%)	0(0%)	07(07%)
	Upto Primary	07(06%)	05(04%)	06(05%)	08(07%)	06(05%)	02(02%)	34(30%)
	Illiterate	11(10%)	10(09%)	08(06%)	13(12%)	14(13%)	12(11%)	67(60%)
Father's Occupation	Govt. Employee	0(0%)	01(01%)	01(01%)	0(0%)	0(0%)	0(0%)	02(02%)
	Private Employee	01(01%)	07(06%)	05(04%)	13(12%)	04(04%)	0(0%)	30(27%)
	Self Employed	02(02%)	03(03%)	01(01%)	01(01%)	04(03%)	0(0%)	11(10%)
	Labour	16(14%)	07(06%)	08(07%)	11(10%)	13(12%)	14(12%)	69(61%)
Mother's Occupation	Private Employee	0(0%)	0(0%)	0(0%)	02(02%)	0(0%)	0(0%)	02(02%)
	Self Employed	01(01%)	16(14%)	0(0%)	0(0%)	0(0%)	0(0%)	17(15%)
	Labour	08(07%)	0(0%)	07(05%)	08(07%)	10(09%)	11(10%)	44(38%)
	Housewife	10(09%)	02(02%)	08(07%)	15(13%)	11(10%)	03(03%)	49(45%)
Total Monthly Income of Family	5000-9999	0(0%)	01(01%)	01(01%)	0(0%)	0(0%)	0(0%)	02(02%)
	2500-4999	10(09%)	12(11%)	14(13%)	21(19%)	18(16%)	13(12%)	88(79%)
	1000-2499	09(08%)	05(04%)	0(0%)	04(03%)	03(03%)	01(01%)	22(19%)

still, fathers were comparatively more literate then mothers. Assessment on parents' occupation shows that only 2% of fathers were working under government sector as a fourth class government employee, 27% were working in private sector, 10% were having their own businesses (like small shops, dairy etc.) and 61% were labourers. Among mothers, 2% were working in private companies as a helper in packaging department, 15% were running dairies through their homes itself (self employed), 38% were labourers and 45% were housewives. The majority (79%) respondents reported total monthly income of their family to be between Rs. 2500-4999.

Vocational interest refers to the activities or subjects that a person prefers. It is believed that an individual's preference is actually a reflection of what the individual perceives to be an ideal occupation. Vocational interests of adolescents have also been linked to adolescents' individual and academic interests as well as their academic performances. According to Sussman (1971) poor adolescents have fewer choices and narrower visions than the affluent and their financial disadvantage gives them a stilted view towards vocational education because of limited exposure to a variety of jobs. The data of present study was analyzed keeping this in view.

Figure 1 clearly represents that mean scores of pre test in all the areas of vocational interest are significantly higher than their respective post test mean scores. It was mainly because adolescents were actually not aware about the different vocations they are choosing or showing

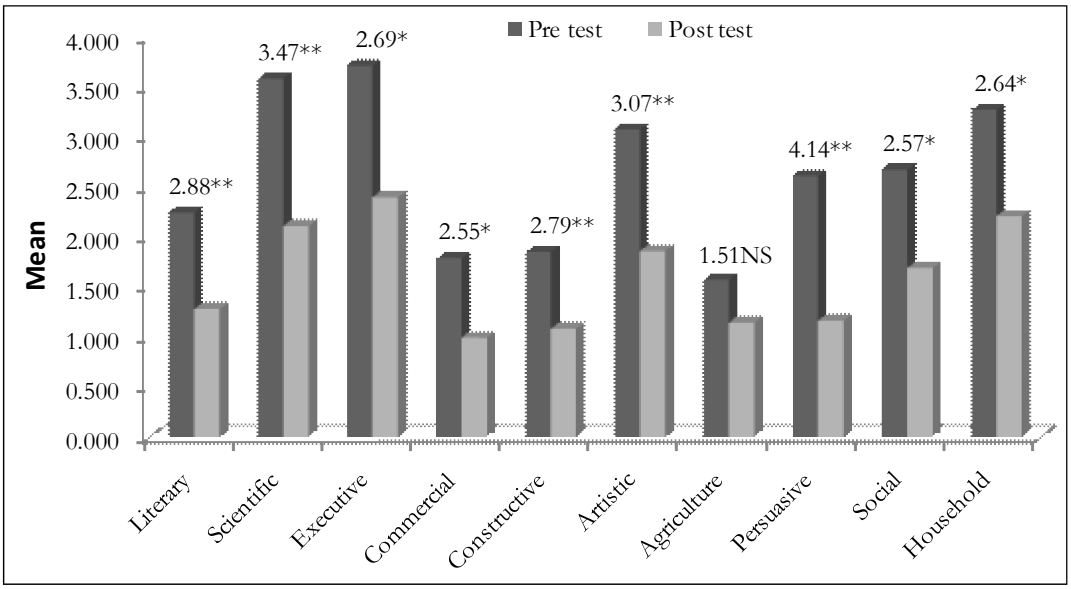

Fig. 1: Mean differences in pre test and post test scores on various aspects of vocational interest of adolescents
**Significant at 0.05 level; **Significant at 0.01 level; NS = Non-significant*

interest in. They just opted or reflected interest for good number of different stream vocations because those vocations sounded fancy to them or are looked up as reputed or glamorous or high earning vocations. They didn't at all choose or showed interest in any particular vocation considering the reality, that is, their capabilities or feasibilities. This observation was an eye opener for the researchers to understand that adolescents were almost unaware of the different vocations and its prerequisites in terms of knowledge and skills. This observation was used as a base to develop intensive intervention module on 'vocational education'.

The Vocational Education module comprised of basic and detailed information about different stream vocations like literary, commercial, constructive, vocations etc. Intensive group as well as individual counseling was provided to the respondents wherein they were exposed to various vocations and thereafter helped in identifying their interest and capabilities for a particular stream of vocation and selecting vocations accordingly. Lastly they were also linked to few nearby institutes; training centres etc from where they can further sharpen their knowledge and skills for vocation of their choice. Thus, after intensive intervention on vocational education their knowledge about different vocations got channelized which restricted their interest to similar stream vocations, so the mean score on VIR got down significantly after intervention. The present finding reveals that awareness through vocational education and counseling helps the respondents in filling up the gap between their knowledge about vocations and their own interests and capabilities. Monika *et al.* (2014) also found that the spread of educational opportunities and the explosion of knowledge have helped in bringing the gap among various adolescents with regard to the vocational choices.

CONCLUSION

The intervention module on vocational education was quite effective and it has and shall enable the respondents to select such subjects in schools which are according to their preferred vocations. It has also proved useful for parents and teachers to understand the adolescents, their interests and capabilities and provide them opportunities on the basis of their interests and capabilities. Vocational interest needs to be tapped through regular participant observation and vocational education through intensive guidance and counseling, workshops and self-directed activities to help adolescents select appropriate subjects at school level to get into vocation of their choice for success, satisfaction and activeness.

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Effectiveness of Short Duration Training Programmes on Field Level Watershed Functionaries

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ABSTRACT

The present investigation was conducted to study the effectiveness of the short duration training programmes organised for field level watershed functionaries. Ten training programmes of four days duration on Soil and Water Conservation were organized in different parts of the country by the School of Agriculture, IGNOU with the financial support of the Department of Land Resources, Ministry of Rural Development, Government of India. A total of 325 participants attended the training programmes. The effectiveness of the training programmes was assessed by evaluating the knowledge gained by the participants after completion of the programme by conducting pre- and post-test of the candidates. The results revealed that the average score of the participants in the post-test (15.4) was comparatively higher than the pre-test score (8.7) which indicated that the awareness programme had significant impact on the knowledge of the participants. Further, the improvement in knowledge on an average of the participants was 82.99% which indirectly indicates the effectiveness of the training programme. The feedback from the participants revealed that they had gained a lot of knowledge in the new technologies and recent trends in watershed management and soil & water conservation. They have also suggested that more such training programmes needs to be conducted on regular basis.

Keywords: Effectiveness, Field level, Functionaries, Short Duration, Training programmes, Watershed

INTRODUCTION

Over the years, the increase in human and livestock population in the country has placed the natural resources system under great stress. Continuous depletion of the vegetative cover, increase in soil erosion and the alarming fall in groundwater level are serious concerns. Increasing human and animal population, diversion of irrigation without adequate concern for the treatment of catchment and provision of drainage and improper agricultural practices on marginal lands has caused a serious level of degradation (Bhan, 2014). Less biomass for animals not only reduces animal productivity; the inevitable uncontrolled grazing pressure on already eroded lands further exacerbates the problem and deteriorates the ecological balance. Growing population pressure, higher demands for food and fodder coupled with impact of rapidly changing socio-economic conditions have added fuel to the fire. To tackle these problems, watershed management has now been accepted as the most favoured tool. Indeed, it has been increasingly accepted as a measure in regional and inter-regional programmes and became an integral part of development over the last ten years. Watershed development projects in the country has been sponsored and implemented by Government of India from early 1970s onwards (Wani *et al.,* 2005 and 2006). Government of India is focussing on this aspect through implementation of Integrated Watershed Management Programme (IWMP) throughout the country. For implementing this project, a huge number of human resource with sound knowledge and skills on various aspects of natural resource management, agriculture and allied fields is required. Capacity building and training of all functionaries and stakeholders involved in the watershed programme implementation needs to be taken up on war footing with definite action plan and requisite professionalism and competence (NRAA, 2011). Knowledge assessment of farmers is very important to bridge the knowledge gap between cultivars and researchers (Subba and Ghosh, 2016). Dissemination and utilization of new technology is most complex and

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significant problem (Tanwar, 2011). The School of Agriculture, IGNOU organized a series of training programme in the area of Soil and Water Conservation with the financial support of the Department of Land Resources, Ministry of Rural Development, Government of India. The present study will help in determining the effectiveness of the short duration training programmes organised for field level watershed functionaries. The major objective of the training programmes was to develop competent human resource for effective implementation of watershed projects. The expected outcome of the training programme was to refresh the knowledge of watershed functionaries involved in the watershed projects and develop skills in different aspects of watershed management activities such as soil conservation, water management as well as in horticulture, agro-forestry, livestock etc.

MATERIALS AND METHODS

The training programme designed and implemented attracted Watershed Development Team members, Block Development Officers, Assistant Engineers, Assistant Agricultural Officers, Assistant Soil Conservation Officers, Project Economists, Extension Officers from different State Departments and Subject Matter Specialists. Ten training programmes of four days duration each on different aspects of soil and water conservation were organized and selected for the study. A total of 325 participants attended the training. Resource persons were drawn from KVK, ICAR Institutes, SAU, State Departments of Agriculture and other government organizations for delivering lectures.

The training programmes focused on concept, scope and importance of watershed management, selection of watersheds, watershed activities, rainfall and runoff, their components and characteristics, instruments used for their measurement; soil erosion, its types and classification, factors affecting water erosion, biological/agronomical and mechanical measures for controlling soil erosion in arable lands, water harvesting its need and scope and methods including roof water harvesting, storage of harvesting rainwater and its proper utilization for irrigation.

The effectiveness of the training programmes was assessed by evaluating the knowledge gained by the participants after completion of the programme by conducting pre- and post-test of the candidates. For this purpose, a multiple choice teacher made test was prepared based on the contents of the study materials. The improvement in knowledge was calculated using the formula (Rahmathulla *et al.* 2012):

$$\text{Improvement in knowledge (\%)} = \frac{\text{Post test score} - \text{Pre test score}}{\text{Pre test score}} \times 100$$

RESULTS AND DISCUSSION

The marks scored in pre-test and post-test were compared and analyzed. The average marks obtained by the participants in the pre- and post test is presented in Table 1. The results revealed that the average score of the participants in the post-test (15.4) was comparatively higher than the pre-test score (8.7) which indicated that the training programmes had considerable impact on the knowledge of the participants.

The lowest average pre-test score was 6 in KVK, Mehaboobnagar (AP) whereas the highest average pre-test score was 12 in Krishi Vigyan Kendra, Mitraniketan (Kerala). The lowest average post-test score was 14 in MRDS, Shillong (Meghalaya) whereas the highest average post-test score was 17 in CARD – KVK, Tiruvalla (Kerala).

The improvement in knowledge of the participants was highest in KVK, Mehaboobnagar (AP). The average post-test score 16 was same at three places i.e. (i) Krishi Vigyan Kendra, Mehaboobnagar (Andhra Pradesh); (ii) Krishi Vigyan Kendra, Mitraniketan, Vellanad, Thiruvananthapuram (Kerala); and (iii) Directorate of Extension, Allahabad Agricultural Institute–Deemed University, Allahabad (UP). However, the improvement in knowledge of the participants in all these three places were different i.e. 166.67, 33.33 and 77.78 per cent, respectively. This is due to the differences in the gap between the average pre- and post-test scores. Variation in enthusiasm and varied interest of the trainees might be the cause for differences in the score (Rahmathulla *et al.,* 2006). Further, it has been found that the improvement in knowledge of the participants was 82.99% on an average which indirectly indicates the effectiveness of the training programme.

Feedback of the participants: The feedback obtained from the participants using feedback proforma revealed that the participants had gained a lot of knowledge in the new technologies and recent trends in watershed

Table 1: Pre-test and Post-test score obtained by the participants

Venue	Average Marks (Out of 20)		Improvement in knowledge
	Pre-test	Post-test	(%)
Krishi Vigyan Kendra -Sylvan, Hengbung, Senapati District (Manipur)	9	15	66.67
Krishi Vigyan Kendra, Mehaboobnagar (Andhra Pradesh)	6	16	166.67
IGNOU Centre for ODL in Research and Training in Agriculture, Agartala (Tripura)	7	15	114.29
CARD - Krishi Vigyan Kendra, Kolabhagom P.O., Thadiyoor, Tiruvalla, Distt. Pathanamthitta (Kerala)	11	17	54.55
Krishi Vigyan Kendra, Mitraniketan, Vellanad, Thiruvananthapuram (Kerala)	12	16	33.33
Krishi Vigyan Kendra, Sher-e-Kashmir University of Agricultural Sciences & Technology, RS Pura, Jammu (J&K)	8	15	87.50
Virendra Kumar Singh Krishi Vigyan Kendra, Unnao (UP)	9	15	66.67
Directorate of Extension, Allahabad Agricultural Institute – Deemed University, Allahabad (UP)	9	16	77.78
Krishi Vigyan Kendra, Dr.Y.S. Parmar University of Horticulture and Forestry, Solan, Kandaghat (HP)	8	15	87.50
Meghalaya Rural Development Society (MRDS), Shillong, Meghalaya	8	14	75.00
Average marks	**8.7**	**15.4**	82.99

management and soil and water conservation. Similar results on gain in knowledge were reported by Nain and Bhagat (2005), Nain *et al.* (2006) and Nain and Chandel (2013) Some of the participants also expressed that they have gained technical knowledge regarding new techniques used in rainwater harvesting, soil conservation, poultry/goat farming etc. They also expressed that this training must help them in improving their existing soil and water conservation practices as well as agricultural/ horticultural practices that ultimately improves the socio-economic status of the community. The participants also wanted that this type of training may also be organized in different parts of the state so that watershed functionaries working in watershed development projects may refresh their knowledge. Participants course evaluation inferred that majority of the participants found the training completely effective in achieving its objectives and also were fully satisfied with the handouts and training materials provided to them. By and large, the participants were satisfied with the contents (theory and practical), interaction with the experts and delivery of the training programme. They also informed that the technical skills and knowledge acquired through these training will be utilized for undertaking watershed activities effectively and efficiently. Regarding the shortcomings of the programme, few have informed that the duration of the programme is too short and requires more hands-on training.

CONCLUSION

It is clearly evident from the study that there is considerable impact on the knowledge of the participants based on the comparison made between pre-test and post-test scores. The results of the improvement in knowledge of the participants indicate the effectiveness of the training programme.

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Stakeholders Perspective on Agricultural Subsidies in Punjab

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ABSTRACT

The present study entitled "Stakeholders Perspective on Agricultural Subsidies in Punjab" was undertaken to understand the perspectives of stakeholders viz. farmers and extension personnel regarding various aspects of agricultural subsidies in terms of their awareness, satisfaction and problems. A random selection of ninety beneficiary farmers and ninety non-beneficiary farmers and twenty extension personnel were selected from three randomly selected districts of the three agro-climatic zones of Punjab. Findings of the study revealed that very less (25%) farmers were aware about the agriculture schemes providing subsidies whereas all the farmers were aware of the subsidies being provided in the areas of seeds, plant protection materials, machinery, micro-irrigation, power and price (MSP). Input dealers and fellow farmers were found to be the most utilised sources by the farmers to get information regarding agricultural schemes/subsidies. Group meetings, informal personal contacts, farm and home visits and office call were the most employed methods by the extension personnel for the dissemination of the information regarding the schemes/subsidies. The level of satisfaction of the beneficiary farmers was found to be low regarding various aspects of the agricultural subsidies. Lengthy documentation procedure, lesser quantity and sub-standard quality of subsidized inputs were found to be the major problems faced by the farmers regarding agricultural subsidies. A considerable section of farmers also reported problems such as the lack of awareness about the time of availability of subsidy and misallocation of subsidies. Lack of proper infrastructure, less funds, lack of staff and information facilities were the major problems reported by the extension personnel in the disbursement of agricultural subsidies.

Keywords: Agricultural subsidies, Awareness, Extension personnel, Farmers, Satisfaction, Problems

INTRODUCTION

Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. In 2013-14, agriculture and its allied sectors contributed 13.94 per cent of the Gross Domestic Product of the country. In addition, the sector recruited about 49 per cent of the entire manpower (Anonymous, 2014a). The Indian agriculture, after independence was in a critical situation and the partition of the country worsened the food situation in the country. In view of this, the Government of India adopted a positive approach and hence a well-defined policy of integrated production programmes with defined targets and a proper distribution programme was adopted along with other measures. Since the mid-sixties, India has been using new technologies in agriculture. The new technologies were in the form of a package programme which included the use of high yielding varieties of seeds, assured irrigation, chemical fertilizers, insecticides, pesticides and machinery. Indian farmers were poor and not in a position to buy these expensive inputs. Therefore, on the recommendations of Jha Committee, 1964 (Food Grain Price Committee), the Government of India started the scheme of subsidies on the purchase of various agriculture inputs to facilitate the farmers (Singh, 1994). Agricultural input subsidies have long been used to promote smallholder farmers' use of inputs, to increase wages, to reduce food prices and to promote economic growth (Crawford *et al.,* 2003). Since many years, the Indian government has been providing subsidies to agriculture sector in direct and indirect form for encouraging agriculture production and attaining self-sufficiency. Various incentives are being provided by the government along with price supporting schemes. Among the agricultural production incentives, subsidies are considered to be the most dominant device to quicken

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the growth of agricultural production. Most of the subsidies provided are designed to recompense the high cost of production and to stimulate the use of modern inputs. Major areas of agricultural subsidies in India are food, fertilizer, irrigation, power and credit. While food and fertilizer subsidies are borne by the Centre, power and irrigation subsidies are borne by the respective state governments and credit subsidies are given through the banking system (Anonymous, 2014b). Subsidies on inputs have their roots in green revolution when extensive subsidies were given on hybrid seeds, fertilizers, pesticides etc. with two major objectives i.e. firstly to keep cost of the food grains at minimum and avoid food inflation and secondly to ensure income security of the farmers (Anonymous, 2014c). The Department of Agriculture & Cooperation, Government of India, has been implementing various schemes and programmes under which these subsidies are provided for the benefit of farmers through State Governments. Some of the schemes being carried out in Punjab are Rashtriya Krishi Vikas Yojana (RKVY, 2007), National Mission on Agricultural Extension & Technology (NMAET, 2010), National Food Security Mission (NFSM, 2007), Mission for Integrated Development of Horticulture (MIDH, 2014), National Horticulture Mission (NHM, 2005), National Mission on Oilseeds and Oil Palm (NMOOP, 2010), Cotton Technology Mission (CTM, 2000) etc. to help the small and marginal farmers reduce their cost of cultivation, increase profit and encourage diversification among them which is a dire need in the state (Anonymous, 2014d). The subsidies under various schemes are given in the form of inputs such as seed, fertilizers, plant protection materials, farm machinery, micro-irrigation units and credit. State government through the Department of Agriculture, provides subsidy on gypsum, gobar gas plant, mini-kits, oilseeds, micro-nutrients, pesticides and insecticides, Jantar seeds, tractors, harvesters, combines, etc. (Grewal and Singh, 1992). According to a report, 75 percent of the population is dependent of agriculture in the state of Punjab which is also referred to as the bread basket of the country (Anonymous, 2015). Agriculture in Punjab in the present scenario is quiet progressive in terms of usage of inputs and technologies. As a result, the farmers in the state have to invest more and more in agriculture because of rise in cost of inputs. The return costs or constant margins in the profit have led to stagnation in the agrarian economy of Punjab (Sidhu, 2002; Roy, 2013). Irrespective of the various subsidies provided by the state government, the farmers' economic condition has deteriorated in the recent years resulting in heavy debts (Singh and Bhogal, 2014; Gaur, 2014). Therefore, the present study was conducted to study the level of satisfaction of the farmers regarding different aspects of agricultural subsidies, sources of information used by the farmers and extension personnel and problems faced by them regarding agricultural subsidies in Punjab.

