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Editorial

Maharashtra Society of Extension Education (MSEE) registered in 1982, has the foremost objective to publish the research journal. Accordingly, the society was publishing the journal entitled Maharashtra Journal of Extension Education. Since the year 2004 this journal has been renamed as Asian Journal of Extension Education.

The journal includes research articles from the researchers and extension workers in the field of extension education from various faculties of various institutes in the country. Extension education plays an important role not only in transfer of innovative technologies but also in developing appropriate methodology in the field of extension more suited for field application. The innovative research methods can be very well communicated for its application and use in further research by the extension fraternity. This can be achieved by publishing research articles.

Asian Journal of Extension Education is a very humble attempt to provide platform towards this goal of networking with the all extension professionals who could kindle the minds of their peers and young scientists through their research articles.

I have immense pleasure to present this 39th issue of Asian Journal of Extension Education for the year 2021. The Journal has received an encouraging response from all corners of the country. We have made an effort to encompass the best articles for the issue. Thanks are due to all the authors who have contributed for this issue.

I extend sincere thanks to Capt. Dr. L. B. Kalantri, Hon'ble President, Dr. D. M. Mankar, Vice President and Respected Member of Executive Body Dr. N. R. Koshti, Dr. N. V. Kumbhare for their constant inspiration, valuable guidance and concrete suggestions to maintain the quality of the journal.

I appreciate the tireless contribution of my colleagues and Joint-Secretary Dr. M. K. Rathod and Dr. S. D. More for their endless efforts in publishing this issue. I am confident that this issue of the Journal will be appreciated by the extension scientists, researchers, students and readers for its usefulness and contents. I solicit their suggestions for further enhancement of quality of the Journal.

Akola

Date: 10 December, 2021

P. K. Wakle
Chief Editor

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RESEARCH ARTICLE

Post-harvest losses of amaranthus in Gondia district

U. B. Dongre[1], N. T. Bagde[2] and M. S. More [3]

[1]M.Sc. Student, Agricultural Economics and Statistics Section, College of Agriculture, Nagpur
[2]Head, Agricultural Economics and Statistics Section, College of Agriculture, Nagpur
[3] Assistant Professor, Agricultural Economics and Statistics Section, College of Agriculture, Nagpur
Corresponding Author's email : ntb366@gmail.com
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ABSTRACT

The present study entitled "Post-harvest losses of Amaranthus in Gondia district" was undertaken in three tehsils of Gondia district i.e. Gondia rural, Goregaon and Sadak Arjuni. The primary data were collected from selected farmers by personal interview method by preparation of schedule and it was tested by asking the information from some selected farmers. The collected information regarding, post-harvest losses faced by the farmers and constraints faced farmer, similarly the post-harvest losses occurred during the marketing of amaranthus . The data were collected from the year 2020-21.The post-harvest losses of Amaranthus at different stages of farm level was workout to be 15.03 kg/qt and per quintal corresponding monetary losses was Rs. 343.16/-. The total post-harvest losses of Amaranthus at market level was observed to be 12.66 kg/qt which causes per quintal economic loss of Rs. 506.40 /-.

The major constraints faced by farmers in post-harvest losses of Amaranthus were burden of transportation cost was the major problem, daily fluctuation of prices, and improper cold storage facilities, high commission charges, rough handling during transportation, packing, handling, loading and unloading.

Keywords: Post-harvest losses, amaranthus, constraints

INTRODUCTION

India has been the second largest producer of vegetables in the world accounting for 14 per cent of the world production of vegetables. Outputs of all agricultural commodities produced in the field have to undergo series of operations such as handling, transportation, processing, storage and exchange before they reach the consumer, and there are appreciable losses of outputs during these stages of their handling. The sum quantity of outputs lost in these operations at all these stages is referred to as "Post-harvest losses" of the crop.

In perishable crops like fruits and vegetables, proper and scientific storage, packaging, transport and handling technologies are the need of us to avoid the considerable amount of produce is wasted.

The post-harvest losses in vegetables during operations due to improper handling and storage are enormous. vegetables are important source of food and income.Total area under Amaranthus in India was 265.00 thousand ha, with production 59.60 MT and productivity of Amaranthus was 0.22 MT/ha. Total area of Amaranthus in Maharashtra was 501.89 thousand ha, with production 4319.67 MT and productivity of Amaranthus was 8.60 MT/ha. [Horticultural Crops Category Wise System, 2020-21(1st Advance Estimate)]. Total area of Amaranthus in Gondia district was 56.00 ha, with production 142.00 MT and productivity of Amaranthus was 2.53 MT/ha. (District Agriculture Office Gondia 2020).

Amaranthus (Amaranthus spp.) also known as “pigweed" and used primarily as “potherb", is one of the most important leafy vegetable grown in India. It belongs to the family Amaranthaceae. Among the leafy types, A. tricolor L. is the main cultivated species. It is rich source of protein, vitamins A and C, minerals; especially iron, calcium, and dietary fiber .