MATERIALS AND METHODS

The study was conducted in three agro-climatic zones of Punjab viz. Central Plain zone, Western zone and Sub-Mountainous Undulating zone and following multistage sampling design three districts viz. Amritsar, Bathinda and Hoshiarpur were selected these zones respectively on the basis that all the three districts had common agricultural schemes which provided subsidies on different inputs to the farmers. Further three blocks from each district were selected randomly thus making a total of nine blocks. The selected agricultural schemes under which subsidies were provided to the farmers in Punjab are *Rashtriya Krishi Vikas Yojana* (RKVY), *National Food Security Mission-Pulses* (NFSM-Pulses), *National Horticulture Mission* (NHM), *National Mission on Oilseeds and Oil Palm* (NMOOP) and *National Mission on Agricultural Extension and Technology* (NMAET). The study comprised of two types of respondents i.e. farmers and extension personnel who are the stakeholders in the agricultural subsidy schemes. Amongst the farmers, the study consisted of beneficiary farmers who were availing subsidies under any of the selected five schemes and the non-beneficiary farmers who did not avail any subsidy under these schemes. A list of farmers availing subsidies under these five schemes was obtained from the office of Chief Agriculture Officer (CAO) of the three selected districts. From this list, two farmers availing subsidies from each scheme were selected randomly, thus making a sample of 10 farmers from each block and a total sample of 90 beneficiary farmers from the three districts. A block in a district is the representative of the villages it comprises. To select the non-beneficiary farmers, one village was selected from each block randomly making a sample of nine villages for this study. Further, ten farmers were selected from each village based on probability proportional to the size of the land holding in that village, thus making a total of 90 non-beneficiary farmers. Thus, a total of 180 farmers were selected for this study. Apart

from these 180 farmers, 20 extension personnel from the three selected districts were selected for this study based on the criteria that these extension personnel were directly involved in the disbursement of the subsidies under the selected five schemes. Thus a total of 200 respondents were selected for this study. A structured interview schedule was prepared to collect the data from these respondents.

RESULTS AND DISCUSSION

Awareness of the farmers regarding agricultural schemes and different areas of subsidy in Punjab: The information pertaining to the awareness of beneficiary and non-beneficiary farmers regarding various agricultural schemes and subsidies under these schemes has been presented in Table 1 and Table 2 and are discussed below.

Awareness of the farmers regarding various agricultural schemes providing subsidies in Punjab: The data in Table 1 revealed that less than 50 per cent (41.11%) of the beneficiary farmers were aware about NFSM-Pulses scheme run by the State Department of Agriculture in Punjab followed by 27.78 percent who were aware about the RKVY scheme. Almost an equal percentage of beneficiary farmers (23.33%), (22.22%) and (21.11%) were aware about the NHM, NMAET and NMOOP scheme respectively. Amongst the non-beneficiary farmers, almost one-third of them (32.22%) were aware about the NFSM-Pulses scheme followed by 24.44 per cent and 17.78 per cent who were aware about the RKVY and NHM scheme respectively. A very less percentage of non-beneficiary farmers i.e. 12.22 per cent and 8.89 per cent were aware about the NMAET and NMOOP respectively. The data shows that maximum awareness was found for the NFSM-Pulses scheme in both the categories of farmers while they were least aware about the NMOOP scheme. Based on the observations and discussions with the farmers in both categories, it can be said that not a very large percentage of them were aware about any of the schemes and the figures are more discouraging in case of non-beneficiary farmers. The findings are similar to the results of Singh (2014) and Vijayakumar (2014).

Awareness of the farmers regarding various areas of subsidy provided in Punjab: It is comprehensive from Table 2 that all the beneficiary farmers and non-beneficiary farmers were found to be aware about the subsidies provided in the fields of power, seeds, micro-

Table 1: Distribution of farmers according to their awareness regarding various agricultural schemes

S.No.	Agricultural Schemes	Beneficiary (n=90)		Non-Beneficiary (n=90)	
		Frequencey	Percentage	Frequencey	Percentage
1.	RKVY	25	27.78	22	24.44
2.	NFSM-Pulses	37	41.11	29	32.22
3.	NHM	21	23.33	16	17.78
4.	NMOOP	19	21.11	8	8.89
5.	NMAET	20	22.22	11	12.22

Table 2: Distribution of farmers according to their awareness regarding various areas of agricultural subsidies

S.No.	Area of Subsidy	Beneficiary (n=90)		Non-Beneficiary (n=90)	
		Aware f (%)	Unaware f (%)	Aware f (%)	Unaware f (%)
1.	Power	90 (100)	-	90 (100)	-
2.	Fertiliser				
	I. Inorganic	65 (72.22)	25 (27.78)	64 (71.11)	26 (28.89)
	II. Organic	30 (33.33)	60 (66.67)	22 (24.44)	68 (75.56)
3.	Micro-Irrigation	90 (100)	-	90 (100)	-
4.	Seed	90 (100)	-	90 (100)	-
5.	Plant protection	90 (100)	-	90 (100)	-
6.	Machinery	90 (100)	-	90 (100)	-
7.	Credit	67 (74.44)	23 (25.56)	60 (66.67)	30 (33.33)
8.	Infrastructure	7 (7.78)	83 (92.22)	3 (3.33)	87 (96.67)
9.	Price (MSP)	90 (100)	-	90 (100)	-
10.	Export	4 (4.44)	86 (95.56)	3 (3.33)	87 (96.67)

irrigation units, plant protection materials, machinery and price (MSP). More than 70 per cent of the beneficiary and non-beneficiary farmers were aware about the subsidy being provided on inorganic fertilizers whereas almost one-third of the beneficiary farmers and 24.44 per cent of the non-beneficiary farmers were aware about the subsidies provided on organic fertilizers. The data in Table 2 also revealed that 74.44 per cent of the beneficiary farmers and almost two-third of the non-beneficiary farmers were aware about the credit being provided as a subsidy to them. More than 90 per cent of the beneficiary and non-beneficiary farmers were unaware about the infrastructure and export subsidies. The findings clearly indicated that both the categories of farmers were well aware about the subsidies on various inputs. The only areas where the farmers were found unaware were those which were not commonly used by them or in other words the practices which were not a part of their livelihood earning. It was observed that the farmers were more concerned about the inputs on which subsidies were given. They were least bothered about the scheme under which those inputs were provided to them.

Sources of information used by the farmers to access information on agricultural subsidies: Farmers receive information about various agricultural aspects from different sources such as State Agricultural Universities, mass media, fellow farmers, State Department of Agriculture, etc. The distribution of farmers according to their source of information regarding agricultural subsidies is given in Table 3 and discussed below. The findings in Table 3 revealed that the biggest source of information for all the beneficiary and 92.22 per cent of the non-beneficiary farmers were input dealers in their areas with rank one followed by fellow farmers at rank two, accessed by 96.66 per cent and 76.67 per cent of beneficiary and non-beneficiary farmers respectively. Majority of the beneficiary farmers, i.e. 86.67 per cent and 81 per cent were also accessing the information regarding agricultural subsidies from the cooperative societies and State Department of Agriculture placed at rank 3 and rank 4 respectively while a little more than 50 per cent of the non-beneficiary farmers accessed this information from the farm telecasts (53.33%) and cooperative societies (52.22%) placed at rank 3 and rank 4 respectively. Less than 50 per cent of the non-beneficiary farmers (46.67%) reported that they accessed their information from the State Department of Agriculture placing them at rank 5. In case of beneficiary farmers, rank 5 was occupied by the farm telecasts accessed by 62.22 per cent of them.

Less than 30 per cent of the beneficiary farmers (28.89%) and almost one-fourth of the non-beneficiary farmers accessed this information from Punjab Agricultural University (PAU) and placed it at rank 8. The findings are in line with the findings of Adhiguru *et al.* (2009) and Nain *et al.* (2015). The in-depth discussions and the observation during data collection indicated that both the category of farmers preferred localite sources such as input dealers, fellow farmers and cooperative societies for such information. The farmers were buying the agricultural inputs from the local input dealers in their

Table 3: Distribution of farmers according to their source of information regarding agricultural schemes/subsidies

S.No.	Sources of Information	Beneficiary(n=90)			Non-Beneficiary (n=90)		
		f	(%)	Rank	f	(%)	Rank
1.	State Agriculture Department (ADO)	73	81.11	**4**	42	46.67	**5**
2.	State Horticulture Department (HDO)	22	24.44	**9**	13	14.44	**10**
3.	Punjab Agriculture University	26	28.89	**8**	23	25.56	**8**
4.	*Krishi Vigyan Kendras* (KVK)	19	21.11	**11**	9	10	**11**
5.	*Kisan Call Centre* (KCC)	21	23.33	**10**	15	16.67	**9**
6.	Cooperatives Societies	78	86.67	**3**	47	52.22	**4**
7.	Fellow Farmers	87	96.66	**2**	69	76.67	**2**
8.	Input Dealers	90	100	**1**	83	92.22	**1**
9.	Special campaigns on awareness of schemes/subsidies	12	13.33	**12**	6	6.67	**12**
10.	Farm Telecasts	56	62.22	**5**	48	53.33	**3**
11.	Radio	32	35.55	**7**	37	41.11	**7**
12.	Newspapers	42	46.67	**6**	38	42.22	**6**

villages or nearby cities and accessed the agricultural information from them. The discussions also revealed that special campaigns or awareness programmes regarding agricultural subsidies were not frequently conducted by the various extension agencies. The major difference among the beneficiary and non-beneficiary farmers was in terms of their access of information from the extension personnel of the State Department of Agriculture. The results indicated that beneficiary farmers had a good rapport with the Agricultural Development Officers (ADOs) as compared to non-beneficiary farmers and as a result were getting the benefits of subsidies on agricultural inputs.

PAU being an educational institute with three mandates of teaching, research and extension, is more focused on delivering higher agricultural education to the students and generating appropriate technologies for the farmers. PAU has developed an effective mechanism for transfer of technology and agricultural implements to the farmers, it has a limited reach to this community owing to its limited staff. The findings are in line with the findings of Kaur (2013). Also, it plays no role in providing subsidies on agricultural inputs to the farmers and therefore, the major responsibility of agricultural subsidies lies with the Department of Agriculture, Punjab which is distributing the subsidies among the farmers.

Methods used by the extension personnel for the dissemination of information about the agricultural schemes and subsidies: A perusal of data given in Table 4 revealed that group meetings, informal personal contacts, farm and home visits and office call were the most employed methods by all of the extension personnel for the dissemination of information regarding agricultural schemes and subsidies. Radio programmes were used by 35 per cent of the extension personnel followed by 25 per cent each who used agricultural exhibitions and WhatsApp groups of the farmer for this purpose. Only 20 per cent of the extension personnel organised the training programmes and awareness campaigns for the dissemination of the information regarding subsidies while 15 per cent of each of them provided this information through television programme and SMS service. The least used media was newspapers (10%) for the dissemination of information regarding the agricultural schemes or subsidies.

Satisfaction of beneficiary farmers regarding different aspects of agricultural subsidies: The data presented in Table 5 showed that a little less than two-third of the beneficiary farmers (65.56%) were satisfied with the timely information regarding subsidies to them while majority of them (90%) were satisfied with the comprehensive information provided to them by the extension personnel regarding subsidies. All the beneficiary farmers showed their dissatisfaction with respect to the paperwork required for availing subsidies. Majority of the farmers viz. 91.11 per cent, 80 per cent and 74.44 per cent were dissatisfied with the quantity of plant protection materials, seeds and fertilisers respectively. On the contrary, all of them were on this aspect with respect to subsidized machines and micro-irrigation units. Regarding the quality of subsidized inputs, 100 per cent, 65.56 per cent and 60 per cent of the farmers were dissatisfied with the quality of plant protection materials, fertilisers and seeds respectively while 100 percent and 95.56 per cent of the farmers were satisfied with the quality of micro-irrigation units and agricultural machinery respectively.

Almost two-third of the farmers (65.56%) were dissatisfied with respect to the timeliness in receiving the subsidy. The observation and in-depth discussion with the farmers indicated that often there is a delay in the release of subsidies such as seeds, fertilisers and plant protection materials. The farmers reported that they didn't get the subsidized seeds at the time of sowing and often the quality of seed was very poor. Similar

Table 4: Distribution of extension personnel according to the methods used for the dissemination of information about agricultural scheme/subsidies (n=20)

S. No.	Methods used	Yes f (%)	No f (%)
1.	Group Meetings	20(100)	—
2.	Informal Personal Contacts	20(100)	—
3.	Farm and Home Visits	20(100)	—
4.	Training Programmes	4(20)	16(80)
5.	Radio Programmes	7(35)	13(65)
6.	Agricultural Exhibitions	5(25)	15(75)
7.	Office Call	20(100)	—
8.	Television Programme	3(15)	17(85)
9.	Newspapers	2(10)	18(90)
10.	SMS Services	3(15)	17(85)
11.	WhatsApp groups of the farmers with extension personnel	5(25)	15(75)
12.	Awareness campaigns regarding only subsidies	4(20)	16(80)

Table 5: Distribution of beneficiary farmers according to their satisfaction regarding various aspects related to agricultural subsidies (n=90)

S.No.	Statements	Highly Satisfied f (%)	Satisfied f (%)	Dissatisfied f (%)
1.	Timely information regarding subsidies	8 (8.89)	59 (65.56)	23 (25.55)
2.	Comprehensive information regarding subsidies	—	81 (90)	9 (10)
3.	Paper work for availing subsidies	—	—	90 (100)
4.	Assistance of extension personnel in understanding the procedure to avail subsidies	46 (51.11)	44 (48.89)	—
5.	Quantity of subsidized inputs			
	i. Seed	—	8 (20)	72 (80)
	ii. Fertilizer	—	23 (25.56)	67 (74.44)
	iii. Plant protection materials	—	8 (8.89)	82 (91.11)
	iv. Machinery	—	90 (100)	—
	v. Micro-irrigation units	—	90 (100)	—
6.	Quality of subsidized inputs			
	i. Seed	—	36 (40)	54 (60)
	ii. Fertilizer	—	31 (34.44)	59 (65.56)
	iii. Plant protection materials	—	—	90 (100)
	iv. Machinery	—	86 (95.56)	4 (4.44)
	v. Micro-irrigation units	—	90 (100)	—
7.	Timeliness in receiving the subsidy by the farmers	—	31 (34.44)	59 (65.56)
8.	Criteria followed for giving subsidy by the government	—	58 (64.44)	32 (35.56)

findings were found in the case with the plant protection materials. On the first hand they were not given at an appropriate time when they are to be sprayed and even when they were given, the quality was so poor that they were not effective and farmers had to increase the number of sprays thus increasing this cost of cultivation. As far as the criteria followed for giving subsidy by the government was concerned, 64.44 per cent of the farmers were satisfied while 35.56 per cent of them showed their dissatisfaction in this regard. The findings were in line with the findings of Salunke (2016) and Mahadeva (2004).

Level of satisfaction of the beneficiary farmers: The level of satisfaction of the farmers was categorized into three categories of low, medium and high. The data in Table 6 revealed that more than two-third (68.89%) of the beneficiary farmers had low level of satisfaction while 28.89 per cent and a mere 2.22 per cent of the farmers had medium and high level of satisfaction respectively. It can be concluded that the selected beneficiary farmers were not at all satisfied with the different aspects of agricultural subsidies. The results were in contradiction to the findings of Kakkar *et al.* (2014).

Table 6: Distribution of beneficiary farmers on the basis of their level of satisfaction (n=90)

Level of satisfaction	Frequency	Percentage
Low (9-15)	62	68.89
Medium (15-21)	26	28.89
High (21-27)	2	2.22

Problems faced by the farmers regarding agricultural subsidies: The data presented in Table 7 revealed that irrespective of the category of the farmers i.e. whether they were beneficiary or non-beneficiary, the lengthy documentation procedure was the biggest problem reported by all the farmers. Lack of credit to avail subsidy on machinery was found to be the next major problem faced by 94.44 per cent of beneficiary and 92.22 per cent of non-beneficiary farmers. Majority of the beneficiary (93.33%) and non-beneficiary (96.67%) farmers reported the problem of high rates of interest charged by the non-formal sources on the loans availed by the farmers. Majority of the beneficiary farmers (90%) complained about the less amount of subsidy and 88.89 per cent of the non-beneficiary farmers were found in agreement with them regarding this problem.

No fixed place of sale of subsidized inputs was reported as a prevailing problem by both beneficiary (85.56%) and non-beneficiary (93.33%) farmers. The farmers revealed that because of this problem, they often

Table 7: Distribution of the farmers according to their problems regarding agricultural subsidies

S. No.	Problems	Beneficiary (n=90)		Non-Beneficiary (n=90)	
		Agree f (%)	Disagree f (%)	Agree f (%)	Disagree f (%)
1.	Lack of awareness about the time of availability of subsidy	29 (32.22)	61 (67.78)	74 (82.22)	16 (17.78)
2.	No fixed place of sale of subsidized inputs	77 (85.56)	13 (14.44)	84 (93.33)	6 (6.67)
3.	Delay in release of subsidies	55 (61.11)	35 (38.89)	82 (91.11)	8 (8.89)
4.	Lengthy documentation procedure	90 (100)	—	90 (100)	—
5.	Lesser quantity of subsidized inputs	71 (78.89)	19 (21.11)	77 (85.56)	13 (14.44)
6.	Sub-standard quality of subsidized inputs	73 (81.11)	17 (18.89)	68 (75.55)	22 (24.44)
7.	Lack of credit to avail subsidy on machineries	85 (94.44)	5 (5.56)	83 (92.22)	8 (8.89)
8.	High interest rates on the loans from non-formal sources to avail subsidy	84 (93.33)	6 (6.67)	87 (96.67)	3 (3.33)
9.	Misallocation of subsidies	48 (53.33)	42 (46.67)	81 (90)	9 (10)

remained unaware of the place where subsidized inputs were given by the government agencies. The problem of sub-standard quality of inputs was reported by 81.11 per cent of beneficiary and 75.55 per cent of non-beneficiary farmers. Majority of the beneficiary (78.89%) and non-beneficiary (85.56%) farmers reported the problem of lesser quantity of subsidized inputs such as in case of seeds, fertilisers and plant protection materials. Regarding the delay in release of subsidies, more than sixty per cent of beneficiary farmers agreed with it as a problem while the figure was quite high among the non-beneficiary farmers (91.11%) who considered it as one of the major problems associated with agricultural subsidies.

It was quite interesting to find that where only 53.33 per cent of beneficiary farmers agreed that there was misallocation of subsidies, 90 per cent of the non-beneficiary termed it as the major factor contributing to their non-receipt of subsidies. Approximately one-third of the beneficiary farmers (32.22%) reported lack of awareness about the time of availability of subsidy whereas the percentage of agreement with this problem was 82.22 per cent among the non-beneficiary farmers. The non-beneficiary farmers held this also as one of the factors responsible for not receiving the subsidy. The findings were in line with the findings of Shivashankar and Uma (2014); Kakkar (2011); Salunkhe (2016) and Mahadeva (2004).

Problems faced by the extension personnel in disbursement of agricultural subsidies: A scrutiny of data set in Table 8 showed that all the extension personnel faced problems of lack of proper infrastructure, lack of funds for organizing extension activities, lack of extension personnel or supporting staff, overloaded with non-departmental work, absence of departmental transportation and lack of information and

Table 8: Distribution of the extension personnel according to their problems faced in disbursement of agricultural subsidies (n=20)

S.No.	Problems	Agree f (%)	Disagree f (%)
1.	Lack of proper criteria for the selection of farmers regarding the subsidy programme.	6 (30)	14 (70)
2.	Lack of proper infrastructure for dissemination of information about the subsidy.	20 (100)	—
3.	Lack of funds for organizing extension activities and campaigns.	20 (100)	—
4.	Lack of extension personnel or support staff.	20 (100)	—
5.	Red-tapism	12 (60)	8 (40)
6.	Lack of departmental transportation.	20 (100)	—
7.	Over loaded with non-departmental work.	20 (100)	—
8.	Lack of knowledge regarding all the aspects of the scheme for effective implementation.	4 (20)	16 (80)
9.	Low education level of farmers disables them to understand the subsidy scheme.	2 (10)	18 (90)
10.	Lack of information facilities (Phone, Computer, Office Internet etc.)	20 (100)	—
11.	Poor support from state government regarding some central government schemes.	6 (30)	14 (70)
12.	Lack of farmers interest in subsidies	4 (20)	16 (80)

communication facilities for dissemination of information about the subsidy. These factors hindered them the most as they had to perform every paperwork in the form of reports which takes a lot of their time. They also mentioned that most of their time was spend on carrying out census work or distribution of BPL (Below Poverty Line) cards, election duties, etc. rather than the service of farmers for which they have been appointed. The extension personnel in order to reach to the farmers in remote areas, had to use their personal vehicle as they lacked any transportation facility. Less than two-third (60%) of the extension personnel reported red-tapism (the practice of requiring excessive paperwork and tedious procedures before official action can be considered or completed) as one of the problems which hindered the smooth functioning in case of subsidies. An equal percentage of extension personnel i.e. 30 per cent of them reported that there was a lack of proper criteria for the selection of farmers regarding the subsidy programme and poor support from the state government towards some central government schemes. Only 20 per cent of extension personnel reported that lack of knowledge regarding all the aspects of the subsidy scheme hampered its effective implementation by them while a similar percentage of them agreed that there was a lack of interest by the farmers regarding subsidy. It clearly depicts that the farmers were very interested to avail subsidies if given to them. Only 10 per cent of extension personnel felt that low education of the farmers disabled them to understand the procedures for availing subsidies. The findings were in line with the findings of Bortamuly and Khuhly (2013); Thanh and Singh (2007); Kumar *et al.* (2011) and Gupta (2014).

CONCLUSION

The findings of the study revealed that the subsidies were an important part of agriculture and that it should be properly targeted especially to small and marginal farmers for its effective implementation and utilisation. Special awareness campaigns needs to be organised once the subsidies are released from the government to disseminate the information on the availability of the subsidies to all the sections of the farmers. Good quality of subsidized inputs such as seeds, fertilisers and plant protection materials need to be ensured by the government for obtaining high yield of crops. PAU and KVKs should make provisions to provide comprehensive information about schemes and subsidies in their various training programmes, campaign and other activities. An independent agency for monitoring and evaluation of disbursement of agricultural subsidies needs to be established to ensure strict enforcement of guidelines of various schemes. This would facilitate in providing the benefits of subsidies to the weaker sections i.e. small and marginal farmers in an effective manner. A "one-stop shop" for all subsidized agricultural inputs such as seeds, fertilizers, soil nutrients and pesticides need to be created for effective dissemination of inputs to all section of farmers. This would help in avoiding confusion among the farmers regarding the place of availability of subsidized inputs and save their time. This will help in developing a sense of trust and increase confidence of farmers in public sector extension services.

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Farm Telecast Viewing Behaviour of Farmers of Punjab

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ABSTRACT

Television is a powerful media, as an institutionalized source of information dissemination. In Punjab, the *"Mera Pind Mere Khet"* is an important farm telecast of Doordarshan Jalandhar. The present study was conducted to know the viewing behaviour of farmers about this farm telecast. The study was conducted on randomly selected 250 farmers from 10 villages of Punjab. A structured interview schedule was prepared to collect the information from selected respondents. The data were collected through personal interview approach and data were analysed using appropriate statistical tools. The majority of the respondents was middle aged males, matriculates and belonged to medium size families with low social contacts. They possessed medium land holdings. Majority of the respondents had high level of awareness regarding the farm telecast and viewed the programme regularly. It was also found that more than half number of respondents (52.04 per cent) talk with others while viewing the programme. Majority of the respondents watched the programme from beginning to end, however they had not discussed the content with fellow farmers. Study further revealed that majority of the respondents never writes down notes on a paper to preserve the information given in programme.

Keywords: Awareness, Doordarshan, Farm telecast, Television, Viewing behaviour

INTRODUCTION

In most of the countries of the world, mass media has become a part and parcel of life. A large proportion of people, around the globe, are being informed and entertained through mass media. Television, as a medium of mass communication, is capable of producing indefinite reproduction of identical messages to receivers physically separated (Venogopal, 1978). Through TV, the information reaches the minds of the individual through eyes and ears simultaneously and has a motivational impact on the viewers. It is considered as one of the most effective and quick mass medium for transmitting information to the farmers/rural community (Burman *et al.*, 2013). The significance of communication for human life cannot be overlooked. This is true because beyond the physical requirements of food and shelter man needs to communicate with his/her fellow human beings. This urge for communication is a primal one and in our contemporary civilization a necessity for survival. That is to say without communication no society can exist, much less develop and survive. For the existence as well as the organization of every society, communication is a fundamental and vital process. The mass media help to overcome the obstacle of prevalence of traditional attitudes and cultural traits by exposing many people simultaneously to important messages. This vital mission of disseminating information, ideas and attitudes to the public at large is accomplished by various media of mass communication.

Among the different mass media radio and television are considered as powerful media, as an institutionalized source of information for creating awareness about the innovation existent with additional information. Dhananjay and Nataraju (2010) reported that T.V. was the most prefer media followed by news paper, magazine and other mass media. They are used as powerful educational tools. The eye and ear mindedness of rural women makes this media as one of the most promising of the present day educational sources. They offer vitality and newness, which attract attention, create interest and stimulate desire to learn. To keep pace with such development, effective utilization of Radio and Television as a means of communication is very much essential (Raina *et al.,* 2011).

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In Punjab, the Jalandhar Doordarshan telecasts a variety of programmes for the viewers in region of Punjab State. It also telecasts a development programme based on the rural community known as *"Mera Pind Mere Khet" (*MPMK*)*. This programme was commenced in 1974 with the objective of dissemination of useful agricultural information to the farmers. To begin with, it was a weekly programme of 15 minutes duration, but presently it is broadcasted for 30 minute duration for 5 days a week. The present study was conducted to know the viewing behaviour of farmers.

MATERIALS AND METHODS

Out of five Agro-climatic zones of Punjab, one block from each zone will be selected randomly from each block, two villages will be selected randomly. The criteria adopted for the selection of villages were that each selected villages must have at least 100 television sets, owned by the farming families. This way, 10 villages were selected in all, i.e. two villages from each of the randomly selected blocks. A list of television owning farmers from each of the selected villages was prepared and 25 farmers were randomly selected out of this list of each selected village. Thus, a total, 250 farmers constituted the sample for this study. A structured interview schedule was prepared to collect the information from selected respondents. The data were collected through personal interview approach and data were analysed using appropriate statistical tools.

RESULTS AND DISCUSSION

Socio economic profile of the respondents: Data in Table 1 indicates that 49.2 per cent of the respondents were in middle age group i.e. 25-45 years followed by 34.4 per cent of respondents in old age group (46 and above) and rest of the rest of the respondents falls in young age group(18-25 years).

The data presented in Table 1 indicated that 89.6 per cent of the respondents were male while only 9.6 per cent respondents were female. It is clear from the data in Table 1 that 42.4 per cent of the respondents had matric passed, 26.4 per cent of the respondents were middle passed and 23.2 per cent of the respondents were graduate and above. Only 8.0 per cent of respondents were illiterate. The data revealed that 46.8 per cent of the respondents had 5-8 family members. Regarding their social participation, it is clear from the data in Table 1 that 71.6 per cent of the respondents had no membership, 19.2 per cent of the respondents had member of an organization and 9.2 per cent had office holder.

Operational land holdings: The respondents were categorized into three groups i.e. small, medium and large. It can be observed that from total 250 respondents 51.2 per cent had 637.44 hectares cultivated area i.e. 53.32 per cent of total 1195.71 hectares cultivated area, followed by 28.4 per cent of the respondents of small size group with 163.02 hectares of cultivated area i.e. 13.63 per cent of the total cultivated area. Only 20.4 per cent of the respondents had large size group with 395.25

Table 1: Distribution of respondents according to their socio-economic characteristics (n=250)

Socio-personal characteristics	Category	Number of Respondents(f)	Percentage (%)
Age	Young (18-25)	41	16.4
	Middle (25-45)	123	49.2
	Old (46 and above)	86	34.4
Sex	Male	226	89.6
	Female	24	9.6
Education Qualification	Illiterate	20	8.0
	Middle	66	26.4
	Matric	106	42.4
	Graduate and above	58	23.2
Family Size	Upto 4	78	31.2
	5-8	117	46.8
	Above 8	55	22.0
Social Participation	No Membership	179	71.6
	Member of An Organization	48	19.2
	Office Holder	23	9.2

Table 2: Distribution of respondents according to their operational land Holdings and cultivable area under each category

Size group	Sample holdings		Total cultivated area		Average farm size
	Frequency	Percentage	Area (ha)	Percentage	(ha)
Small	71	28.4	163.02	13.63	2.09
Medium	128	51.2	637.44	53.32	4.98
Large	51	20.4	395.25	33.05	7.75
Overall	**250**	**100.00**	**1195.71**	100.00	

hectares of cultivated land i.e. 33.05 per cent of the total 1195.71 hectares of cultivated area.

It can be also observed from the Table 2 that according to the size of operational land holding small, medium and large size group had 2.09, 4.98 and 7.75 hectares of average farm size, respectively.

Awareness of the respondents about Mera Pind Mere Khet programme: The data in Table 3 showed that all the respondents were aware about the name of the programme. From the total 89.2 per cent were aware about the duration of the telecast followed by 82.8 per cent, who were aware about the days of telecast. While 76.8 per cent of the respondents were aware about the time of telecast.

Extent of regularity to view Mera Pind Mere Khet programme: The data shown in the Table 4 has revealed that 44.26 per cent of small farmers followed by 43.42 per cent medium level farmers and 21.45 per cent of large farmers said that they view the *Mera Pind Mere Khet* programme regularly. Where, more than half no. of respondents 53.27 per cent medium farmers followed by 30.84 per cent small farmers and 15.80 per cent. Large farmers said that they view this programme. Generally, while remaining 56.71 per cent of medium level farmers, 26.86 per cent of large and 16.41 per cent small level farmers respectively response that they view this programme occasionally. Findings are in line with the study conducted by Singh *et al.* (2014).

Table 3: Distribution of respondents according to their awareness about *Mera Pind Mere Khet* programme (n=250)

Aspect of the programme	Number (f)	Percentage
Name of the Programme	250	100
Days of Telecast	207	82.8
Time of Telecast	192	76.8
Duration of the Telecast	223	89.2

Viewing habits of respondents for Mera Pind Mere Khet programme: The data in Table 5 that revealed that more than half of respondents (52.04 per cent) talk with others while viewing *Mera Pind Mere Khet* (MPMK) programme while 18.40 per cent said that they do not talk with other while viewing this programme. Mean while 14.80 per cent of the respondents said that they do talk about other things while watching *Mera Pind Mere Khet* (MPMK) programme and 14.40 per cent respondents said that they talk about the other programmes while viewing *Mera Pind Mere Khet* (MPMK) Programme.

The data in Table 6 revealed that 89.6 per cent of the respondents had purpose to viewing the programme to get general agricultural information followed by four per cent watched this programme for entertainment purpose. Findings are in line with the study conducted by Sravanthi and Reddy (2012) in which they found that majority (87%) of the farmers watch agricultural programmes for the purpose of new information followed by market related informations (67%) and to

Table 4: Distribution of respondents according to the extent of regularity to view *Mera Pind Mere Khet* programme (n=250)

Degree of regularity	Small	Medium	Large	Total
Regularly	27(44.26)	33(43.42)	16(21.05)	76(30.4)
Generally	33(30.84)	57(53.27)	17(15.80)	107(42.80)
Occasionally	11(16.41)	38(56.71)	18(26.86)	67(26.8)
Overall	**71(100.00)**	**128(100.00)**	**51(100.00)**	**250(100.00)**

Figures in parentheses indicates percentages

Table 5: Distribution of respondents according to their viewing habits *for Mera Pind Mere Khet* programme (n=250)

Viewing habit	Small	Medium	Large	Total
Talking with others	42(32.06)	70(53.43)	19(14.50)	131(52.04)
Talking about the programme	09(25.00)	12(33.33)	15(41.66)	36(14.40)
Talking about other things	09(24.32)	17(45.94)	11(29.72)	37(14.80)
Do not talk with others	11(23.91)	29(63.04)	6(13.04)	46(18.40)
Overall	**71(100.00)**	**128(100.00)**	**51(100.00)**	**250(100.00)**

Figures in parentheses indicates percentages

get solutions to problems (43%). The data presented in Table 6 showed the result for extent of viewing the programme. It can be concluded that 62.8 per cent of the respondents watch *Mera Pind Mere Khet* (MPMK) programme from beginning to end while 37.2 per cent of respondents watch some part of it. It was observed that 73.6 per cent of the respondents had not discussed the content with fellow farmers while 26.45 per cent had discussed it with their fellow farmers.

Information preservation behaviour: The data shown in Table 7 has shown the information preservation behaviour of the respondents. It shows that majority of the respondents said that they never write down notes on a paper to preserve the information given in *Mera Pind Mere Khet* (MPMK) programme while 14.8 per cent sometimes write down on a paper and 6.4 per cent said that they regularly note down on a paper to preserve important information. In case of maintaining a dairy a large no. of respondents (90.8 per cent) said that they never maintain a dairy to preserve information given in *Mera Pind Mere Khet* Programme. Only 9.2 per cent said that they sometimes maintain a dairy while surprisingly no respondent has maintain a dairy regularly while, it was seen that all the respondents (100 per cent) said that they never record video of *Mera Pind Mera Khet* Programme to preserve important information. Further 56.4 per cent of the respondents said that they sometimes memorize the important information given in *Mera Pind Mere Khet* (MPMK) programme. While 20.40 per cent of the respondents said that they never memorize any information given in *Mera Pind Mere Khet* (MPMK) programme and no respondent ever memorize any information regularly.

CONCLUSION

The present study was conducted to know the viewing behaviour of farmers of Punjab about the farm telecast. Study revealed that majority of the respondents had high

Table 6: Distribution of respondents according to their viewing behavior towards *Mera Pind Mere Khet* programme (n=250)

Viewing behavior	Category	Number	Percentage
Purpose to viewing the programme	General agricultural information	224	89.6
	Solutions to problems	16	6.4
	For Entertainment	10	4.0
Extent of viewing the programme	Beginning to End	157	62.8
	Some Part of It	93	37.2
Discussed the content with fellow farmers	Yes	66	26.4
	No	184	73.6

Table 7: Distribution of respondents according to their information preservation behavior (n=250)

Methods	Regularly	Sometimes	Never
Taking down notes on a paper	16(6.4)	37(14.8)	197(78.8)
Maintaining a diary	0(0.0)	23(9.2)	227(90.8)
Video recorder	0(0.0)	0(0.00)	250(100.0)
Simply memorizing	58(0.0)	141(56.4)	51(20.4)

Figures in parentheses indicates percentages

level of awareness regarding the farm telecast and viewed the programme regularly. Majority of the respondents watched the programme from beginning to end, however they had not discussed the content with fellow farmers. Study further revealed that majority of the respondents never writes down notes on a paper to preserve the information given in programme. Television has been acclaimed to be the most effective media for diffusing information into rural areas and particularly to rural women than any other mass media source in the study conducted by Manasa *et al.* (2012). They reported that 60.8 % of the viewers has medium useful level of opinion about the programme. Mass media create empathetic spirit, widens people's horizon and conducive climate for change. That is why Bellurkar (2000) stated that the mass media should be put to service for national development.

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Perceived Benefits of Adoption of Low Tunnel Technology for Vegetable Production in Punjab State

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ABSTRACT

Protected cultivation has emerged as the best option for small farmers to increase the family income from the same piece of land. Under protected cultivation low tunnel technology is helpful in management of abiotic and biotic stresses to the large extent which ultimately contributes towards its success. Cultivation under low tunnels is the practice of raising the summer vegetables like chilly, tomato, cucurbits etc. during off season, where unfavourable environment does not allow them to raise these in open conditions. Small farmers are substantially increasing their income by adoption of protected cultivation of vegetables in off-season For maximizing the income, intercropping of suitable vegetables depending upon their growth development and fruiting period are being practiced for utilizing the space and time resources to its fullest extent. The study reports the perceived benefits of the adopter farmers and it was reported that on an average one can earn around Rs. 2-2.5 lakh/acre.

Keywords: Adoption, Benefits, Perceived, Production, Technology, Vegetable

INTRODUCTION

In India majority of the farmers (around 80%) fall in the category of small land holding less than two hectare. In the present world of high cost of living it is very difficult for them to sustain their life by traditional means of farming. Protected cultivation is one of the best option for them to increase the family income from the same piece of land. Under protected cultivation low tunnel is the best way to enhance their family income. In terms of production of vegetables India ranks 2nd in the world. However it is much below the level in terms of per capita consumptions or requirement of balanced diet as per the Worlds Health Organisation. The present vegetable production 162 million tones is to be raised to 250 million tones (ministry of agriculture) by 2024-25 (Singh, 1998). So there is ample scope of vegetable production in India and small farmers can play major role by adopting low tunnel vegetable cultivation. Vegetables, such as muskmelon, summer squash, bottle gourd, bitter gourd, round melon, cucumber etc. can be transplanted with this technique. Low tunnels are flexible transparent covering that are installed over the rows or individual beds of transplanted vegetables to enhance plant growth by warming the air around the plants in the open field during winter season. Now-a-days with the introduction of biodegradable plastic for making low tunnels purposes, it becomes not only eco-friendly, but also sustainable technology for off season vegetable production. This biodegradable plastic of varying durability is available for its usage as per the requirement of one or more crop seasons.