The best time for sowing is from March to September. Pusa Badi Chulai, Pusa Kiran, Arka Suguma etc. are some of the important varieties grown in the country. It prefers temperature between 25-30°C. Depending upon variety, crop is ready for harvesting about 3- 4 weeks after sowing. For harvesting, sharp knife or sickle is used.

The study on post-harvest losses in Amaranthus at various stages of marketing would help in assessing the extent and magnitude and losses in identifying the factor responsible for such losses. This in turn would help in developing proper measure to reduce post-harvest losses at different stages of production point to consumption point. Under these circumstances, the reduction in post-harvest losses can help in increasing the availability of vegetables to a great extent without increasing the production. In the absence of reliable and objective estimates of post-harvest losses at different stages, the way to evolve correct policies for minimizing such losses is more difficult.

Objectives

1. To workout post-harvest losses of Amaranthus at various stages.
2. To identify the constraints in post-harvest losses of Amaranthus.

METHODOLOGY

The present study had been undertaken with aim to study post-harvest losses of Amaranthus in Gondia district. It deals with methodology adopted for study viz. Selection of sample, collection of data, analysis and interpretation of data.

a. Selection of Area

The present study had been undertaken in Gondia district of Vidarbha region. The district was selected purposely, wherein production of Amaranthus was concentrated. The data was pertained to the year 2020-21 for rabi season only.

b. Selection of Sample

From Gondia district, three Tehsils were selected where the production of Amaranthus raised. From each Tehsil, two villages were selected randomly, hence total six villages were selected. The ten farmers from each village were selected randomly, producing Amaranthus. Therefore, total 60 farmers from 6 villages were selected for present study. The five commission agents, five wholesalers from APMC Gondia as well as five retailers who marketed the Amaranthus in different markets were selected, to assess the marketing losses during marketing of the Amaranthus.

c. Source of data

I. Primary data

The primary data were collected from selected farmers by personal interview method by preparation of schedule and it was tested by asking the information from some selected farmers.

The collected information regarding, post-harvest losses faced by the farmers, constraints faced by farmer similarly the post-harvest losses occurred during the marketing of Amaranthus. The data were collected from the year 2020-21.

ii. Selection of market intermediaries

All the major agencies involved in marketing of amaranthus i.e. 5 commission

agents, 5 wholesalers and 5 retailers were selected to study the marketing of amaranthus.

Analysis of data

The collected data were tabulated, interpreted for the necessary results. The data were summarized with aid of statistical tools like average, percentage etc. to obtain meaningful results.The collected data were analyzed, interpreted by simple tabular method using average, mean etc. on the following sub heads.

1. Post-harvest losses

The post-harvest losses had been analysed in the form of physical loss as well as monitor loss at different stages of marketing was calculated.

Post-harvest losses (ML) is expressed as follows:

ML = {LF x GPF}+ {LW x GPW}+{LR x GPR}

Where,

LF is the physical loss of produce at field level

GPF is the gross price received by the farmer

LW is the physical loss during wholesaling

LR is the physical loss during retailing

GPW is the gross wholesale price

GPR is the gross retail price

RESULTS AND DISCUSSION

Keeping in view the objectives of the study, the necessary data collected from different sources were analysed and interpreted. The results obtained are presented and discussed below.

1. Post-harvest losses in Amaranthus

Post-harvest losses may occur at any point in marketing process, from the initial harvest through assembling and distribution to the final consumer. During the process of distribution and marketing, substantial losses occurred which range from slight loss of quality to total spoilage.

I) Post-harvest losses in Amaranthus at farm level

The post-harvest losses occurred for overall farmers to final retailer were estimated and presented in Table 1.

Table 1 : Post-harvest losses in Amaran-thus at farm level.

Stages	Losses (q/ha)	Per cent Loss	Economic Loss (Rs.)	Losses (Kg./qt)	Per cent Loss	Economic Loss (Rs.)
A. Harvesting						
Pest and disease	2.87	18.32	8400.00	2.09	13.90	61.16
Loss of firmness due to physiological disorder	1.80	11.49	5333.33	1.32	8.78	39.46
Injury	2.88	18.39	8550.00	2.29	15.23	67.73
Loss of texture	1.74	11.11	5016.66	1.35	8.98	38.63
Sub total	**9.29**	**59.32**	**27300.00**	**7.05**	**46.90**	**207.00**
B. Grading and Packing						
Sorting	1.77	11.30	5250.00	3.85	25.61	38.40
Packing	0.86	5.49	2550.00	0.58	03.85	17.40
Sub total	**2.63**	**16.79**	**7800.00**	**4.43**	**29.47**	**55.80**