The technology offers distinct advantages of quality, favourable market price to the growers as it advances the crop by 30 to 40 days than the normal season and productivity of vegetables. Many cucurbits (squash, cucumbers, melons) respond well under row covers with increased yields of as much as 25 percent (Helbacka, 2002). The cost of installation of low tunnels is around 25600/- per acre . Vegetables being short duration crops can be fitted into crop rotations easily. As low tunnel technology is used in winter, it can replace wheat in wheat-rice rotation, can help in crop diversification and can help to increase the cropping intensity also. This practice is also helpful in increasing the cropping intensity and inclusion of basmati instead of paddy for saving the precious underground water as most of the farmers

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adopt this rotation i.e. winter vegetables followed by basmati. Besides the economization of the natural resources with this practice, the profitability realization of the farmers is also the highest. The study explores the perceived benefits of adoption of low tunnel technology in Punjab state.

MATERIAL AND METHODS

The study was conducted in Ferozepur district of Punjab. The dependent variable of this study was grower's response, which is a reaction, as that of an organism or a mechanism, to a specific stimulus (Mangal, 1990). In this study it is considered as the reaction shown by the growers to cultivate vegetable under low tunnel technologies and measured in light of three different parameters such as: income from the vegetable production, problems and the benefit of this technology. Income from the vegetables grown by this method is calculated on the basis of the information provided by the grower's through different questions on cost of production and profit on different aspects of vegetable cultivation in low tunnel technology. To identify the problems faced by the growers an open ended question was asked to indicate the problems faced by them during the cultivation. The benefits from these technologies were also studied. The list was prepared on the basis of the benefits quoted by the respondents. All possible precautions were taken to shun biasness and maintain fidelity and fairness of responses. Responses were recorded accordingly, without making judgments or comments on them.

RESULTS AND DISCUSSION

Cost of production/cultivation was calculated on the basis of the replies of the different questions given by the respondents, it was found that average cost of production was around Rs. 114190/- per acre. Out of the total cost of production the chunk of the cost occurs on protected sheath and harvesting of crops. Therefore work on mechanization of harvesting should be done. The gross profit from the cultivation of these vegetables under protected sheaths was Rs. 330000/- acre, which means net profit, was around Rs. 215810/- per acre and the detail of the cost and profit was given in the Table 1. Radha and Prasad (2001) revealed that net returns were in the tune of Rs. 55792 and 49758 from cauliflower and tomato in Karim Nagar district of Andhra Pradesh. Low tunnel cultivation has clear edge in terms of profitability over the traditional crops. Gupta (2013) reported similar returns from the combination of vegetables grown under low tunnel technology and the maximum returns obtained by growing the chilly + cucumber. Thakur *et al.* (1997) also found that returns from growing vegetables were very high and ranged from Rs. 75000-146000/- from tomato and cauliflower cultivation.

Table 1: Mean Cost and profitability of growers during the vegetable production under low tunnel technology (n=50)
Cost of production per acre/hectare (Rs.)

Parameters	Acre
Cost on land preparation	4650
Cost on sowing of crop	600
Cost on seed/seedling	3600
Cost on seed treatment	20
Cost on protected sheath	25600
Cost on fertilizer	
Urea (kg)	390
DAP (kg)	2400
MOP (kg)	280
$Zn SO_4$	600
FYM	2400
Labour for fertilizer application	150
Cost on weed control	
Manual or herbicide and labour charges	2700
Cost on pest management	
Pesticide spray	1200
Labour for pesticide spray	100
Cost on harvesting	
Manual	67500
Cost on transportation to mandi/ market	2000
Total Cost	114190
Yield (quintal)	300
Rate of sale of produce Rs. per quintal	1100
Income from produce	330000
Total income	330000
Net income	215810

Growers also reported many benefits of this technology to them and are given in the Table 2. The data reveals that the major benefit of this technology was cultivation of the crops under adverse conditions and higher crop yield, which resulted in higher return due to the favourable market price and advancement in crops by 30-40 days. Income from the small and the marginal land holdings can be increased by producing crops earlier than their normal season and fetch higher prices due to higher market price and shortage of supply in the market. It can act as entrepreneurial activity for the

Table 2: Benefits received by growers by growing the vegetables under low tunnel technology (n=50)

S.No.	Benefits	Frequency (%)
1.	Crops could be grown under the inclement climatic conditions when it would not be otherwise possible to grow crops under the open field conditions	98
2.	Crop yields are at the maximum level per unit area, per unit volume and per unit input basis	94
3.	High value and high quality crops could be grown for local and foreign markets.	84
4.	It advances the crop by 30 to 40 days than the normal season and hence increases the price of the crop due to favourable market price.	96
5.	Production of higher quality products which are free from insect attack, pathogens and chemical residues'	94
6.	Income from the small and the marginal land holdings can be increased by producing crops earlier than their normal season and fetch higher prices due to higher market price due to shortage of supply in the market.	86
7.	It can be used to generate self employment for the educated rural youth in the farm sector.	62

farmers as it provides sufficient income to adopt it as carrier by the young farmers/educated youth. Shaweta *et al.* (2014) reported that advantages of low tunnel technology in cultivation of vegetables under adverse conditions, quality production, higher yield, high profits and self employment. Singh and Asrey (2005) found that under green house yield of tomato and sweet pepper increased, quality of produce improved and income was also enhanced than in normal conditions. Anonymous (2006) and Dixit (2007) also reported the same.

The growers also listed their problems which they were facing during the cultivation of vegetables under this technology. Majority of growers quoted that low prices offered in the market due to lack of MSP/assured market is the main problem they are facing. Sharma *et al.* (2004) also lack of regulated market, lack of storage facility and exploitation by the middlemen were the major problems faced by the vegetable growers of Punjab state. It was followed by non availability of electricity during the peak period of irrigation and they were forced to use diesel pumps for irrigating their crops and it increases the cost of production and results reduction in profit. Other problem indicated as high cost of inputs which are very high even after the subsidy. Thyagarajan and Prabhu (2005) found in their study that tomato growers in Tamil Nadu faced the problems of wide price fluctuation, high cost of labour, inadequate water supply, exploitation by middlemen, lack of inadequate market facility and storage facilities at the village level.

Table 3: Problems faced by growers during the vegetable production under low tunnel technology (n=50)

S.No.	Problems	Frequency (%)
1.	Low prices of vegetables	100
2.	Non availability of electricity during peak period of irrigation	90
3.	High cost of inputs like polythene sheaths, wires etc.	80
4.	Labour shortage during peak season.	66
5.	Lack of storage facility	64
6.	Lack of cold store vans	64

Govt. should provide subsidy based on the acres of land under low tunnel cultivation on the basis of fixed formula and each farmer adopting low tunnel vegetable cultivation may get their share. Labour shortage during the peak season forced them to pay higher labour charges which results in high cost of production and low profitability. Sreeram (2014) revealed many problems faced by the farmers like Problems related to marketing of the produce, Problems related to functioning of the enterprise, Problems related to input availability, Problems related to management of the enterprise, Problems related to credit and Problems related to labour.

To overcome this problem Govt. need to mobilize the Mahatama Gandhi NREGA labour as farm labour of those identified farmers who demanded labour in advance. Further lack of storage facility at the village level and lack of cold stored vans during transportation of vegetables resulted in the quality deterioration of vegetables during transportation to far away markets. Creating cold stores in the vegetable producing hubs and also by providing cold storage vans to the cooperative societies of those pockets identified as vegetable grower's pockets may go a long way in sustainable adoption of technology. Kumar and Singh (2002) reported in their study that vegetable growers are facing major problems like non availability of inputs at right time, high cost of inputs, and lack of govt. support in terms of subsidy

results in poor adoption of vegetables by the farmers. Upadhyay *et al.* (2008) revealed in their study that 44 per cent respondents reported lack of technical guidance as a problem in adoption of vermiculture technology though they possessed good knowledge but they wanted to know more about this technology and technical guidance was needed at different stages of using vermiculture technology. The popularity of this technology amongst farmer's increasing day by day due to higher crop yield, water saving, quality produce due to less attack of insect pest and diseases, early market advantage and higher income as compared to the normal season crops attracted the farmers towards low tunnel technology as such the problems need serious look from policy level.

CONCLUSION

The study revealed that profit from vegetables under low tunnel cultivation gave higher returns than by other methods. Benefits of cultivation of vegetables under low tunnel were cultivation under adverse conditions, high yield, better quality, high returns, free from insect pest attack, earliness of crop and more over act as self employment or source of entrepreneurial activity. The problems faced by the growers during the cultivation of vegetables under low tunnel are low prices, non availability of electricity during peak period, high cost in the beginning, labour shortage during peak season, lack of cold stores and cold stores mobile vans. In net shell this technique is very beneficial to the small scale farmers as they get high revenue from the small holdings and also arrange work for their family by engage them in this high profit venture.

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Investigation of Nutritional and Health Status of Indian Rural Hill Farm Women

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ABSTRACT

In hill region of India, women play a major role in agricultural production, livestock and cottage industries and remain busy from dawn to dusk to collect water, fuel wood and fodder which adversely affects their health. In order to study nutritional status of farm women information regarding food intake was obtained from 120 farm women from high, mid and low hills using 24 hours recall method with interview schedule cum observation worksheet. Physiological characteristics and anthropometric measurements related to nutrition like weight, height, skin fold measurements, blood pressure, heart rate, energy expenditure rate, VO, max and pulse rate of subjects were recorded. Results indicated that diet of farm women of high, mid and low hill region was inadequate in terms of energy, protein and β-carotene. It was also found that calcium and β-carotene consumption by farm women during winter was significantly higher. On the basis of BMI, about 45 per cent subjects were found Chronic Energy Deficient (CED) and 22.5 percent were in the category of Low-Normal. Only 30 percent subjects were in the category of Normal.

Keywords: Nutritional Status, Hill farm women, Chronic energy deficiency

INTRODUCTION

Uttarakhand is a small state in the northern part of India with a total area of 53,484 km² of which 93% is mountainous. Uttarakhand is located between 28° 43'–31° 27' N latitudes and 77° 34'–81° 02'E longitudes with an altitudinal variation ranging from 200 meter to more than 8,000 meter above mean sea level. The average annual rainfall of the state, as recorded is 1,547 mm. In Uttarakhand about 70 percent population resides in rural areas. More than three-fourths of state's total population depends on agriculture for their livelihood and the economy is predominantly dependent on mountain agriculture. Uttarakhand is one of the few states in India where women are the active workforce in agriculture, due to their total involvement with agriculture, animal husbandry, fodder and fuel-wood collection and household activities. (Population Foundation of India, 2002). Women here are therefore considered as the backbone of hill agriculture and are the mainstay of rural economy.

Small land holdings, low agricultural productivity and less job opportunities have given rise to out migration. This has dramatically dislocated Uttarakhand village communities. The large scale out-migration of men in search of employment in the plains or in the army has led to a demographic imbalance in the region. While men predominate in urban areas, the rural areas contain significantly high female population (Rawat, 2004). Further, changes in the climate usually have more impact on sectors that are traditionally associated with women, such as crop cultivation, collection of fuel and fodder etc. Seasonal migration of men in search of job is both widespread and linked to low agricultural productivity. 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. This phenomenon is referred to as the 'feminization of hill agriculture and livelihood'. Increasingly women are left with no other choice but to cope with the food shortages and the management of the home and farm.

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According to an assessment (Bhati and Singh, 1987) in the Himalayan region, a pair of bullocks works for 1064 hrs, a man for 1212 hrs and a woman for 3484 hrs in a year on a one hectare farm. Unlike women in plain areas, the women here look after all the agricultural operations (except preparation of field) and trek longer areas to fetch fuel, fodder and water. This heavy work is bound to have its impact on the health of the women and girls in hills of Uttarakhand. Borah and Kalita (2002) revealed that, the average time devoted by women in agricultural operation is 8 to 9 hours per day in peak season and 4 to 5 hours in slack season. Several researchers have studied and confirmed that women work for 14-18 hours daily (Ancheta, 1982; Kaur and Punial, 1986) on live stock raising, fetching fodder, farming operations, collecting fuel and water from far off places and expend more total energy a day as compared to men. Kishtwaria *et al.* (2009) studied the extent of participation and time spent by women in different activities in three different zones of Himachal Pradesh. In the hilly areas, contribution of labors is the most important factor in livestock management and production. Majority of women were involved in performing various farm activities i.e. cutting/uprooting (85.52%) weeding (79.32%), bundling (74.20%), picking/doffing (72.79%). The women spent maximum time in transplanting (327.68 hrs/years) followed by transportation of manure (138.05 hrs/years). 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). Constantly carrying heavy weights/loads on spine, commonly on head and back has severe health implications. 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.

Poor health has repercussions not only for women but also their families. Women with poor health and nutrition are more likely to give birth to low weight infants. They are also less likely to be able to provide food and adequate care for their children. Finally, a woman's health affects the household economic well being, as a woman with poor health will be less productive in the labour force. 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. Efforts have been done by various institutions to raise the economic status of rural families through interventions in the field of agriculture. But nutritional status of women depends upon several factors like food intake, income, healthcare practices and status of women in the society. Therefore it becomes necessary to study whether improvement in economic status of farm families has led to improvement in nutritional status of farm women. Seasonal shortfall in food availability tends to affect women disproportionately since their already inadequate intake will be curtailed drastically. Even when more food is available, it tends to be preferentially allocated to men, thus preventing women from accumulating any reserves. If seasonal shortfall coincides with pregnancy or lactation, the implications for women and infants are particularly harsh (Chatterjee and Lambert, 1989).

In a study it was calculated that daily kilocalorie expenditure on various agricultural and domestic activities was 2473 for men and 2505 for women. Whereas average daily intake of kilocalories per man was estimated to be 3270 and 2410 for women (Batliwala, 1987). Thus, women faced both a relative deprivation in comparison with men, and an absolute deficit vis-à-vis their calorie expenditure. It was demonstrated that women's daily energy expenditure was likely to be higher than men's, particularly in rural settings where men's work is seasonal but women's is continuous and includes domestic and reproductive chores. Anand and Kumar (2015) also reported that there are adverse disparities seen amongst the entire population especially between men and women which seems convincing enough to evolve strategies to counter these disparities spread across economic and social domains. While much of data both from official

and non-official sources on the health of the women are missing, the few which is available after 2000, is casual and unhelpful to draw authoritative conclusions. One sphere that has yet to receive adequate attention is the relationship between women's work and women's nutritional status in the agricultural setting. There is a paucity of information on diet, dietary pattern and nutritional status of hill farm women. Therefore, an attempt has to be made to assess the dietary pattern and nutrition status of farm women in hill region of Uttarakhand. Therefore this study is being undertaken to assess nutritional status of hill farm women during different seasons.

MATERIALS AND METHODS

The present study was conducted on 120 farm women from low, mid and high hills of Uttarakhand. The subjects selected were in the age group of 18 to 45 years (excluding pregnant and lactating women) and actively engaged in farming. Those women who willingly cooperated to provide information required for the study were only included in the study. Anthropometric measurements of women recorded included weight, height, skin fold measurements, blood pressure and pulse rate. The method suggested by Gibson (1990) was followed for this study. Measurements were taken in triplicate and average values were recorded. The extent of malnutrition in women was assessed by computing the BMI (Body Mass Index).

$$\text{BMI } (kg/m^2) = \frac{\text{Weight (kg)}}{\text{Height (m) x Height (m)}}$$

The respondents were categorized into different grades of nutritional status using BMI index (James *et al.,* 1988).

BMI Grades	BMI Range
CED III	Less than 16
CED II	From 16-17
CED I	From 17-18.5
Low-Normal	From 18.5 to 20
Normal	From 20-25
Over weight & obesity	More Than 25

Information regarding food intake was obtained from 120 farm women using 24 hours recall method using pre-structured interview schedule. The data pertaining to the daily intake of foodstuff along with quantity was collected using 24 hours recall method (2 recalls). The quantity of raw food was calculated using the following formula:

$$\text{RFI} = \frac{\text{TRQ x II}}{\text{TCQ}}$$

Where, RFI = Raw amount of a food stuff consumed by the individual

TRQ = Total raw quantity of food stuff used in that preparation

II = Individual intake of the cooked amount of preparation

TCQ = Total cooked quantity of food prepared.

The average daily intake of foods by individual respondents was computed and compared with the suggested levels of intake (ICMR 2010). The nutritive value for the quantity of raw foods consumed by the individual respondents were calculated by using food composition tables (Gopalan *et al.,* 1989) and compared with the Recommended Daily Allowances (RDA).

Body density, percent body fat and fat free mass of subjects were calculated using skinfold thickness from formula given by Durnin and Womersley (1974) as follows:

20-29 years, D = 1.1599 – (0.0717 x L)

30-39 years, D = 1.1423 – (0.0632 x L)

40-49 years, D = 1.1333 – (0.0612 x L)

D = Body Density

Siri Percent Fat Equation, 1961

Percent Body Fat = (495 / Body Density) – 450

Fat Mass (kg) = Body weight (kg) x (4.95/D – 4.5)

Fat Free Mass (kg) = Body weight (kg) – Fat mass (kg)

Physiological characteristics in terms of B.P., H.R. energy expenditure rate, VO, Max and Total Cardiac Cost of Work (TCCW) was recorded. Mean blood pressure (mmHg) was calculated using the measured Systolic and Diastolic pressures, SP and DP.

Mean blood pressure (mmHg) = DP + 1/3 (SP-DP)

Formula for calculating EER

Energy Expenditure Rate (kJ/min) = 0.159 x Avg. working HR – 8.72

Formula for calculating VO_2 max

VO_2 max (l/min) = 0.023 x Body weight (kgs) – 0.034 x Age (years) + 1.65

Formula for calculating

TCCW (Total Cardiac Cost of Work) = Cardiac Cost of Work (CCW)+Cardiac Cost of Recovery (CCR)

Where,

CCW = Average Heart Rate (AHR) x Duration of Activity

AHR = Average Working Heart Rate - Average Resting Heart Rate

CCR = Average Recovery Heart Rate- Average Resting Heart Rate (AWRHR)

PCW (Physiological cost of work)= TCCW/Total time of Activity

Frequency, Mean, Standard Deviation, Coefficient of correlation and t test were used for statistical analysis.

RESULTS

Nutrient intake: The results in Table 1 shows that average energy consumption per capita per day of farm women from high hills was 1802 (±252) kcal followed by 1716 (±245) kcal and 1712 (±293) kcal of farm women from mid and low hills respectively. It is evident from the Table 3 that 37.5, 42.5 and 32.5 per cent farm women from low, mid and high hills consumed energy less than 75 per cent of RDA (2230). A study also reported the average energy intake by the rural women of the central Himalaya below the standard requirement (Pant, 2002). Restriction in energy intake affects adversely the utilization of dietary protein. It is also evident from Table 2 that in low hills energy consumption by farm women in summer and winter differed significantly at 1 per cent level.

Protein plays an important role in many bio-chemical, bio-physical and physiological processes in the body. Table-1 reveals that average protein consumption of farm women in high, mid and low hills was 46.2 (±8.6) g, 41.6 (±7.8) g and 43.9 (±7.9) g which is 16, 24.3 and 20 per cent lower than RDA respectively. Results presented in Table 2 shows that in low hills protein consumption by farm women in summer and winter differed significantly at 1 per cent level. It is also evident from Table 3 that 17.5, 30 and 12.5 per cent farm women

Table 1: Average nutrient consumption by farm women in hills

Nutrients	Low Hills [Mean (SD)]	Mid Hills [Mean (SD)]	High Hills [Mean (SD)]	RDA
Energy (kcal)	1711.8(±292.6)	1716(±245)	1802(±251.7)	2230
Protein (g)	43.9(±7.9)	41.6(±7.8)	46.2(±8.6)	55
Calcium (g)	731(±182)	879(±329)	965.3(±398.5)	600
Iron (mg)	26.5(±5.4)	27.3(±8.9)	29.2(±7.5)	21
β-carotene (µg)	2837(±3015)	4459(±3463)	4504(±5020)	4800

Table 2: Nutrient consumption by farm women in hills during different seasons

Nutrients	Low Hills			Mid Hills			High Hills			RDA
	Summer Mean (SD)	Winter Mean (SD)	Paired t-value	Summer Mean (SD)	Winter Mean (SD)	Paired t-value	Summer Mean (SD)	Winter Mean (SD)	Paired t-value	
Energy (kcal)	1675.5 (±301.2)	1748.1 (±286.7)	5.993**	1751.8 (±255.7)	1681 (±234.8)	0.929	1818 (±285.2)	1786 (±219.4)	0.371	2230
Protein (g)	43.1 (±8.0)	44.7 (±8.0)	4.292**	42.1 (±7.9)	41.6 (±7.8)	0.286	47.9 (±7.7)	44.6 (±9.2)	1.121	55
Calcium (g)	653 (±151.2)	809.4 (±180.1)	4.395**	674.3 (±170.5)	1083.9 (±324.2)	5.858**	780 (±194.5)	1150.5 (±464.7)	3.120**	600
Iron (mg)	23.9 (±4.4)	28.9 (±5.3)	4.432**	22.6 (±3.6)	31.9 (±10.3)	3.497**	28.5 (±5.8)	29.9 (±8.9)	0.497	21
B-carotene (µg)	1808.8 (±1494.3)	3865.1 (±3768.2)	2.532*	3857.2 (±3786.4)	5061.9 (±3085.5)	0.970	1861.7 (±1963.2)	7146.3 (±5760.9)	3.804**	4800

* Significant at 5% level; **Significant at 1% level

from low, mid and high hills consumed protein less than 75 percent of RDA.

Intake of calcium was found to be higher than Recommended Dietary Allowance (RDA) among farm women of three hill region during both seasons. In hills, coarse grains i.e, ragi and barnyard millet which are rich in calcium content being the part of their daily diet contributes towards higher intake of calcium. Average calcium consumption by farm women in low, mid and high hills was 731 (±182) g, 879 (±329) g and 965 (±398) g which was 21.6, 46.5 and 60.8 per cent higher than RDA. Results presented in table-2 shows that calcium consumption by farm women of low, mid and high hills in summer and winter differed significantly at 1 per cent level. Table 3 shows that 92.5, 82.5 and 80 per cent farm women in high, low and mid hills were consuming calcium more than RDA respectively. Some studies also reported higher percentage of women consuming adequate calcium in their diet (Dobhal *et al.,* 2003). It is evident from table-2 that there was a significant variation in calcium consumption by farm women of three different altitudes in hills at 1 percent level of significance.

Results presented in Table 1 shows that the average iron consumption by farm women of low, mid and high hills was 26.5 (±5.4) mg, 27.3 (±8.9) mg and 29.2 (±7.5) mg/day. Data presented in Table 2 shows that iron consumption by farm women of low and mid hills in summer and winter differed significantly at 1 per cent level. It was also found that 85, 77.5 and 80 per cent farm women from low, mid and high hills were consuming iron more than RDA respectively. Whereas 15, 22.5 and 20 per cent respondents from low, mid and high hills were consuming iron more than 75 per cent of RDA but less than RDA respectively (Table 3). Diet of farm women was deficient in terms of energy, protein and iron due to which the physical work capacity is decreased (Singh 2012). In India nearly 70 percent of women are estimated to be iron deficient. Iron deficiency can exist without anemia. Iron deficiency Anemia (IDA) is very late manifestation of iron deficiency because iron deficiency is very well tolerated Anemia does not develop till storage iron is exhausted (Shah, 2004). The main reason for IDA have been determined to be inadequate intake of iron, low bioavailability (1-6 percent) of dietary iron from plant foods (Rao *et al.,* 1983).

Table 3: Percentage distribution of farm women in hills according to intake of nutrients

Nutrient	Group	≥ 100 % of RDA	100 – 75 % of RDA	≥75% of RDA
Protein	Low Hills	12.5	70	17.5
	Mid Hills	12.5	57.5	30
	High Hills	32.5	55	12.5
Energy	Low Hills	5	57.5	37.5
	Mid Hills	0	57.5	42.5
	High Hills	10	57.5	32.5
Calcium	Low Hills	82.5	15	2.5
	Mid Hills	80	17.5	2.5
	High Hills	92.5	7.5	0
Iron	Low Hills	85	15	0
	Mid Hills	77.5	22.5	0
	High Hills	80	20	0
B-carotene (µg)	Low Hills	15	15	70
	Mid Hills	42.5	10	47.5
	High Hills	35	2.5	62.5

Average consumption of β-carotene by farm women in low, mid and high hills was 2837 (±3015) µg, 4459 (±3463) µg and 4504 (±5020) µg. It is evident from Table 2 that in low hills consumption of β-carotene by the farm women in summer and winter season differed significantly at 5 percent level whereas in high hills consumption of β-carotene by the farm women in summer and winter season differed significantly at 1 percent level.

Table 3 shows that 70, 47.5 and 62.5 per cent farm women were consuming β–carotene less than 75 percent of RDA. It was found that intake of β-carotene was higher than RDA in three hill regions during winters due to the huge availability of green leafy vegetables like fenugreek leaves, spinach, amaranth, onion stalks, radish leaves and buck wheat. Over 80 percent of the dietary supply of vitamin-A in the Indian diets is derived from its precursors, β-carotene, a-carotene, g-carotene and b-cryptoxanthin which are present in much plant food. Among these carotenoids, β-carotene has the highest vitamin A activity. The important deficiency states due to vitamin A intake in diet are night blindness, xerosis conjunctiva, xerosis cornea, bitot's spots, keratomalacia and follicular hyperkeratosis.

Protein-Calorie adequacy among farm women in hills: Table 4 clearly illustrates that majority of farm women of high, mid and low hills consumed inadequate protein and calorie. It was found that 87.5 per cent

Table 4: Protein calorie adequacy (%) among farm women in hills

Group	P+C+	P+C-	P-C+	P-C-
Low Hills	5	7.5	0	87.5
Mid Hills	0	12.5	0	87.5
High Hills	10	22.5	0	67.5

farm women in low and mid hills each and 67.5 per cent farm women in high hills consumed inadequate protein and calorie in their diet. Only 10 per cent and 5 percent subjects in high and low hills respectively consumed adequate protein and calorie. Without correcting the exiting calorie gap, the provision of protein concentrates will not prevent protein-calorie malnutrition (Reddy and Rao, 2000).

Physiological Characteristics: As per the physiological characteristics of the subject (Table 5) the mean age of the subjects was 23.5 years with ±4.31 standard deviation. The corresponding mean heart rate (rest) was found to be 73.51 beats/min. The maximum heart rate was with a mean value of 172.10 beats/min with ± 6.54 SD. The mean VO2 max was observed to be 1.80 l/min. In general, it was observed that the VO2 max of female decreased with increase in age. Similar results of VO2 max of Indian female subjects were also reported earlier (Nag *et al.*, 1988; Gite, 1996; Vidhu, 2001). The mean blood pressure of the subjects was 81.44 mm Hg with ± 2.15 SD which is normal in Indian women. The corresponding pulse rate was found to be 68.24 with ± 4.58 SD.

The Total Cardiac Cost of Work (TCCW) and Physiological Cost of Work (PCW) were found 2017.5 and 134.5 respectively, after 10 hours of agricultural and household works.

Anthropometric measurements and body composition of farm women in hills: Anthropometric data related to nutrition were recorded with anthropometric kit. Skin-fold thickness was measured at four sites i.e. biceps, triceps, subscapula and suprailiac. The data (mean ± Standard Deviation) pertaining to Bicep was 6.54 (±1.13) mm, Tricep 8.53 (±1.18) mm, Subscapular SFT 12.42 (±1.51) mm, Suprailiac SFT 10.36 (±1.19) mm, Body Density (D) 1.033 (±0.002), % Body Fat 24.61 (±1.32), Fat mass 10.58 (±1.62) kg, and Fat free mass (kg) 31.93

Table 5: Physiological characteristics of the subject

Physiological characteristics	Range	Mean	Std. deviation
Age (Years)	20-45	23.5	4.31
Weight (kg)	38-59	48.5	3.19
Stature, cm	142.5-161.5	152.5	3.1
HR rest, beats/min (3 replication)	65-78	73.51	2.19
HR max, beats/ min (3 replication)	168-196	172.10	6.54
Mean Blood Pressure (3 replication)	75.24-96.56	81.44	2.15
Pulse Rate (per min)	64-78	68.24	4.58
VO, rest, l/min	0.16 – 0.28	0.20	0.03
VO, max, l/min	1.61 – 2.11	1.8	0.06
TCCW, beats/min (3 replication)	1870.5-2183.5	2017.5	5.12
PCW, beats/min (3 replication)	129.5-137.5	134.5	6.14

Table 6: Anthropometric measurements and body composition of farm women in hills

Parameters	Mean ± SD	95th Percentile	50th Percentile	5th Percentile
Bicep (mm)	6.54 ± 1.13	8.41	6.54	4.67
Tricep (mm)	8.53 ± 1.18	10.48	8.53	6.57
Subscapular SFT (mm)	12.42 ± 1.51	14.92	12.42	9.92
Suprailiac SFT (mm)	10.36 ± 1.19	12.33	10.36	8.39
BMI, kg/m^2	18.80 ± 2.69	23.25	18.80	14.36
Body density (D)	1.033 ± 0.002	1.038	1.033	1.029
% Body fat	24.61 ± 1.32	26.80	24.61	22.43
Fat mass	10.58 ± 1.62	13.26	10.58	7.90
Fat free mass (kg)	31.93 ± 3.55	37.80	31.93	26.07

(±3.55) kg, which shows that women in N-W Himalayan region is malnourished and they have very lean body mass and fat free mass. Along with mean and standard deviations 95th and 5th percentiles were also calculated and presented in Table 6.

Prevalence of Chronic Energy Deficiency (CED) among farm women by physiological status: Prevalence rate of Chronic Energy Deficiency (CED) is used as a measure of (adult) nutrition and health status for any region. Nutritional status of farm women was assessed using Body Mass Index (BMI). Body Mass Index of the respondents was computed using height and weight values and subjects were classified into various categories of Chronic Energy Deficiency (James *et al.,* 1988). The nutrition deficiency disease may not essentially be due to lack of single nutrient. It may occur due to lack of more than one nutrient in the diet taken by the people for a specified duration of the year Nutrition deficiency is one of the major problems in the hilly region (Pant, 1994; Pant, 1998; Jalal *et al.,* 2001).

The findings in Table 7 and Figure 1 shows that 45 percent subjects were Chronic Energy Deficient and 22.5 percent were in the category of Low-Normal. Only 30 percent subjects were in the category of Normal. The

Table 7: Prevalence (%) of chronic energy deficiency (CED) among farm women by physiological status

BMI Grades	BMI Range	Frequency	Percentage
CED III	Less than 16	15	12.5
CED II	From 16-17	11	9.2
CED I	From 17-18.5	28	23.3
Low-Normal	From 18.5 to 20	27	22.5
Normal	From 20-25	36	30
Over weight & obesity	More than 25	3	2.5

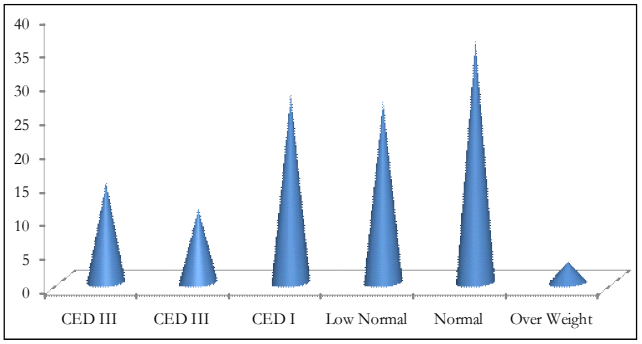

Figure 1: Chronic Energy Deficiency (CED) among farm women by physiological status

Mean Body Mass Index (BMI) of the subject was found to be 18.96 (±2.8) kg/m² with the range from 13.1 kg/m² to 25.6 kg/m².

The deficiencies restrain their physical growth and mental development and make them more susceptible to morbidity and mortality due to infectious disease. A significantly positive relationship was found between protein and Body Mass Index (0.52) at 1 per cent level. Also a significantly positive relationship was found between energy and Body Mass Index (0.58) 1 percent level (Table 8). A study also reported that in case of hill region a total of 52 per cent women were reported as Chronic Energy Deficient and 20 per cent were found to be low normal (Sharma *et al.,* 2016).

Table 8: Relationship between nutrient consumption and body mass index

Nutrients	Correlation co-efficient
Protein	0.518*
Energy	0.578*

*Significant at 1% level

CONCLUSION

The study concludes that the diet of farm women of high, mid and low hill region of Uttarakhand is inadequate in terms of energy protein and iron. It was also found that calcium and β-carotene consumption during winter was significantly higher than consumed during summer season. This is due to huge availability of green leafy vegetables like fenugreek leaves, spinach, amaranth, onion stalks, radish leaves and buck wheat. Climate of hill region of Uttarakhand is suitable for cultivation of off-seasonal vegetables. But most of the farmers are cultivating vegetables based on other traditional knowledge. There is huge yield gap in cultivation of vegetables. Off seasonal vegetable production will provide nutritional security to hill population in Uttarakhand during lean seasons. About 45 per cent respondents were Chronic Energy Deficient. 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. The study population being active workforce in hilly region of Uttarakhand, their health and nutritional status should be considered as an important public health issue. Creating awareness

and making them self sufficient in modifying food behavior and life style pattern within their accessible environment should be included as an intervention strategy in the regional programs.

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Use of Revolving Stool for Drudgery Reduction among Farm Women Involved in Milking Dairy Animals

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ABSTRACT

Women engaged in dairy farming maintain their own convenient posture for performing the task. Use of revolving stool has been popularized through various extension activities such as training, demonstration and field days to reduce drudgery involved in milking activity. Technology on revolving stool provided by the Department of Family Resource Management, College of Home Science, G.B. Pant University of Agriculture and Technology, Pantnagar has been used for conducting extension activities by Krishi Vigyan Kendra, Kashipur during the year 2014-15 and 2015-16. Ten demonstrations were conducted in five villages of Rudrapur block, district U.S. Nagar namely Danpur, Bhoorarani, Chattarpur, Khanpur-1 and Anandkhera-1. The observations and experiences of respondents were collected through questionnaire and field visits for its ease in operation and reduction in musculo skeletal disorders. Results revealed mean score for the parameters for two years i.e. 2014-15 and 2015-16 such as bio- mechanical- 4.3, 4.8; physical stress- 4.6, 4.6; work output-3.6, 4.0; tool factor- 4.8,4.8; field acceptability- 4.6,4.6 and the average mean score were found to be 4.38 and 4.56 whereas acceptability score was found to be 70.8 and 71.8, respectively. Percent change in knowledge pre exposure 11.36% and post exposure of training and field day it was found as 90.96%, profitability (in terms of health benefits) pre exposure 5.68% and post exposure it was found as 93.18% and awareness regarding revolving stool pre exposure -7.95% and post exposure it was found as 98.86%. The results of ten demonstrations conducted on revolving stools revealed that they were highly acceptable and relevant for drudgery reduction among farm women for milking operation of dairy animals.

Keywords: Dairy farming, Drudgery reduction, Milking, Revolving stool

INTRODUCTION

Dairy farming involves backbreaking tasks as all the activities are carried out in arduous posture. Drudgery is concerned as physical and mental strain, fatigue, monotony and hardship experienced by women (AICRP-1997-98). Milking is a strenuous activity as it requires adoption of squatting posture for longer period which induces static muscular strain in lower body extremity. Further muscles remain in a contracted state for a long time. Prolonged muscular contraction stops the flow of blood into the muscles which heads to the diminished supply of oxygen and build-up of waste products. Building up of waste products particularly carbon dioxide and lactic acid brings about a painful stage of fatigue (Sharma, 1997). The women adopt long static postures for some of the activities, which increase the static muscular effort resulting in physiological cost and low productivity. In some cases, the angle of body deviation in lumbar region is affected. Angle of body deviation from its natural alignment due to habitual error can damage the curve of backbone permanently because in pulling and pushing inter vertebral disc which join the vertebrae is torn away, making fluid (viscous fluid) to flow away sciatic nerve causing the severe sciatic pain. With the going away of discs fluid, the backbone becomes less flexible and continues to pain at the time of work and after work (Oberoi, 1997). Work related to animal husbandry is being conducted by women and major role has been played by the farm women of Punjab, Haryana,

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Gujarat and Uttarakhand in white revolution. Researchers proved that any work design or work environment that helps to perform the work with minimum energy and put minimum stress on cardio vascular system and muscular system is the best design of work (Varghese *et al*., 1994). Deepali Chauhan (2013) carried out a study on ergonomic assessment of farm women performing weeding and winnowing operations. She assessed impact of work related risk factors of weeding and winnowing operations on anatomical body structure of female. Muscular and postural stress were observed higher in weeding operation as compared to winnowing operation. It may be due to squatting poster adopted by females during weeding operation. Panwar and Gupta (2008) carried out a study on appropriateness of drudgery reducing technologies as perceived by farm women. They reported that use of serrated sickle and wheel hoe as highly appropriate technologies in terms of drudgery reduction. 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. Corlett *et al.* (1983) showed the effect of poor working posture in order to perform task could lead to postural stress, fatigue and pain which may in turn force the operator to stop work until the muscle recovers. Pinzke *et al.* (2001) opined that the high muscle loads in combination with extreme positions and movements of the hand and forearm might contribute to the development of injuries among milkers. Tripathi and Pandey (2011) reported 26 per cent saving in cardiac cost of women workers per unit of out put for milking a buffalo using a revolving stool as compared to the continuous squatting position while milking an animal traditionally. Naik and Sumangala (2015) reported that there was a significant reduction in energy expenditure, physiological cost of work, total cardiac cost of work, time taken and body angles when the activities were carried out by using drudgery reducing tools i.e., revolving stand and stool for milking activity and Gopal khore spade in cleaning of animal shed activity. Therefore, improved tools for performing the selected activities are beneficial because they lead to the reduction of drudgery, reduce the muscular stress, help the women to adopt correct posture work and also reduce the angle of deviation. The use of revolving stool may significantly reduce the physiological and muscular cost of milking activity. Appropriate height of the stool improves the posture, therefore reduces the musculoskeletal problems of women while performing the activity. Benefits of stools have been realized because use of revolving stool saves energy and heart speed upto 6 percent. It helps in maintaining posture (spinal cord) and hence reduces the problem of backache. It provides comfort to legs and knees and thus helps in reduction of pain in legs. It reduces the load on heart upto 13.48 percent during working time and reduces energy expenditure upto 8.75 per cent. This type of stool can be easily made by local carpenter hence cost of the stool can also be reduced by using wooden or tin plate instead of steel. Ball bearing type of stool makes convenience in movement. Revolving stool can be used contrary to squatting posture of worker engaged in milking operation to reduce the work stress of dairy workers involved in milking which was designed as per the sitting height measurements of females.