Stages	Losses (q/ha)	Per cent Loss	Economic Loss (Rs.)	Losses (Kg./qt)	Per cent Loss	Economic Loss (Rs.)
C. Transportation						
Handling	0.65	4.15	1950.00	1.29	8.58	12.87
Poor Packing	0.55	3.51	1650.00	0.35	2.32	10.50
Loading and Unloading	1.70	10.85	5083.33	1.29	8.58	38.53
Sub total	**2.90**	**18.51**	**8683.33**	**2.93**	**19.49**	**61.90**
D. Self Marketing						
Manifestation through yellowing and wilting	0.52	3.32	1550.00	0.37	2.46	11.16
Decay, shriveling, loss of crispness and succulence	0.32	2.04	966.66	0.25	1.66	7.30
Sub total	**0.84**	**5.36**	**2516.66**	**0.62**	**4.12**	**18.46**
Total1	**5.66**	**100.00**	**46300.00**	**15.03**	**100.00**	**343.16**

Table 1. presents that the overall scenario of post-harvest losses of amaranthus at different stages was workout to be 15.03 kg/qt and per quintal corresponding monetary losses was Rs. 343.16/-

The maximum losses registered at harvesting (7.05 kg/qt) followed by grading and packing(4.43 kg/qt), transportation (2.93 kg/qt), and marketing (0.62 kg/qt).

I) Post-harvest losses of Amaranthus at commission agent cum wholesalerand retailer level

The post-harvest losses occurred at wholesaler and retailer level were estimated and presented in Table 2.

Table 2: Post-harvest losses in Amaranthus at market level

Stages	Physical Losses	Per cent Loss	Economic Losses (Rs.)
A. Losses at commission agent cum Wholesaler level			
Loading & Unloading	2.00	15.79	60.00
Sorting & Grading	0.90	7.10	27.00
Storage	0.99	7.81	29.70
Transportation	1.50	11.84	45.00
Sub total	**5.39**	**42.57**	**161.70**
B. Losses at Retailer level			
Loading & Unloading	2.49	19.66	99.60
Sorting & Grading	1.85	14.61	74.00
Storage	1.62	12.79	64.80
Transportation	1.31	10.34	52.40
Sub total	**7.27**	**57.42**	**290.80**
Total	**12.66**	**100.00**	**506.40**

It is revealed from the table that the total post-harvest losses of Amaranthus at market level was observed to be 12.66 kg/qt which causes per quintal economic loss of Rs. 506.40 /-.

The maximum losses occurred commission agent cum wholesaler level during loading & unloading, transportation, storage and sorting & grading *i.e.* 2.00, 1.50, 0.99 and 0.90 kg/qt respectively corresponding economic losses were Rs. 60.00 /-, Rs. 45.00 /-, Rs. 29.70 /-, and Rs. 27.00 /-. The per quintal economic losses was Rs. 161.70 /-.

The total post-harvest losses occurred retailer level was 7.27 kg/qt, in which losses incurred by loading & unloading was maximum 2.49 kg/qt followed by sorting & grading, storage and transportation *i.e.* 1.85, 1.62, and 1.31 kg/qt respectively.

The per quintal economic losses were estimated be Rs. 99.60 /-, Rs. 74.00 /- ,Rs. 64.80 /- and Rs. 52.40/-. The per quintal total economic losses was Rs. 290.80/-.

1. Constraints in post-harvest losses of Amaranthus

In post-harvest losses of Amaranthus, farmers faced number of constraints which were identified and given in table 3.

Table 3: Constraints in post-harvest losses of Amaranthus

Sr. No.	Constraints	No. of farmers (n=60)	Percentage of total farmers	Rank
1.	Daily fluctuation of prices	55	91.66	II
2.	Burden of transportation cost	58	96.66	I
3.	Rough handling during transportation, packing, handling, loading and unloading	30	50.00	V
4.	Improper cold storage facilities	52	86.66	III
5.	High commission charges	47	78.33	IV

It was revealed that, burden of transportation cost was the major problem expressed by 58 farmers (96.66 per cent) followed by daily fluctuation of prices which was expressed by 55 farmers (91.66 per cent) and improper cold storage facilities (86.66 per cent), high commission charges (78.33 per cent) and rough handling during transportation, packing, handling, loading and unloading (50.00 per cent).

CONCLUSION

1) The present study was undertaken to Post-harvest losses of amaranthus in Gondia district, to worked out post-harvest losses of amaranthus and to identify constraints faced by post- harvest losses of amaranthus.
2) The overall scenario of post-harvest losses in amaranthus at different stages was worked out to 15.03 kg/qt and per

quintal corresponding monetary losses was Rs. 343.16/- The total post-harvest losses in amaranthus at market level was observed to be 12.66 kg/qt which resulted to per quintal economic loss of Rs. 506.40 /-.

3) The most of the farmers beared of burden of transportation cost was the major problem expressed by 96.66 per cent farmers followed by daily fluctuation of prices which was expressed by 91.66 per cent which was resulted to farmers's income.

Suggestions

On the basis of present study, the farmers should be aware regarding standardization ,grading, handling, proper packing through the training organized by government agricultural department. It is suggested that, leafy vegetables for their study have optimum shelf life at temperature of approximately 0°C to 10°C, if it not maintain loss of storage potential. It is also suggested that, coating of leafy vegetables can be applied, therefore it creating the barrier for the moisture and air migration through the surface while lowering the rate of respiration and evapotranspiration of the leafy vegetables. Hence, deterioration process is reduced resulting a considerable long post-harvest life and fetching better prices in market.

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REVIEW ARTICLE

Use of information communication technologies for apple growers

Arpita Sharma[1]

Assistant Professor, Deptt. of Agricultural Communication, College of Agriculture GBPUA&T, Pantnagar-263145

Corresponding Author's Email : sharmaarpita615@gmail.com

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ABSTRACT

Agriculture is the backbone of India's economy and plays an important role in the development of the Nation. About more than 50 per cent of India's population lived in the villages and agriculture is their primary source of food, fodder, and fuel, as well as income to satisfy other needs also. The agriculture sector contributes about 17.8 per cent to the National GDP and generates employment for 58 per cent of the population. This sector provides raw materials to the industrial sector. The agriculture sector acts as a wall in maintaining food security and in the process, National security as well. India has achieved self-sufficiency in food grain production and now the major concern is to achieve a higher growth rate. It is the central trade of each developing Nation as history shows, and most of the developed Nation these days grew on the back of a solid agricultural trade. The focus has now changed from the agriculture sector to the horticulture sector. Horticultural crops included nutritional security, offer good potential for efficient input use, higher productivity per unit area, crop diversification, higher-earning crops, and provide greater employment through post-harvest processing in Agro-based industries. In India fruits growers are facing many problems due to lack of Information, knowledge and education on many aspects. Extension strategies can empower the fruits growers by providing them knowledge, information on various aspects.

Key words: Apple Growers, Agriculture, Extension strategy

INTRODUCTION

The agricultural and horticultural sector are considered together with the impressive factors for the economic development of the Nation. Horticulture may be a prominent segment under the agriculture sector and fastest-growing sector. India has been bestowed with a big choice of climate and physical-geographical conditions and intrinsically is best fitted to growing various kinds of horticultural crops like fruits, vegetables, flowers, nuts, spices, and plantation crops. India is the second-largest producer of fruits and vegetables in the world. Fruits and vegetables are crucial supplements to the human diet as they supply the essential minerals, vitamins, and fibers required for maintaining health. Fruits are a superb source of magnesium, vitamin A, vitamin C and potassium.

Indian horticulture sector contributes more than 30 per cent to the Agriculture Gross Value Added (GVA) making a very significant contribution to the Indian economy. Fruit growing is one of the important and age-old practices in India since the past. Cultivation of fruit crops plays a crucial role in the overall status of mankind and therefore the nation. The consumption pattern of people has changed over a period. Now people preferred including fruits and vegetables for better health and conscious about it. The area under crops is larger than the horticultural crops that are about 127.67 million hectares and 25.66 million hectares respectively. But the production and

productivity-wise horticultural crops are more superior to crops. Role of horticultural crops in the Indian economy food processing industry in India is a sunrise sector that has gained prominence in recent years. Availability of raw materials, changing lifestyles, and appropriate fiscal policies have given a substantial push to the industry's growth. The Government is additionally taking steps to scale back food processing bottlenecks by augmenting processing and storage capabilities and making finance available. The major challenges in the horticulture sector are an inadequate transport system, the poor linkage between farmers and extension services, poor linkage of farmers with the market update, seasonal diseases, insects-pest, lack of knowledge inputs, and shortage of qualified manpower to address the new and emerging problems and deliver at the grassroots level.

Importance of Fruits in India: Fruit growing is one of the important and age-old professions, practiced in India since ancient times. The cultivation of fruit crops plays an important role in the overall status of mankind and the Nation. The standard of living of the people of a country is depending upon the production and per capita consumption of fruits. Fruit growing has more economic advantages. Fruits are very important for health. **[**1] High productivity: From a unit area of land more yield is realized from fruit crops than any of the agronomic crops. The average yields of Papaya, Banana, and Grapes are 10 to 15 times that of agronomic crops. [2] High Net profit: The initial cost of the establishment of an orchard is high, it is compensated by higher net profit due to higher productivity or high value of produce. [3] Source of raw material for agro-based industries: Fruit farming provides raw materials for various agro-based industries canning and preservation (fresh fruits), coir industries (coconut husk), pharmaceutical industry (Aonla, Papaya, Jamun) Transporting and packaging industries, etc. [4] Efficient utilization of resources: Growing fruits being perennial, enables the grower to remain engaged throughout the year in farm operations and to utilize fully the resources and assets like machinery, labor, land-water for production purposes throughout the year compared to agronomic crops. [5] Utilization of waste and barren lands for production: Although most of the fruits crops require perennial irrigation and good soil for production, there are many fruit crops of hardy, Mango, Ber, Cashew, Custard apple, Aonla, Phalsa, Jamun, etc. which are grown on poor shallow, undulated soils considered unsuitable for growing grain/ agronomical crops. [6] Foreign exchange: Many fresh fruits, processed products, and spices are exported to several countries earning a good amount of foreign exchange. Nutritional importance of fruits are: [1] The importance of fruits in the human diet is well recognized. Man can't live on cereals alone. [2] Fruits and vegetables are essential for a balanced diet and good health. [3] Nutritionists advocate 60-85grams of fruits and 360 grams. [4] Vegetables per capita per day in addition to cereals, pulses, eggs, etc. [5] Fruits and vegetables are good sources of vitamins and minerals without which the human body cannot maintain proper health and develop resistance to a disease they also contain pectin, cellulose, fats, proteins, etc.