MATERIALS AND METHODS

Creation of awareness towards the use of revolving stool for drudgery reduction: This was achieved by the following methods:

- Frequent visits made by the home scientists of Krishi Vigyan Kendra, Kashipur to the field sites.
- Continuous and healthy discussions with the farm women during field visits on need and importance of drudgery reduction.
- Creating awareness by conducting trainings and demonstrations on related aspects of drudgery reduction.
- Field day organized by the home scientists to motivate other farm women. The purpose was to introduce a new idea and to stimulate the interest of as many farm women as possible to offer general guidance to answer questions and queries for popularization and adoption of revolving stool.
- Technical and scientific guidance provided to each farm women in using revolving stool
- Demonstrations conducted on the use of revolving stool.

Selection of farm women for demonstrations and training: Ten physically fit farm women belonging to 24-48 yrs of age were purposively selected from Danpur, Chattarpur, Bhoorarani, Khanpur-1 and Anandkhera-1 villages of Rudrapur block, district Udham Singh Nagar, Uttarakhand state for conducting demonstrations possessing dairy animals viz cows and buffalos for milk production. The technology provided by the Department of Family Resource Management, College of Home Science has been used for conducting demonstrations on revolving stool through various extension activities such as training, demonstration and field days. Ninety women were randomly selected for imparting trainings, field day and for identifying the factors and attributes in production system that prioritizes the use of revolving stool for milking activity. These extension activities were organized by Krishi Vigyan Kendra, Kashipur during the year 2014-15 and 2015-16 to motivate other farm women towards using revolving stool for milking activity.

Method of data collection: The observation and experiences of respondents were collected through a questionnaire (Table 1) and field visits as far as its ease in operation and reduction in musculo skeletal disorders were concerned. The information was collected from the farm women purposively selected for conducting demonstrations. These farm women were interacted during field visits and other extension activities for

Table 1: Statements to measure user opinion on the improved technology after ergonomic intervention

Activity: Milking Technology: Revolving Stool

S.No.	Statements	HR	R	N	IR	HIR
Bio Mechanical	I feel					
1	I am able to maintain comfortable body posture at sitting position while using the revolving stool					
2	Twisting of trunk while doing the activity was minimized with the use of the revolving stool					
3	I could synchronize the movements of the animal					
Physiological Fatigue/Physical Stress	I feel					
4	No pains and cramps in the region of my body after performing the activity with the revolving stool					
Work Output	I Feel					
5	The tool is effective as per time cost					
6	The revolving stool is effective in improving the production efficiency					
Tool Factor	I feel					
7	The milking activity is light enough when I use the revolving Stool					
8	The height of the revolving stool needs to be adjusted to my working height					
9	The revolving stool is compact enough to store					
10	Easy to maintain or repair this tool					
11	The revolving stool serves multiple purposes					
12	The revolving stool is stable while sitting and performing the activity					
13	It is difficult to move the revolving stool on uneven grounds					
14	The seat of revolving stool is smooth and soft					
Field Acceptability	I feel					
15	The improved tool is a good replacement to the existing work practice					
16	I shall possess the revolving stool					
17	The tool requires modification					

HR = Highly Relevant; R = Relevant; N = Neutral; IR = Irrelevant; HIR = Highly Irrelevant

obtaining information related to drudgery reduction. Discussions were held with the farm women to assess their knowledge on technical know-how and importance of drudgery reduction.

RESULTS AND DISCUSSION

Dairy farming is an important task performed by rural women in district U.S. Nagar. 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 10 women were selected for conducting demonstrations and as sample under the study for observation and ergonomic assessment of dairy activities viz., milking by using traditional method and drudgery reducing revolving stool. The traditional method of milking involved squatting position carried out by farm women. Hence, trainings, demonstrations and field days conducted helped to motivate and create awareness among other women to start using revolving stool for drudgery reduction. Table 2 depicts the physiological workload of women respondents performing milking activity. Extension activities carried out in selected villages of Rudrapur block, district U.S. Nagar namely Danpur, Bhoorarani, Chattarpur, Khanpur-1 and Anandkhera-1revealed mean score for the parameters such as bio- mechanical- 4.3, 4.8, physical stress- 4.6, 4.6, work output- 3.6, 4.0, tool factor- 4.8, 4.8 field acceptability- 4.6, 4.6 and the average mean score were found to be 4.38 and 4.56 whereas acceptability score was found to be 70.8 and 71.8, respectively for 2014-15 and 2015-16. The results of ten demonstrations conducted on revolving stool from Table 2 revealed that they were highly acceptable and relevant for drudgery reduction among farm women for milking operation of dairy animals. Table 3 shows percent change in knowledge pre exposure 11.36% and post exposure of training and field day it was found as 90.96%, profitability (in terms of health benefits) pre exposure 5.68% and post exposure it was found as 93.18% and awareness regarding revolving stool pre exposure- 7.95% and post exposure it was found as 98.86%**.** Tripathi and Pandey (2011) revealed that respondents did not complain for pain in low back, knees, ankles and calf muscles due to the use of revolving stool during milking. Saving in the reduction of grip strength was to the tune of 11.81 per cent found when milking was done using revolving stool. The reduction of grip strength was only 9.03 per cent as compared to the squatting position where strength in grip reduction was 14.9 per cent. Reduction in perceived exertion and total cardiac cost of work with the use of revolving stool for milking were 24.00 per cent and 32.72 per cent, respectively. Vinay and Sharma (2012) studied the effect of selected dairy activities on performers in terms of various ergonomic parameters so as to provide suitable remedies to reduce work stress and reported that physiological workload of women in terms of heart rate was highest during milking i.e. 124.60 beats per minute

Table 2: Drudgery reduction parameters

Parameters	Mean Score rabi, 2014-15	Mean Score rabi (2015-16)	Interpretation scores	
No. of demonstrations	05	05	1	Highly irrelevant
Bio- Mechanical	4.30	4.80	2	Irrelevant
Physical Stress	4.60	4.60	3	Neutral
Work Output	3.60	4.00	4	Relevant
Tool Factor	4.80	4.80	5	Highly Relevant
Field acceptability	4.60	4.60	Less than 60	Not acceptable
Average	4.38	4.56	60-70	Acceptable
Acceptability Score	70.80	71.80	More than 70	Highly acceptable

Table 3: Knowledge, profitability and awareness parameters before and after exposure of revolving stool

Parameters	Pre–exposure (training and field day)	Post-exposure (training and field day)
Percent change in knowledge	11.36%	90.96%
Profitability (in terms of health benefits)	05.68 %	93.18%
Awareness regarding revolving stool	07.95 %	98.86%

in comparison to other dairy activities such as cleaning etc. Suggestive tools/techniques to reduce work stress involved revolving stools for milking, long handle broom and dung collector for cleaning cattle shed, naveen sickle for fodder cutting and trolley for disposing off the dung. The present study reveals that use of revolving stool for milking is beneficial and women should be motivated to use the revolving stool for reducing the drudgery due to milking activity.

CONCLUSION

Revolving stool can be used at each household those who have milch animals. It is beneficial to use, easy to carry and maintain. Extension workers should make efforts to popularize this drudgery reducing technology for milking animals by the Indian rural women. The use of revolving stool helps to maintain good posture when milking as it reduces the problem of backache, physiological stress and enhances the work output.

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Depeasantry in Punjab: A Case Study

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ABSTRACT

A decade back, in village Kanjhla like other villages of the state, agriculture was the main occupation. Among the families selected, not a single family is doing farming now. They have shifted to other occupations like shops, labour work, and other small scale businesses to earn their livelihood. The main reasons for leaving farming were falling productivity, fragmentation of holdings, increasing prices of inputs, low profit, etc. They either sold their land or leased out their land. Indebtedness of farmers were also the main reasons for depeasantization. The next generations of farmers don't want to adopt farming as an occupation. The 'push factors' have affected a lot to these small and marginal farmers. The growth-led transformation is related with the developmental factors like mechanization of agriculture, increasing employment and income, high education level, urbanisation, development of secondary and tertiary sectors and even state intervention for generating employment opportunities. These factors are known as 'pull factors', which contribute to 'pull' the workforce from farming to more lucrative non-farm activities. On the other hand, distress-induced transformation is based on the hardship or crisis driven factors like falling productivity, increasing costs, decreasing returns and crop failure; unemployment and underemployment; increasing indebtedness and even suicides. These factors are known as 'push factors', which push the agriculture workforce towards non-farm activities to earn their livelihood.

Keywords: Depeasantry, Pubjab, Shrinking

INTRODUCTION

The Punjab state has 5.03 m ha geographical area out of which 4.23 m ha is under cultivation. Agriculture is a way of life. About 75 percent of its population depends directly on agriculture. It has shaped the thought, outlook, culture and economic life of our people. Therefore, it will continue to control all strategies for planned socio-economic development of the state. Since the advent of green revolution, the state has made rapid strides in agricultural production. The cropping intensity increased from 126 per cent to 186 percent during the period 1965-66 to 2004-05 and 190 percent in 2012-2013. The state has played a prominent role by achieving self- sufficiency in food grains by contributing 60 per cent wheat and 40 percent rice to the central pool (Anonymous, 2014).

The green revolution strategy which brought a phenomenal growth in the agricultural sector and improved the economic conditions of the farming community during the 1970s and 1980's, seems to be growing dim with the passage of time. Punjab, the pioneer of green revolution in India, is no more a state of ever-booming agriculture as it is facing economic crisis. Agriculture in Punjab had high growth for a long time up to early 1990s. The crisis in agriculture has manifested itself in the form of stagnating productivity, rising cost of production, decelerating income, shrinking employment, mounting indebtedness and ecological imbalance. The overexploitation of natural resources, especially groundwater, further dragged the farm incomes towards digging deeper for submersible pumps installation (Singh, 2008). During the era of high growth, the farmers attained high living standards, which also led to their social and cultural obligations being more expensive. Little wonder, the indebtedness of the farmers, more so to the non-institutional agencies and particularly of the small/marginal farmers, whose economic base is poorer, increased faster than their repaying capacity. As a result, their distress continued to mount. The agrarian distress reached a high climax by early 2000, when the Government of India sponsored an all-India independent NSSO study (2003), which

reported that 40 percent of the Indian farmers and 37 percent of the Punjab farmers have expressed their desire to leave farming, it being not a profitable occupation (NSSO, 2005). Due to economic and other reasons, about two lakh marginal and small farmers had left farming between 1991 and 2001 (Dhaliwal *et al.,* 2012). The marginal and small land holders constituted 44.76 per cent of the total holdings in 1990–91 which declined to 31.25 per cent in 2005–06 in Punjab (Singh *et al.,* 2009), although due to fragmentation of holdings the average size of holdings has decreased to 3.77(2012-13) from 3.95 in 2005-06. The declining percentage of marginal and small land holders from last decade is an issue for concern.

Punjab state has played a prominent role by achieving self- sufficiency in food grains by contributing 60 per cent wheat and 40 per cent rice to the central pool (Anonymous, 2014). The green revolution strategy which brought a phenomenal growth in the agricultural sector and improved the economic conditions of the farming community during the 1970s and 1980's, seems to be growing dim with the passage of time. The agrarian distress reached a high climax by early 2000. Due to economic and other reasons, about two lakh marginal and small farmers had left farming between 1991 and 2001 (Dhaliwal *et al.,* 2012). This transformation of workforce from farming to non-farming sector is called depeasantry and the process is called as depeasantization.

In this context, present study was conducted in Kanjhla village of Dhuri block in Sangrur district, which is having total area of 1566 ha and total cultivated area 1428 ha.

The main objective of the study was to find out the status of depeasantry in the village and the reasons behind depeasantry and occupations being adopted by the farmers after leaving farming.

MATERIALS AND METHODS

Present study considered both secondary and primary data. Secondary data about the village as a whole and its land, population structure were collected from District Census Hand Book, Village Red Book and other land record available with village *Patwari*. The Primary data were generated through a primary survey. The survey was conducted in month of November 2015. A complete listing of all farmers who left farming from 2005-2015 was done. Total number of farmers who left farming was around 200 and from those farmers 20 farmers were selected randomly and were interviewed regarding this issue.

Village Profile: The total population in the village has increased 5.24 per cent (up to 2011) from the year 2001, whereas on the other hand cultivators declined from 1066 to 892 during the decade. As such the decrease was 19.50 per cent. If percentage of population in agriculture is taken into account then the decrease is 4.57 percent. These figures clearly indicate the status of depeasantization in the village and from Table 1 status of depeasantization in Punjab can be well understood.

Table 1: Scenario of village 'Kanjhla'

Years	Total population	No. of cultivators	% of population in agriculture
In 2001	4841	1066	22.02
In 2011	5109	892	17.45
% shift	+ 5.24	-19.50	4.57

RESULTS AND DISCUSSION

Age of the depeasantized farmers: The age of respondents was classified into three categories by using range method and these were young, medium and old as represented in Table 2. Majority of the respondents were in the middle age group i.e. 60 percent while 30 per cent were in young age group and 10 percent of the respondents fell in the old age group which suggests that only young generation is leaving farming is not correct in case of village Kanjhla.

Educational qualification of the depeasantized farmers: The education of the respondents was categorized into 4 categories as presented in Table 2. It is clear from the table that 50 percent were matriculate, 25 percent of the respondents were middle passed and

Table 2: Distribution of respondents according to socio personal characteristics of the respondents (n=40)

Characteristics	Classes	Frequency (f)	%
Age	Young (25-40)	12	30
	Middle (40-55)	24	60
	Old (55-70)	4	10
Education	Illiterate	4	10
	Middle	10	25
	Metric	20	50
	Graduate	6	15
Land owned	1.5-2.33	12	30
	2.33-3.17	16	40
	3.17-4.0	12	30

Table 3: Distribution of respondents on the basis of status of land (n=40)

Status	Frequency (f)	Percentage
Sold	24	60
Leased out	16	40

15 per cent were graduates, which suggests that the farmers are not uneducated but they are not very well qualified.

Land owned by the depeasantized farmers: Land owned by the respondents was classified into three categories again by using range method as represented in Table 2. The study findings revealed that land owned by the respondents varied between 1.5-4.0 acres as many as 40 percent of the respondents owned 2.33-3.17 acres of land while 30 percent of the respondents owned 3.17-4.0 acres of land and an equal percent of respondents owned 1.5-2.33 acres of land.

Table 4: Distribution of the respondents on the basis of occupations adopted after leaving farming (n=40)

Occupations adopted	Frequency (f)	Percentage
Shop	14	35
Private job	8	20
Gone abroad	6	15
Dairy farming	8	20
Nothing	4	10

It is apparent from the data that in Table 3 that 60 percent of the respondents had sold their land and 40 per cent of the respondents had leased their land due to one or the other reasons.

The data placed in Table 4 reveal that 35 percent of the respondents had started various type of shops after leaving farming, 20 percent of respondents started doing private jobs and an equal percent of respondents had adopted dairy farming as an occupation whereas 15 percent of respondents had gone abroad after leaving farming to earn their livelihood and only 10 percent of farmers had done nothing.

The data in the Table 5 indicated that 40 percent of the respondents left farming for being a non- viable option, 20 percent of the respondents left farming because their next generation did not want to adopt farming as an occupation whereas 15 percent of the respondents sold their land and left farming to pay their debt and an equal percentage of respondents had left farming due to old age while 10 percent of the respondents sold their land and left farming due to drug addiction.

Table 5: Distribution of respondents on the basis of reasons for leaving farming (n=40)

Reasons	Frequency (f)	Percentage
Non- viable	16	40
Debt repayment	6	15
Drugs	4	10
Old age	6	15
Next generation don't want to adopt farming	8	20

CONCLUSION

The process of depeasantisation in Punjab began since early 1990s and gathered momentum since 2000. Low income from farming due to low productivity and high production costs were the main reasons for leaving farming in the state. The fragmentation of land holdings increased the cost of production, squeezed the returns and hence brought the farmers under debt. The smaller and marginal farmers were most severely affected by these problems. However, the other main reasons like high land rent, and low returns and money spent for social obligations were also responsible for pushing the smaller farmers away from agriculture. Thus the 'push factor' has impacted strongly to small and marginal farmers.

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Socio - Economic Upliftment of Farmers through Udaipur Agro Producer Company Limited

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ABSTRACT

The present study was conducted in Udaipur Agro Producer Company Limited (UAPCL) in Udaipur of Rajasthan. The sample included 50 members and 50 non-members selected randomly to analyse the social and economic impacts of participation in the organisation. The production, income and employment generation for the members of the organisation were significantly higher in comparison to the non-members. There was considerable difference in the amount of savings, expenditure and assets owned between the members and non-members. A significant difference between the members and non-members was observed in terms of food security and social empowerment. The members were also relatively well off in terms of health, educational and habitat security.

Keywords: Employment, Food security, Habitat security, Income, Social empowerment, UAPCL

INTRODUCTION

India is mostly an agrarian economy but the agricultural scenario of India is plagued with severe challenges. Indian agriculture is dominated with 85% small and marginal farmers. Due to increasing demand of land for nonfarm use, arising from industrialization and urbanization, the per capita availability of agricultural land in the rural area has shrunken from 0.683 hectares in 1950-51 to 0.13 hectares 2011 (DAC, 2014). Thus it is faced with the issues of dispersed land holdings, low marketable surplus and thus low profitability. Indian farmers specially need to be made aware of the benefits of economies of scale through collectivization in various aspects of input procurement, storage, marketing, processing, etc. The farmers can pool resources and form groups like farmer organisations, farmer interest groups, commodity based organizations, farmer producer companies. The farmer organisations provide common services like farm inputs, information, training, technical assistance, credit, research, enhanced bargaining power, marketing support and create opportunities for involvement in value-addition and processing. Nandeesa *et al.* (2013) reported that the Muttlur farmers of Nallavur Farmers Producers Organization, Chennai could increase their share in the consumer price by resolving issues of trader exploitation, exploring new markets, accessing timely credit and quality inputs. Patkar *et al.* (2012) reported that farmers can get better prices for commodities, reduce the production and marketing risks, and eliminate the traditional intermediaries by getting organized in groups. The SHGs are a powerful tool of socio-economic development of the poor women in rural areas as it accelerates the change in income, occupation, social participation, expenditure, decision making and change in confidence level (Bansode *et al.,* 2013). Sakthi *et al.* reported that the members of TAMAFED (Tamil Nadu Mango Growers Federation) in Tamil Nadu gained social and economic benefits and the costs incurred on input and output transactions were quite low ultimately adding to the benefit. Tolno *et al.* (2015) found positive farm income effects of group membership for the potato producers in Middle Guinea. Keeping these things in mind, the present study was undertaken to analyse the socio-economic impact through participation in farmers' organisation.

MATERIALS AND METHODS

The study was conducted in Udaipur Agro Producer Copany Limited (UAPCL) located in block Jhadol,

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Udaipur district of Rajasthan. Fifty UAPCL farmer members and fifty non-members were selected through simple random sampling. To analyse the economic impact, the respondents were asked about their production details, employment days generated, annual income earned, total annual savings, and their investment pattern in various enterprises annually. The production, income and employment figures were taken considering ginger crop. The obtained data were analysed using the t-test in order to find whether the differences between the figures of the two groups were significant or not. For analyzing the social impact, data were collected from the respondents on a set of statements listed under various heads of food security, habitat security, educational security, health security and social empowerment. Frequency and percentage analysis was carried out for analyzing habitat security, educational security and health security. To see the significance of difference in terms of food security and social empowerment between the UAPCL members and non-members, Wilcoxon Mann Whitney U test was used.