Scenario of Apple in India: Among the fruit crops apples is one of the major horticultural crops produced in India. It is a temperate fruit crop that is grown in high-altitude regions. Its botanical name *Malus domestica* belongs to the Rosaceae family. Apple fruits are also known as the king of temperate fruit and symbol of health. It is mainly cultivated in Jammu & Kashmir, Himachal, Uttarakhand, Arunachal Pradesh, Nagaland, Kerala, Tamilnadu, etc. Apple production and area in India is 2,316 thousand metric tonnes and 308 thousand hectares respectively.

Table : State wise production and percentage share by apple in the year 2017-18

S.No.	State	Production (000 tonnes)	% share of the state in production
1.	Jammu & Kashmir	1808.33	77.71
2.	Himachal Pradesh	446.57	19.19
3.	Uttarakhand	58.66	2.52
4.	Arunachal Pradesh	7.35	0.32
5.	Kerala	4.00	0.17
6.	Nagaland	1.99	0.09
7.	Tamilnadu	0.01	Nil
	Total	**2326.91**	

Scenario of Apple growers in Uttarakhand: Agriculture is a predominant sector in the state economy which contributes around 23.4 per cent in State Domestic Product. The temperate fruits are grown in all the hilly tracts of Uttarakhand. Apple was not a traditional crop of the hilly people. Till independence, the progress of apple cultivation was slow. There was only 2400 hectares area under fruit in 1953 and apple was the main fruit crop. Most of the orchards were situated in Ramgarh, Mukteshwar, Chaubattia, Lohaghat, Binsar, Jalna, Kanatal, and Harsil. The average landholding size of an apple grower in Uttarakhand is estimated at 1.57 hectares. There is a 74 per cent apple growers belong to marginal farmer category while, 17 per cent, 9 per cent belongs to small and medium farmer category respectively. Only 0.1 per cent of apple growers belong to the large farmer category. The farmers of Uttarakhand are purely dependent on farming as their source of income. Various apple varieties are grown in the different districts of Uttarakhand including Royal delicious, Red delicious, Richard delicious, Red golden, Super chief, Red spur, Golden spur, Tyde men early, Golden delicious. Delicious group varieties are found to be the most grown.

Table: Division wise Area and production of apple fruits in Uttarakhand state in the year 2018-19

Apple areas and production in Uttarakhand		
	Garhwal region	**Kumaon region**
Areas (in hectares)	20808.39	4867.48
Production (in metric tonnes)	31743.97	26009.52

Apple accounts for 17 per cent of the total area under fruit crop production in the State and 13 per cent of the total fruit production. In 2014-15, the total area and production of apples in the State was estimated at 34,000 ha and about 92,300 MT respectively compared to 625,000 MT in Himachal Pradesh from an area of 1,08,000 ha and production of 1,170,300 MT in J&K from the area of 1,63,400 ha. The State ranks third in the production of apples after Jammu & Kashmir & Himachal Pradesh accounting 11 per cent of the area and 5 per cent of all India's production of apples. Low production and productivity of apples in the State may be attributed to various factors as old and senile orchards, relatively newly planted area under apple, which is non-fruit bearing stage, quality of planting material, poor crop management practices, post-harvest wastages, imbalance use of resources, etc. There is significant potential for enhancing

the overall State average productivity through various interventions.

Apple is cultivated in almost all hill districts of the State. Uttarkashi and Almora are the two major districts with the highest production. The two districts account for more than 50 per cent of the State's apple production.

Ranking of Uttarakhand in horticulture in India: [1] Uttarakhand ranks first in the country in the production of Pear (0.788 lakh MT), Peach (0.579 lakh MT), Plum (0.362 lakh MT), and Apricot (0.282 lakh MT). [2] Uttarakhand ranks second in the country in the production of Walnut (0.19 lakh MT) followed by Jammu & Kashmir (2.10 lakh MT). [3] Uttarakhand ranks third in the country in the production of Apple production (0.62 lakh MT) followed by Jammu & Kashmir (13.68 lakh MT) and Himachal Pradesh (6.25 lakh MT).

Uttarakhand's strength or power for apple production: Already being an apple grower and having vast experience in apple production. Uttarakhand is having a rich gene bank like Early Sunberry, Fanny, Benoni, Chaubatia Prince, Red Delicious, Starkid Delicious, Mactos, Cardland, Golden Delicious, Raimer, etc. In Uttarakhand, naturally favorable geographical location and climatic conditions for apple production. There are proper arrangements for marketing. Ease of transport such as road, air routes, and rail routes is widely spread in Uttarakhand.

Problem faced by Apple Growers: Nature has endowed the state of Uttarakhand with a wide range of agro-climatic conditions which permit the production of varieties of temperate fruits. It has vast climatic features, topography, and diversity in physiographic features with the existence of temperate, intermediate, and subtropical zones within a small geographical area. India is the second-largest country in foodgrain production and most of the horticultural crops producing countries in the world. It is not only playing a crucial role in the economy of the country but has also provided livelihood and employment for a large proportion of the Indian population. Uttarakhand ranked 3rd in apple production followed by Jammu & Kashmir and Himachal Pradesh. Many marginal and small apple growers do not have proper access to information related to new technologies and programs related to apple cultivation In India, there are highly dispersed rural populations, high cost of delivering information in person Thus, there is limit of the efficacy of traditional extension systems.

Major problems faced by apple growers in the Garhwal region in production were seasonal changes like natural calamities, unseasonal rains, storms, hailstorms, etc. Rapidly changing land use and rapid sale of cultivable land to outsiders and construction of residential colonies at these locations. Increasing incidence of diseases and pests in apple orchards. Increasing interference of wild animals in the populated area is responsible for ruining agriculture and horticulture. Due to this, the farmer gets discouraged. Shortage of skilled labour, poor storage facilities, less use of modern farming equipment, over-dependence on traditional apple varieties, lack of desired chemical fertilizers, plant protection chemicals, financial problems, post-harvest losses, lack of grading and sorting equipment, unavailability of proper packaging materials like wooden boxes, no branding of apple products, lack of marketing intelligence, no Government scheme have reached yet too small farmers.

The extension workers and farmers ratio are 1:1156 which is quite less and shows a huge gap. This is one of the reasons behind the knowledge gap exists between farmers. To fill this gap and to deliver information easily and effectively, extension strategy can be considered as a good extension tool. There

is a lack of data that up to what level e-booklet is effective and accessible to apple growers. In Uttarakhand, the apple cultivation practices have been carried for Britishers time, but the state is still lagging.

Information needs of Hill farmers

Apple growers are facing many problems and they have many needs related to apple production. **Patel (2004)** concluded that farmers needed information related to various aspects of marketing, water management, plant protection measure, fertilizer management and variety. **Kushwaha (2008)** observed that majority (61.92%) of the farmers had high level of knowledge followed by 28.56 per cent of them had medium level of knowledge regarding apple production. Only 9.51 per cent of farmers had low level of knowledge related to apple production technology. **Meitei and Devi (2009)** reported that maximum (21.92 per cent) farmers needed information about different types of seeds, fertilizers, and equipment, pesticides, and irrigation, harvest and post-harvest techniques. **Bachhav (2012)** conducted a study on the Information needs of rural farmers. He found the areas of information mentioned by the farmers in his study were information on crop production (70.86%), seeds availability (74.29%) and insecticide availability (62.29 per cent). Further, he also stated that farmers showing the information needs regarding water management (34.28%), and 23.43 per cent of farmers mentioned information need on the weather. **Damanbhai (2013)** reported that majority (70.00 %) of the tomato growers were under the medium level, followed by 19.16 per cent of the tomato growers were categorized under high level. Rest of 10.84 per cent of the tomato growers were categorized under low level of information needs. **Sahu *et al.* (2013)** concluded that 88.33 per cent of respondents lacked knowledge about seed rates, improved varieties, and sowing time. 85 per cent of the respondents lacked knowledge about IPM technologies. **Benard *et al.* (2014)** concluded that farmers needed information related to marketing, new varieties, disease and pest control, weather condition, pesticide and its application and planting methods for rice cultivation. **Pawar (2016)** concluded that potato growers faced many problems during production such as insect and pest attacks, low production due to climate change, non-availability of information regarding technical guidance literacy but still the areas and locality lagging in this aspect. **Rawal (2017)** found that the majority (56.87%) of the farmers needed information related to the pre-sowing stage followed by 51.87 per cent needed information related to growth stage and post-harvesting stage by 49.37 per cent respectively. **Beevi *et. al.* (2019)** found that respondents needed information related to seed treatment, varieties, machinery, disease and pest management, farm implement, crop rotation and water management.

Thus, we can say that people are facing many problems in hills due to lack of knowledge, information and Education on various aspects.

ICTs for Apple growers

ICT is an umbrella term that includes all technologies used for the communication of information related to Apple farming. Using Information and Communication Technologies (ICTs) in innovative ways through ICT-enabled services help in disseminating timely information on agricultural advisories, providing financial services and helping in getting agricultural marketing intelligence and minimize risk to the farmer to improve their capacity. The benefit of ICTs is that it accommodates all the key stakeholders. It will help in ease of doing business and deployment of technology related to Apple farming. It is also a cost-effective method that can be used for information sharing among different

farmers and to make them familiar with new innovative technologies. Uttarakhand is mostly a hilly State (i.e., 86 per cent of total geographical area) and having poor infrastructure and road network. Many marginal and small apple growers do not have proper access to information related to new technologies and programs related to apple cultivation (like – new varieties, fertilizer application, weed management, irrigation, insecticide & fungicide application, marketing information, fruit processing, and packaging, etc). In Uttarakhand, there are highly dispersed rural populations, high cost of delivering information in person. The extension worker and farmers ratio are 1:1156 which is quite less and shows a huge gap. This is one of the reasons behind the knowledge gap exists between farmers. To fill this gap and to deliver information easily and effectively e-booklet can be considered as a good extension tool that has emerged out of the digitalization and communication revolution.