RESULTS AND DISCUSSION

Measurement of the economic impact: The economic impact was assessed though the annual production of ginger in quintals, employment days generated and annual income from the ginger crop, total annual savings and annual investment pattern per enterprise. The income for members and non-members was Rs 1.59 lakhs and Rs. 0.85 lakhs respectively. From Table 1, the higher income generating capacity of the members was clearly evident and the difference was significant, which was the result of adoption of recommended package of practices for efficient production and direct marketing of their produce through their company outlets. From Table 2, it was clear that the average production (50 q) for the members of UAPCL was higher than the non-members' production (30 q). It indicated higher production capacity of the UAPCL members, which was a result of access of extension support about the recommended package of practices from networking with various agricultural research institutes and availability of timely and good quality inputs provided by the organisation.

The members of UAPCL were employed for 151 days per year on an average whereas the non-members could find 100 days of employment from cultivation of ginger. It is clear from Table 3 that the higher employment generation capacity of UAPCL is significant. Members saved up to Rs 15,000 per annum whereas the non-members saved up to Rs 8,000 only. Table 4 indicates significant difference in the average savings of members as compared to non-members. Table 5 represents the average investment (rupees in thousands) made by the UAPCL members and non-members in various enterprises. Though there was significant difference in the average investment made by the members as compared to non-members due to the higher income earned by the member farmers; but the amount available

Table 1: Average income of respondents from ginger (n= 100)

Group	Mean (l)	Std. Deviation	Std. Error Mean	t value
Members of UAPCL	1.5967	.22967	.04193	12.59*
Non- Members	.8567	.22542	.04116	

*Significant at 5% level of significance

Table 2: Average production of ginger of the respondents (n= 100)

Group	Mean (q)	Std. Deviation	Std. Error Mean	t value
Members of UAPCL	50.3333	11.95778	2.18318	9.31*
Non- Members	30.0000	.00000	.00000	

*Significant at 5% level of significance

Table 3: Average employment of respondents from ginger cultivation (n= 100)

Group	Mean (days)	Std. Dev	Std. Error Mean	t value
Members of UAPCL	151.6667	33.43376	6.10414	8.46*
Non- Members	100.0000	.00000	.00000	

*Significant at 5% level of significance

Table 4: Average savings of respondents generated from ginger cultivation (n= 100)

Group	Mean (Rs)	Std. Dev	Std. Error Mean	t value
Members of UAPCL	15.1000	2.77116	.50594	12.94*
Non- Members	8.2667	.82768	.15111	

*Significant at 5% level of significance

Table 5: Average investment capacity of respondents in various enterprises (n= 100)

Group	Mean (Rs)	Std. Deviation	Std. Error Mean	t value
Members of UAPCL	8.4333	1.45468	.26559	18.23*
Non- Members	3.3333	.47946	.08754	

*Significant at 5% level of significance

is too meagre and not very substantial to reap high benefits.

Measurement of the social impact of UAPCL: The social impact in the study area was studied by gathering information from all the respondents under various heads of security in terms of food, habitat, education, health and the level of social empowerment. The responses of members and non-members were taken on the structured schedule, coded and analysed using Wilcoxon-Mann-Whitney U nonparametric test in order to identify the significance of difference between member and non-member farmers in case of food security. Table 6 indicates that there was significant difference in terms of food security between the control and the experimental group. In case of dwelling, 80% members were found to reside in owned houses, unlike the non-members, among whom 70 percent still dwelled in rented houses, as evident form Table 7. Eighty percent of members possessed toilet facilities in their houses as compared to 66% in houses of non-members. Similarly 86% members owned vehicles against 46% non-members. This may be attributed to the high income of the members as compared to non-members, so the members are particularly well off in the social amenities.

Table 6: Level of food security of the respondents based on Wilcoxon-Mann-Whitney test (n=100)

Food Security	Members	Non members	Z value
Mean Rank	45.37	15.63	-6.708*

*Significant at 5% level of significance

Eighty six percent of the UAPCL members' children got college education but only 26 percent of non-members' children got the same. Table 8 depicts that 60 percent members participated in functional literacy programme but none in case of non-members. The members' and non-members' responses on the schedule were collected and then, frequency and percentage analysis was done. The table below (Table 9) shows that it was unaffordable for the non-members to bear expenditure for health, so they primarily depend upon the locally available health facilities only, unlike the members of UAPCL. The obtained responses of members and non-members were rated and analysed using Wilcoxon-Mann-Whitney's U test in order to identify the significance of difference between member and non-member farmers in case of social empowerment. The following

Table 7: Distribution of respondents according their habitat security (n=100)

		Members		Non-members	
		Frequency	Percentage	Frequency	Percentage
Dwelling	Owned	40	80	15	30
	Rented	10	20	35	70
Housing type	Pucca	45	90	20	40
	Kaccha	05	10	30	60
Toilet facilities in house	Yes	40	80	33	66
	No	10	20	17	34
Possession of vehicles	Yes	43	86	23	46
	No	7	14	27	54

Table 8: Distribution of respondents according their educational security (n= 100)

Statements		Members		Non-members	
		Frequency	Percentage	Frequency	Percentage
Access to information regarding education opportunities for children	Yes	40	80	28	56
	No	10	20	22	44
Children sent to public/ convent/ English medium schools	Yes	38	76	16	32
	No	12	24	34	68
Children got collegiate education	Yes	43	86	13	26
	No	7	14	37	74
Children sent to nearby town or cities for education	Yes	42	84	8	16
	No	8	16	42	84
Adults from your family participate in functional literacy programme	Yes	30	60	0	0
	No	20	40	50	100
Children had to stop their studies due to high cost & unaffordability	Yes	4	8	40	80
	No	46	92	10	20

Table 9: Distribution of respondents according their health security (A= Agree and D= Disagree) (n= 100)

Statements		Members		Non-members	
		Frequency	Percentage	Frequency	Percentage
We depend only on local hospital for all our health problems	A	30	60	50	100
	D	20	40	0	0
We travel to outside town in order to get better health services	A	15	30	0	0
	D	35	70	50	100
We can't afford the health care facilities available	A	7	14	45	90
	D	43	86	5	10

Table 10: Level of social empowerment of the respondents as per Wilcoxon-Mann-Whitney test (n=100)

Category	Mean Rank		Z value
	Member Farmers	Non member farmers	
Social empowerment	45.50	15.50	-6.679*

*Significant at 5% level of significance

table (Table 10) indicates that there was significant difference in case of social empowerment between the control and the experimental groups in the study area. The members felt that they were more socially empowered than non-members.

DISCUSSION

The UAPCL members produced on an average 50 quintals per year whereas the non-members produced only 30 quintals of raw ginger. This sharp difference was due to the access to guidance and technical support from the tied up research organisations and adoption of the recommended package of practices by the member farmers. Membership to such organizations is considered to increase the level of agricultural production and yield economic benefit to farmers as well as promote their general welfare (Oyeyinka *et al.,* 2009; Mwaura, 2014). Producers' organizations help farmer members to perform better buying and selling due to scale benefits and lower transaction costs for buyers and sellers, besides providing technical guidance in the production process and therefore, creating social capital (Patibandla and Sastry, 2004). A wide difference between the incomes of members and non-members was observed. The UAPCL members earned almost double (i.e. 1.6 lakhs/ yr) what the non-members were earning. This can be attributed to the direct sale of their products, without the involvement of middlemen. Traditionally, small and marginal cultivators sold their produce at the farm gate, often to middlemen at low prices (Fafchamps and Hill,

2005). Research evidence increasingly points that producer organizations can transform market arrangements in favour of marginal and small farmers (International Fund for Agricultural Development, 2001) and ensure their effective market participation (Stockbridge *et al.,* 2003). Farmer organizations strengthen farmers' bargaining power, raise the price of produce, control monopsony exploitation and increase social welfare (Shivramkrishna & Jyotishi, 2008). The finding is also in line with the findings of Bachke (2009) that there is a positive causal effect from membership in a farmers' organization to overall agricultural profits. This group of income is always significant and around 50% for agricultural profits. Sokchea and Culas (2015) conducted field surveys with 75 farmers (including 39 contract farmers) in Kampong Thom province, Cambodia and also reported similar findings that contract farming with farmer organizations significantly raises farmers' income. The UAPCL members got employment (151 days) for more number of days as compared to the non-members (100 days). A significant difference between the members and non-members was observed in terms of food security and social empowerment. There was also striking difference between the members and non-members in Rajasthan in terms of habitat, health and educational security. This is in accordance to the finding that the FPOs empower the small and marginal farmers along with instilling an entrepreneurial quality to farming (De Janvry *et al.,* 1991). When farmers come together, they see it as an opportunity to socialize, share and learn. Also, Bingen *et al.* (2003) reported that the farmer organizations can provide important platforms for capacity building, information exchange, and innovation in rural settings. Swanson (2008), Rondot and Collion (2001) also found similar result that farmers' organizations can be very effective in meeting the genuine needs of the rural communities to support farmers and represent their interests in decision-making processes. This matches with the findings of Armando (2009) that the farmer organisations contribute directly and indirectly to gender equality through increased financial security for the members. Formation of commodity specific Farmer Interest Groups (FIGs) has been highly beneficial to farmers through better performance in yield and income of vegetables in Palakkad district of Kerala (Shanmugasundaram, 2015).

CONCLUSION

The membership in organisation was positively related to the socio-economic upliftment of the people in the study area. The production, income and employment generated for the members were significantly higher in comparison to the non-members. Also, the members could divert their excess money towards saving, investment in other enterprises and purchasing of assets, unlike the non-members. The condition of members in terms of food, health, education and habitat security was in a much better condition than the non-members and thus the members had a greater sense of social empowerment as compared to the non-members. Thus, this justifies that the membership in organization can directly affect the socio-economic status of an individual. Thus, initiatives should be made to mobilize the farmers, especially small and marginal into groups and replicate such successful models across the country in order to reap benefits of collective action.

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Identification of Constraints for Delineating Extension Strategies for Bt Cotton Cultivation in Punjab

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ABSTRACT

The study was conducted in three main cotton growing districts of Punjab i.e. Bathinda, Mansa and Fazilka of Punjab state to know the constraints faced by Bt cotton growers of Punjab. A total sample of 150 farmers from 15 villages was taken for the study. It was found that major constraints faced by farmers regarding the production of Bt cotton were high cost of seeds (85.33%), non-availability of canal water for pre-sowing irrigation (77.33%), poor quality of irrigation water (81.33%), sub standard quality of pesticides (87.33%), ineffectiveness of pesticides (94.67%), high cost of pesticides (79.33%) and non-availability of the labour for picking (71.33%). The major technological constraint reported by the 56.00 per cent respondents was the non-availability of cotton stalk up rooter. Price fluctuation and lower MSP of Bt cotton produce were the major marketing constraints faced by 96.67% and 94.67% of the respondents, respectively, whereas 64.00 per cent of the respondents faced the constraint of high cost of cultivation of Bt cotton. About 48.00 per cent of the respondents reported the lack of proper demonstrations/ trainings/ awareness camps regarding Bt cotton cultivation practices as the major institutional constraint. Development of better Bt cotton varieties resistant to sucking pests and to keep quality check on seeds and pesticides along with fixed market selling prices were found important for delineating extension strategies for Bt cotton cultivation in Punjab.

Keywords: Bt cotton, Production, Technological, Marketing, Institutional, Constraint, Punjab

INTRODUCTION

Cotton is one of the important cash crop of India and plays a dominant role in economy of the country; hence known as 'white gold' and 'king of fibers'. It contributes around 30 per cent to the gross domestic product of Indian agriculture. India is an important grower of cotton on a global scale. India accounts for approximately 25 per cent of the world's total cotton area and 16 per cent of global cotton production. Most of the cotton in India is grown under rainfed conditions, whereas about one third is grown under irrigated conditions. Cotton occupies an area of 119.78 lakh hectares in India with a production of 398 lakh bales in the year 2013-14. However, India`s average yield of cotton is 566 kg/ha as compared to worlds average productivity of 766 kg/ha (Anonymous, 2015a).

Indiscriminant use of pesticides in the cotton crop resulted in development of resistance in many insect-pests of cotton crop and thus increasing the cost of cultivation (Guillaume *et al.,* 2008). Insect-pest resistant cotton commonly referred to as Bt cotton was first introduced commercially in 1996. It produces an insecticidal protein from the naturally occurring soil bacterium *Bacillus thuringiensis* (Bt). Global adoption of Bt cotton has risen dramatically from 800,000 hectares in its year of introduction in 1996 to 5.7 million hectares in 2003. Significant economic and production advantages have resulted from growing Bt cotton globally. Bt cotton was approved in India on 26 March, 2002 for the central zone (Maharashtra, Gujarat & Madhya Pradesh) and south zone states (Andhra Pradesh, Karnataka and Tamil Nadu). In northern zone including Punjab state, Bt cotton was approved for cultivation in the *kharif* season of year 2005 (Choudhary and Gaur, 2010).

Being a major commercial crop, cotton occupies an important place in agricultural scenario of Punjab. It is the main *kharif* crop of south-western districts of the

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state i.e. Bathinda, Mansa, Fazilka (part of erstwhile Ferozepur), Muktsar, Faridkot, Barnala and Sangrur. Cotton crop was cultivated on an area 472 thousand hectares with average productivity of 16.00 quintal per hectare under irrigated conditions in Punjab (Anonymous, 2015b). In recent years, pest menace in cotton is severe resulting in escalation of cost of production, increase in crop losses and reduction in productivity and income to farmers, thus the present study was undertaken to study the major constraints faced by the Bt cotton growers of Punjab regarding Bt cotton cultivation.

MATERIALS AND METHODS

The Study was conducted in the Punjab state. Three major cotton growing districts of the Punjab state i.e. Bathinda, Mansa and Fazilka were selected purposively because these were having their maximum area under Bt cotton cultivation. The five villages were selected from each of three districts (Bathinda, Mansa and Fazilka) and 10 farmers from each village were taken for the study. Thus, a total sample of 150 farmers from 15 villages was taken for the present study. An interview schedule was designed and finalized consisting of questions regarding the constraints faced by the Bt cotton growers in cultivation of Bt cotton crop. These were categorized into production, technological, marketing and institutional problems. Data were collected personally by visiting the study area and interviewing the farmers using structured interview schedule. Suggestions of the farmers about Bt cotton cultivation were also sought in the study. The response to the statements/ questions was recorded in yes/no form along with open ended questions. The data were further analyzed with the help of suitable statistical tools such as frequency, percentage.

RESULTS AND DISCUSSION

Production constraints regarding Bt cotton cultivation: The data in the Table 1 show that respondents faced many constraints related to production of Bt cotton and were further categorized into seed, sowing, weather related, irrigation, fertilizer, pesticides, labour related constraints. In case of seed related constraints, majority of the respondents (89.33%) felt that seed cost was high. Higher price of seed as a constraint was also reported by Ramasundaram *et al* (2007). Sub-standard quality of seed was other constraint in Bt cotton cultivation faced by about 65.00 per cent of the respondents. Nearly half (52.67%) of the respondents found that seed of recommended variety was not available for cultivation. In case of sowing related constraints, 34.67 per cent respondents faced the problem of rainfall at the time of sowing or just after the sowing, which led to poor germination of cotton seeds. Also 21.33 per cent respondents were not aware of the recommended seed rate. Nearly one third (38.00%) of the respondents of the respondents were having no knowledge about the nutrient status of their soils. As many as 17.33 per cent of the respondents were having the problematic soils with high salinity in their lands. Similar findings were also reported by Singh (2014). Gujjar and Padaria (2012) also studied the farmers perception and constraints in adoption of Bt cotton technology and stated that for better adoption of Bt cotton constraints like high seed cost, unavailability of irrigation in time and adequate quantity and lack of information dissemination of complete package of technology through public extension system need to be managed.

In case of weather related constraints, problem of uncertain or fluctuating rainfall was faced by majority of respondents (91.33%). Other constraint faced by majority of the respondents (69.33%) was high temperature at germination stage of Bt cotton. Problems of high speed winds were faced by 52.67 per cent of the respondents. Half of the respondents also faced the difficulty of unfavourable weather while spraying of the chemicals. In case of irrigation related constraints, major constraint faced by majority (77.33%) was non-availability of canal water for pre-sowing irrigation (*rauni)* of the cotton fields. About 81.33 per cent of the respondents faced the constraint of poor quality of irrigation water. Also 44.67 per cent of the respondents faced the constraint of lack of irrigation at critical periods of the crop growth. This untimely availability of water affects the sowing dates and maturity period of crop.

In case of pesticides related constraints, majority (94.67%) of the respondents perceived the recommended pesticides to be ineffective against insect pests. About 87.00 per cent respondents complained about sub-standard quality of the pesticides. About 80.00 percent of the respondents also reported the high cost of pesticides as major constraint in Bt cotton cultivation. Problem of non availability of recommended pesticide was faced by 27.33 per cent of respondents, while 52.00 per cent of the respondents were not aware about the recommended doses of the pesticides. Such constraints

Table 1: Distribution of respondents according to production constraints faced in Bt Cotton cultivation (n=150)

Production constraints	Frequency*	Percentage
Seed related		
Non-availability of seed of recommended variety	79	52.67
Sub-standard quality of seed	98	65.33
High cost	128	85.33
Sowing related		
Rainfall at the time of sowing	52	34.67
Lack of knowledge of recommended seed rate	32	21.33
Soil related		
Lack of knowledge about soil nutrient status	57	38.00
Problematic soils (alkalinity, salinity etc.)	26	17.33
Weather related		
High temperature at germination stage	104	69.33
Uncertain/fluctuating rainfall	137	91.33
High speed winds/storms	79	52.67
Unfavourable weather while spraying chemicals	74	49.33
Irrigation related		
Non-availability of canal water for pre-sowing irrigation (*rauni*)	116	77.33
Poor quality of irrigation water	122	81.33
Lack of irrigation water at critical periods of crop growth	67	44.67
Pesticides related		
Non availability of recommended pesticides	41	27.33
Sub-standard quality of pesticides	131	87.33
In-effectiveness of the recommended pesticides	142	94.67
High cost of pesticides	119	79.33
Lack of awareness about recommended doses	78	52.00
Fertilizers		
Shortage at required time	42	28.00
Poor quality of fertilizers	26	17.33
High prices of fertilizers	92	61.33
Lack of knowledge of recommended doses of fertilizers	38	25.33
Labour		
Non availability of labour for hoeing/weeding	68	45.33
Non availability of labour for picking	107	71.33
Lack of skilled labour	40	26.67
High cost of labour	102	68.00

*Multiple response

are faced by respondents, points out to the misleading information provided by the some of the private agencies or dealers. These findings are found to be in line with the findings of Singh and Kaur (2005).

In case of fertilizer application, 61.00 per cent of the respondents faced the high cost of fertilizer as major constraint. Shortage of fertilizers at required time and lack of awareness about the recommended doses were other constraints faced by about one fourth of the respondents, whereas 17.33 per cent of respondents reported the poor quality of fertilizers. The major constraints regarding labour were found to be non-availability of the labour for picking and their high cost which was faced by more than 70.00 per cent of the respondents. Also 45.33 per cent of the respondents faced the problem of non-availability of labour for hoeing operations, whereas 26.67 per cent of the farmers also faced the difficulty of the lack of skilled labour for various operations in Bt cotton cultivation such as for spraying, weeding. The findings were also found to be similar with those of Kumar (2004) as majority of his respondents were also facing the same type of constraints.