Now a days, information is a basic necessity of everyday life. Information can be obtained or retrieved from a variety of sources. Farmers constitute a particular group of users whose information needs are very specific. The term information need is often understood as an individual or group's desire to locate and obtain information to satisfy a conscious or unconscious need. It is closely related to the concept of relevance: if something is relevant for a person concerning a given task, we might say that the person needs the information for the task. According to Taylor (1962), information need has four levels: [1] The conscious and unconscious need for information not existing in the remembered experience of the investigator. In terms of the query range, this level might be called the “ideal question”: the question which would bring from the ideal system exactly what the inquirer, if he could state his need. It is the actual, but unexpressed, need for information. [2] The conscious mental description of an ill-defined question. At this level, the inquirer has conscious information needs in mind and might talk to someone else in the field to get an answer. [3] A researcher forms a rational statement of his question. This statement is a rational and unambiguous description of the inquirer's doubts. [4] The question is presented to the information system.

Need Based information for Apple growers

Information given at right time to apple growers can empower them. Message designing is art and science. Thus, the need based information can provide them right information at the right time. **Manhoff (1986)** found out the factors that message designers must follow in order to produce effective and relevant message. It relates to: 1) Content: What action in audience is required to take to change behaviour. 2) Design: number of ideas, culture relevance of the ideas, message style etc. 3) Persuasion: rational for action, believability of solution proposed. 4) Memorability: How should the main theme be reinforced. **Nutbeam (1998)** study community action collective effort which were directed towards increasing community control over determinants of any action. This definition presumes a situation in which organization representing a variety of section together with community members, are involved in need assessment, priority setting in the development, implementation and evaluation of any particular action. **Nair and White (2004)** in a study reported that message development is direct involvement of intended audience in various process necessary for constructing and delivering message utilizing both external and indigenous source of knowledge. Some of the steps are: 1) Identifying and selecting the audience. 2) Constructing need assessment 3)

Constructing receiver profile. 4) Outlining message and media options. 5) Choosing channels and context for message delivery. **Huang (2005)** stated that there were five sequential phases for designing multimedia module. (1) understand the learning problem and the user's needs according to the target audience; (2) design the content to harness the enabling technologies, it is done through users point of view; (3) building multimedia materials with web style standards and human factors principles; (4) user testing; (5) Evaluate and improve design. **Sharma (2011)** in a study stated that steps of participatory message designing are: 1) Need Assessment 2) Views taking through the target audience and experts. 3) Members of the studio read the data. 4) Discussion between target groups and media practitioners. 5) Decision of format. 6) Scriptwriting. 7) Recording of the program. 8) Editing. 9) Broadcasting. **Martin *et al.* (2013)** concluded a study on "Development of an interactive multimedia instructional module" stated that the module was built for following the systematic design process. The steps for the development of an effective module are analysis, design, development, the implementation than at last evaluation. **Singh (2014)** revealed that prepared repository by collecting information from reliable sources such as textbooks, technical bulletins, research papers, and journals. Further, management module was developed by using suitable software.

CONCLUSION

On the above discussion we can say that Information Communication Technologies can empower the apple growers. Different ICTs tools are used to develop apple growers. Different mobile apps are used to provide them information, education and knowledge to the apple growers. There are different websites and portals for apple growers. Apple growers can also take different information on apple from the use of different Information Communication Technologies.

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RESEARCH ARTICLE

Determinants of attitude of rural youth towards agriculture

Umesh R. Chinchmalatpure[1] and N. R. Koshti[2]

Department of Extension Education, Dr. PDKV, Akola, Maharashtra, India

Corresponding Author's email : rcumesh@rediffmail.com

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ABSTRACT

The present study was focused on the determinants of attitude of rural youth towards agriculture and conducted in the twelve villages of four Panchayat Samities of Akola and Amravati districts in Maharashtra State. Data was collected from 120 rural youth through interview schedule. An exploratory design of social research was used for the study. The finding revealed that the attitude of rural youth towards agriculture was found to be at moderately favourable (64.17%) followed by 25.83 per cent of the rural youth had less favourable attitude towards agriculture and only 10 per cent of them had high favourable attitude towards agriculture. Further the data reported that marital status of the rural youth was found non-significantly correlated with the attitude towards agriculture and allied activities whereas, variables like education, land holding, annual income, mass media exposure, extension contact, extension participation, achievement motivation, economic motivation and innovativeness were found to be significantly correlated with the attitude of the rural youth towards agriculture and allied activities.