Technological constraints in Bt Cotton cultivation: The data in the Table 2 represent the technological constraints regarding Bt cotton. The important technological problems faced by the farmers were found to be lack of quality spray pumps and nozzles for spraying chemicals (23.33%), inferior quality of Bt refuge (21.33%). Also 56.00 per cent of the respondents reported the non-availability of cotton stalk uprooter as other technological constraint. About 20.00 per cent farmers also reported the problem of lack of Bt varieties of cotton crop, whose seed can be sown in the next season. As many as 11.33 per cent of the respondents also felt the need of good quality improved seed drills. The similar types of constraints were reported by the Sherawat *et al.* (1992).

Table 2: Distribution of respondents according to technological constraints faced by them in Bt cotton cultivation (n=150)

Technological constraints	Frequency*	Percentage
Lack of quality spray pumps & nozzles	35	23.33
Improper working of seed drills/breakage of seeds	17	11.33
Inferior quality of Bt refuge	32	21.33
Non-availability of cotton stalk uprooter	84	56.00
Lack of such varieties whose seed can be sown in next season	29	19.33

*Multiple response

Marketing constraints in Bt cotton cultivation: As shown in the Table 3, majority (94.67%) of the respondents faced constraint of lower MSP of Bt cotton. Problem of Low price of farm produce at the time of harvesting was also reported by Visawadia *et al.* (2006). Price fluctuation of Bt cotton was another major problem faced by majority of respondents (96.67%), whereas 64.00 per cent of the respondents faced the constraint of high cost of cultivation of Bt cotton. Non-availability of storage space and transportation facilities for marketing of Bt cotton produce was faced by nearly 20.00 per cent of the respondents. Also 30.00 per cent of the respondents also faced the constraint of deterioration of the produce while storing at home.

Table 3: Distribution of respondents according to marketing constraints faced by them in Bt cotton cultivation (n=150)

Marketing constraints	Frequency*	Percentage
Lack of storage space	36	24.00
Price fluctuation	145	96.67
Lower MSP	142	94.67
Deterioration of produce while storing	44	29.33
High cost of cultivation	96	64.00
Lack of transport facilities	27	18.00

*Multiple response

Institutional constraints faced in Bt Cotton cultivation: The data in the Table 4 represent that need of proper demonstrations/trainings/ awareness camps regarding Bt cotton cultivation practices was the major institutional constraint faced by about 48.00 per cent of the respondents. Nearly thirty per cent (29.33%) of respondents faced the constraint of lack of trusted seed suppliers. Nearly 60 per cent of the respondents faced the problem of non-availability of credit from the government sources and high rate of interest from the private or non-institutional sources of credit. About 38.67 per cent of the respondents faced the difficulty of non-availability of agriculture literature at village level. Also 30.67 per cent of the respondents reported the lack of extension contacts and availability of expert advice in their area.

Suggested extension strategies for Bt cotton cultivation in Punjab: Respondents were also asked to give their suggestions regarding cultivation of Bt cotton crop. The data pertaining to Table 5 depict the various suggestions given by the respondents regarding Bt cotton cultivation. Nearly sixty per cent (58.67%) of the respondents suggested that improved Bt varieties resistant against whitefly and other sucking pests should be developed. Gopalakrishnan *et al.* (2007) also called for production of seeds of the resistant cultivars for north India on a war footing. As many as 57.33 per cent of respondents suggested that seed prices should be affordable. Half of the respondents (50.00%) suggested that minimum support price (MSP) should be high and secure. Also 46 per cent of the respondents suggested that pesticides quality should be improved and checked regularly, so that their effectiveness could be maintained for the Bt cotton crop. About 41.33 per cent suggested that strict quality control measures may be enforced for checking the sale of sub-standard pesticides. Also 30.67 per cent of the respondents suggested that sufficient amount of compensation should be provided by the government in case of any crop damage or failure. About

Table 4: Distribution of respondents according to institutional constraints faced by them in Bt cotton cultivation (n=150)

Institutional constraints	Frequency*	Percentage
Lack of trusted seed suppliers	44	29.33
Lack of proper demonstrations/trainings/ awareness camps regarding Bt cotton cultivation practices	72	48.00
Non-availability of agriculture literature at village level	58	38.67
Lack of extension contacts/experts advices	46	30.67
Non-availability of credit from government sources	87	58.00
High rate of interest from non-institutional sources	85	56.67

*Multiple response

Table 5: Distribution of respondents according to suggested extension strategies for Bt cotton cultivation (n=150)

Suggestions	Frequency*	Percentage
MSP should be remunerative and secure	75	50.00
Pesticides quality should be checked and improved and effective pesticides should be provided	69	46.00
Better quality certified seeds should be produced and provided to farmers	57	38.00
Seed prices should be reasonable	86	57.33
Improved Bt varieties resistant against whitefly and other sucking pests should be developed	88	58.67
More extension trainings/awareness camps should be organized in the villages	40	26.67
Irrigation water facilities by should be enhanced.	23	15.33
Sufficient compensation should be provided by govt. in case of crop failure	46	30.67

* Multiple Response

38.00 per cent of the respondents suggested that better quality seed should be provided by seed agencies. More than one fourth (26.67%) of the respondents suggested that more extension trainings, awareness camps regarding Bt cotton should be organized in the villages. Venkatachalam *et al.* (2014) also reported that Farmers' dependency upon seed dealers and private companies for information about Bt cotton technology. About 15.33 per cent of the respondents also suggested that irrigation water facilities should be made enhanced.

On the basis of analysis of constraints faced by the respondents and suggestions the following extension strategies may be delineated for Bt cotton cultivation in the state:

- Public investment should be increased for boosting R&D facilities in Bt cotton crop these steps especially important for development new improved varieties of Bt cotton resistant to sucking pests such as whitefly.
- Improved quality Bt cotton seeds should be provided by the government departments at the reasonable prices to the farmers.
- Minimum support price of the Bt cotton produce should be ensured for the farmers.
- The quality of pesticides should be improved and checked regularly by the government authorities, to maintain their effectiveness on the fields.
- Awareness and demonstration camps regarding Bt cotton should be organized to educate farmers about improved production technologies.

CONCLUSION

Bt cotton technology cannot be doubted as a valuable option for cotton farmers. But it has been facing some major constraints as challenges throughout its period, which caused a declining trend in terms of yield and net returns for the farmers. High costs of seed and their sub-standard quality was found to be major constraint faced by the respondents. Also some farmers were suffering from poor quality of underground irrigation water and unavailability of canal water at time. Similarly sub-standard quality and ineffectiveness of the recommended pesticides along with their high costs were major constraints faced by the farmers in the recent years. Major marketing related problems faced by majority of farmers were sale price fluctuations and the lower MSP followed by lack of storage space and deterioration of produce while storing produce at home. Some farmers also reported few institutional problems such as lack of trusted seed suppliers, lack of proper seed

demonstrations / trainings / extension contacts / agricultural literature availability at village levels. Development of better Bt varieties resistant to sucking pests and to keep check on seeds and pesticides along with fixed market selling prices were found important for delineating extension strategies for Bt cotton cultivation in Punjab.

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Short Communication

Knowledge Level of Dairy Farmer in Roorkee Block of District Haridwar

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ABSTRACT

The study was conducted in Roorkee Block of district Haridwar, Uttarakhand to find out the extent of scientific livestock rearing understanding among dairy farmers. An appraisal of study area revealed that 46.67 percent livestock owners belonged to young (18-38 years) age group, 48.33 per cent fall in the category of marginal farmers (below av. 1.0 ha land) group, 60.00 percent have secondary level of education and 100.00 and 95.83 percent had television and news paper as information sources, respectively. About 92.50 percent were depending on tube well for irrigation facility. Engagement with different village and district level social and agricultural organizations were found to be 51.67 and 35.00 percent, respectively. Small family size owned by dairy farmers was 58.33 percent while 46.33 percent dairy farmers had two earning member in their families. Livestock rearing in integration with crop cultivation including other activities or business being done by 85.83 percent dairy farmers while 14.17 percent respondents had dairy farming as their sole livelihood source. Majority of farmers (42.50%) were found to rear four milch animals. Plantation of poplar increased with the increase in land holdings sizes. Area covered under green fodder production was little bit higher (14%) with marginal farmers. On an average 57.61, 27.19 and 15.21 percent had low, medium and high level of awareness about different scientific livestock manage mental parameters. Thus, it was concluded that the majority of dairy owners of study area possess low level of knowledge regarding improved animal husbandry practices.

Keywords: Cropping pattern, Dairy farmers, Knowledge, Scientific livestock rearing, Socio-economic status

In India, livestock sector contributes nearly 25.6% of value of output at current prices of total value of output in Agriculture, Fishing & Forestry sector. The overall contribution of Livestock Sector in total national GDP 4.11% at current prices during 2012-13. Hardwar district of Uttrakhand is well known for his holy importance and quality animals, although, livestock component has low share in the economy of state because of livestock rearing in this area is taken up as subsidiary to crop production. Roorkee block which is naturally enriched with Ganga canal, basically part of tehsil Roorkee comprises 113 villages and as per 2012 census the tehsil having 70336 cattle and 130584 buffalo population of varying breeds. There are 3565 milk Societies in Uttarakhand with members 135601 of Anchal dairy cooperatives. In spite of India's first Rankin world milk production, the average annual milk yield from bovines is only 1214 kg as against the world average of 2104 kg per lactation (Planning Commission, 2012). As a fact the large quantity of milk is handled by farmers who are unaware about economic aspects of profitable dairy business. Adoption of dairying as Commercial enterprise is a prerequisite of sustainable agriculture production system. However, majority of rural dairy farmers rearing dairy animals, face difficulty to adopt the recommended package of practices of livestock management on the scientific lines. Thus, in order to maximize the profit margin and sensitization of farmers about the improved scientific technologies in dairy production, it is necessary to know the existing level of scientific knowledge about livestock rearing among dairy farmers. The present study was undertaken with the objectives to study the knowledge and resource status with socio- economic profile of dairy farmers and their elementary knowledge of scientific and improved animal rearing practices.

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The present study was conducted in Hardiwar district of Uttarakhand where in general along with crop production, dairy farming is the main component of the existing agriculture production system. Roorkee block was selected among total of six blocks in Haridwar district for the investigation which is mainly known as low land area of the district. Randomly, 120 dairy farmers from 12 villages were selected for the present study. Primary data were obtained by the means of a household survey with the help of a comprehensive questionnaire with co-operation of RAWE (Rural Agricultural Works Experience) students on age, education, information sources, land holding pattern, irrigation facilities, social participation approach, family size, main occupation, number and type of animals rearing, linkages with other agencies, land distribution under crops, agriculture mechanization system, performance parameters of reared bovines and knowledge level etc. The elementary knowledge of a research innovation is prerequisite for technology adoption. To measure the knowledge level regarding scientific dairy farming, a teacher made test having various component was developed. On the basis of observations collected for this purpose, dairy farmers were classified into three groups i.e. high, medium and low level groups.

Socio-economic profile of the respondents: Majority (46.67%) of livestock farmers belongs to the young age group followed by middle (32.50%) and old age group (20.83%). These findings are contradictory to reported by Toppo (2005), Bhatt (2006), Saha *et al.* (2010), Raval and Chandawat (2011), Sharma *et al.* (2012), Kumar *et al.* (2014, 2015) and Sarita (2016).

About 60.00 percent of dairy farmers had obtained secondary education whereas 21.67 percent had primary level of education followed by 14.17 percent who were found to be graduated. Thus, 81.67 percent of dairy farmers were having primary and secondary level of education, which might be due to lack of awareness and availability of quality educational facilitates in rural areas. Similar findings have been reported by Gour (2002), Bhatt (2006), Sen (2007) Sharma *et al.* (2012) and sarita *et al.* (2016).

Majority of respondents used Television, News Paper and Radio as sources of information regarding improved agricultural practices including animal rearing. Furthermore, it was observed that 48.33, 30.00, 10.83, 7.50 and 3.33 per cent of farmers were falls under marginal, medium, medium-big, big and landless category. Majority (78.33%) of dairy farmers had 0-2 hectare of land holding. The smaller landholding sizes could be on account of emergence of nuclear families in the village systems. These results were in support of study conducted by Bhatt (2006), Sen (2007), Sharma *et al.* (2012), Rathod *et al.* (2012), Kumar *et al.* (2015) and Sarita *et al.* (2016).

Nearly 92.50 per cent farmers were found to have irrigation facility as tube wells. About 61.67 per cent of dairy farmers were engaged with mixed agriculture and animal rearing, services and business practices whereas only 14.17 per cent of the respondents had animal rearing as the sole means of livelihood. Hence, it can be concluded that 75.84 per cent of farmers were dependent on agriculture and dairy farming alone. This finding was in agreement with the results of various workers namely Gour (2002), Sen (2007) and Sharma *et al.* (2012).

It was observed that 51.67 and 35.00 percent of the respondents actively participated in village and district level agricultural technology transfer programmes

Table 1: Mechanization of agriculture production system

Farm Implements	Land size (ha)							
	Marginal Farmer* (< 1 ha)		Medium Farmer (1-2 ha)		Med–Big Farmer (2-3 ha)		Big Farmer (> 3 ha)	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Tractor	43	74.13	36	100.00	13	100.00	09	100.00
Harrow/Cultivator	38	65.51	36	100.00	13	100.00	09	100.00
Seed sowing machine	-	-	-	-	09	69.23	04	100.00
Sugarcane ridger	35	60.34	27	75.00	13	100.00	05	100.00
Rotavator	-	-	04	11.00	08	61.54	05	100.00
Spray machine	35	60.34	29	80.56	13	100.00	05	100.00

* Landless farmers are also included in the category of marginal framer

organized by different agriculture based departments including animal husbandry, respectively and many of them had membership of various organizations like- Anchal milk cooperative societies, gram panchayat, village cooperative societies and FACs. These findings are similar to those reported by Khokher (2008) and Sharma *et al.* (2012) which contradictory to those reported by Bhatt (2006).

Under the present investigation it was observed that 58.33 percent of dairy farmers had small families with less than six members and 41.67 percent of dairy farmers had large family sizes with more than six members. It has been noticed that 46.33 percent of families having two worth generator person or earning member. About 33.33 percent with one worth generator person and 23.33 percent families were there with more than two worth generator persons within the family. These findings are in view of family size contradictory to Sharma *et al.* (2012). Out of the total respondents considered, 42.50 percent had four milch animals followed by 17.50, 15.00, 10.83, 9.17 and 5.00 percent of farmers who reared two, six, ten, more than ten and eight animals, respectively. Majority of dairy farmers (60.00%) reared both cattle and buffaloes and 25.83 and 14.17 percent people reared only buffaloes and cattle, respectively. These findings were in agreement of Gour (2002) and Kumar *et al.* (2014, 2015) while contradictory to Sharma *et al.* (2012).

It was observed that majority of dairy farmers had contact with the para vets, officers of dairy cooperatives, livestock extension officers and K.V.K scientists for obtaining information regarding animal husbandry practices. Similar findings were reported by Gour (2002), Bhatt (2006) and Sharma *et al.* (2012).

Mechanization: During the survey some data on the farm implements have also been collected to assess the

Table 2: Performance of Milk producing animals

Parameters	Local Cows		CB Cows		Buffaloes	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Calving interval (Months)						
12-15 months	17	18.89	50	17.54	25	6.94
16-19 months	26	28.89	86	30.18	91	25.28
20-23 months	26	28.89	94	32.98	112	31.11
More than 23 months	21	23.33	55	19.30	132	36.67
Age at first calving (Years)						
1.5-3.0 years	08	8089	41	14.39	08	2.22
3.0-4.0 years	24	26.67	44	15.44	75	20.83
4.0-5.0 years	16	17.78	18	6.32	93	25.83
5.0-6.0 years	-	-	-	-	21	5.83
More than 6.0 years	-	-	-	-	-	-
Lactation length						
140-180 days	12	13.33	42	14.74	34	9.44
181-220 days	18	20.00	94	32.98	120	33.33
221-260 days	37	41.11	114	40.00	136	37.78
261-300 days	23	25.56	35	12.28	70	19.44
Parity order						
One	15	16.67	41	14.39	44	12.22
Two	26	28.89	64	22.46	46	12.78
Three	19	21.11	66	23.16	100	27.78
Four	16	17.78	65	22.81	117	32.50
More than four	14	15.56	49	17.19	53	14.72
Average milk production (lit./day/animal)						
Up to 04 lt	29	32.22	27	9047	60	16.67
4.1 to 06 lt	39	43.33	59	20.70	76	21.11
6.1 to 8.0 lt	15	16.67	62	21.75	130	36.11
8.1 to 12 lt	07	7.78	81	28.42	44	12.22
More than 12 lt	-	-	56	19.65	50	13.89

Table 3: Distribution of dairy farmer on the basis of scientific dairy farming knowledge

Characteristics	Knowledge					
	High		Medium		Low	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Calf management	12	10.00	34	28.33	74	61.67
Heifers management	12	10.00	45	37.50	63	52.50
Breeding management	04	3.33	22	18.33	94	78.33
Feeding management	21	17.50	24	20.00	75	62.50
Water management	31	25.83	42	35.00	47	39.17
Cattle shed management	26	21.67	29	24.17	65	54.17
Health management	16	13.33	29	24.17	75	62.50
Clean milk production	24	20.00	36	30.00	60	50.00

present status of mechanization in the area of study and presented in Table 3. According to survey, the area is saturated with sufficient numbers of tractor; however the mechanization should not be viewed as displacement of man-power, in-reality it's opened up new avenues for human employment Verma (2005). Sugarcane is the main agronomic crop of the area so that low populations of seed sowing machine were found. The reason may be the increasing trend of growing plywood tress like poplar (populusdeltoides) for better remunerative. This restricted the use of seed drill type machinery. High number of spray machines (table 3) indicates that farmers are much interested in vegetable production. These findings were in agreement with the results of Kumar *et al.* (2014, 2015).

Average performance of dairy animals: The results shown in Table 4 reveals that almost half (52.28%) of crossbreed cattle and almost two third (67.78%) of buffaloes were distressed with long calving interval problems, which might be the biggest reason affecting milk production and adoption of commercial dairy farming as business. About 43.33 percent dairy farmers owned local cows with 4.0-6.0 liter milk per day and 32.22% had animals up to 4.0 liter milk per day. Similarly 28.42% had cross breed cows producing milk 8.0-12.0 liter per day while only 19.65% had cross breed cows producing milk more than 12.0 liter per day. On the other hand 36.11% farmers were keeping buffaloes with 6.0-8.0 liter milk per day followed by 21.11% with 4.0 to 6.0 liter per day and 13.89% with more than 12.0 liter per day production of milk. These findings were in agreement of Kumar *et al.* (2014).

Knowledge of Dairy farmers about scientific livestock rearing practices: The data collected on colostrum feeding to calf, balance ration to heifers, breeding policy, silage preparation etc. under different characteristics (Table 5) shows that the knowledge level of all the respondent farmers was low in term of recommended package and practices for viable commercial dairy farming. So that area of study is in requirement for paying special attention towards recommended package and practices to the people to perform dairy farming in better ways. These findings are similar to those reported by Saha *et al.* (2010) and Kumar *et al.* (2014) and while contradictory to those reported by Kumar *et al.* (2015).

The scientific livestock rearing knowledge level of all the respondent farmers of Roorkee block of district Haridwar was low in term of recommended package and practices for viable commercial dairy farming**.** Almost one-third of respondent farmers acquired higher education were active member of rural social organization. Most of the farmers were marginal to medium land holders equipped with tube well irrigation facilities having good scope of growing green fodder and other feeding components to make the dairy farming more profitable.

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