Keywords: Rural youth, Attitude, Agriculture, Dairy, Horticulture,

INTRODUCTION

Agriculture sector is potentially the largest employment providing sector in the country. Rural youths are closely involved in agriculture. Youths are also playing important role in agriculture by performing some farm activities and helping their families in different farm operations. Most often school dropout, unskilled and unemployed youths face serious difficulties and problems in their life. Due to lack of adequate literacy, lack of knowledge on agricultural information and technology they cannot achieve the desired production of crops. Many of them do not have enough skills in handling the modern agricultural technologies. So, many techniques and research are developing day by day. It is very necessary to make aware people about it. In that case rural youth play very important role, so it is very essential to study. The study was undertaken with the scope that the attitudes with dependent on the characteristics and the local situation of the rural youth. Therefore, in this study the local situation and the characteristics were taken into consideration. This study is helpful to reveal the facts about attitude of rural youth towards agriculture and allied activities. The present study has been carried out with the specific objectives.

1) To study the attitude of the rural youth towards agriculture and allied activities
2) To study the relationship of selected characteristics of the rural youth with their attitude

METHODOLOGY

An exploratory design of social research was used in the present investigation as the study emphasized on attitude of the rural youth about agriculture and allied activities. The present study was conducted in the six villages of Akola Panchayat Samiti and Barshitakali Panchayat Samiti of Akola

district and six villages of Chandur railway Panchayat Samiti and Bhatkuli panchayat samiti of Amravati district. From each selected village, ten rural youths were randomly selected as respondents. In all, total 120 rural youths were randomly selected from twelve villages and data collection was done using pretested structured interview schedule. Attitude was measured on five point continuums using a scale developed by Hari (2014) with slight modification. The scale consisted of seven positive and fourteen negative statements. For each positive statement the scores ranged from 1 to 5, with 1 for strongly disagree, 2 for disagree, 3 for neutral, 4 for agree and 5 for strongly agree attitude. Scoring was reversed for negative statements. The attitude score of each respondent was calculated by adding the scores of all statements, for that respondent. Based on scores, the respondents were categorized into 3 classes, viz. less favourable, moderately favourable and highly favorable using equal class interval methods between the minimum and the maximum scores.

Sr. No.	Category	Score range
1.	Less favourable Upto	69
2.	Moderately favourable	70 to 98
3.	Highly favorable Above	98

RESULTS AND DISCUSSION

I. Profile of rural youth:

The data with respect to various characteristics of the respondents have been furnished in Table 1.

From the Table 1, it could be observed that 43.33 per cent of the rural youth were educated upto higher secondary and college level education followed by 34.17 per cent were educated upto high school level education. Further 13.33 per cent of the rural youth were educated upto middle school level and 9.17 per cent of the rural youth were educated upto primary school level. It was noted that no one was found illiterate among selected youth. Majority of the respondents were found unmarried (73.33%) and 26.67 per cent of them were married. It could be noticed that 39.17 per cent of the respondents were in small land holding group, followed by 30.00 per cent and 19.17 per cent of the respondents were in marginal and semi-medium land holding category, respectively. About 11.66 per cent of the rural youth were possessed land at marginal level. It is revealed that near about fifty per cent (48.33%) of the rural youth having annual income of in between Rs. 1,00,000 to Rs. 2,00,000, respectively. The remaining 27.50 per cent and 24.17 per cent of the rural youth belonged to annual income group of Rs. 1,00,000 and above Rs. 2,00,000, respectively. Majority of the rural youth i.e. 70.83 per cent were having medium mass media exposure, followed by 21.67 per cent were having low mass media exposure and only 7.50 per cent of them having high level of mass media exposure. Majority of respondents (45%) had medium extension contact, followed by 42.50 per cent and 12.50 per cent of rural youth found in low and high level of extension contact, respectively. Majority of respondents (67.50%) had medium level of extension participation, followed by 17.50 per cent and 15.00 per cent of respondents found in high and low level of extension participation, respectively.

Table 1. Distribution of respondents according to their characteristics

Sr. No.	Category	Respondents (n=120)	
		Number	Percent
1.	**Education**		
i)	Illiterate	00	00.00
ii)	Primary (1st std. to & 4th std.)	11	09.17
iii)	Middle (5th std. to & 7th std.)	16	13.33
iv)	High school (8th std. to 10th std.)	41	34.17
v)	Higher Secondary & College	52	43.33
2.	**Marital Status**		
i)	Married	32	26.67
ii)	Unmarried	88	73.33
3.	**Family Land holding (ha)**		
I)	Marginal (upto 1 ha)	36	30.00
ii)	Small farmers (1.01 to 2.0 ha)	47	39.17
iii)	Semi-medium (2.01 to 4.0 ha)	23	19.17
iv)	Medium (4.01 to 10.00 ha)	14	11.66
v)	Large (Above 10.00 ha)	00	00.00
4.	**Family Annual income (Rs.)**		
I)	Upto Rs. 1,00,000	33	27.50
ii)	Rs. 1,00,001 to Rs. 2,00,000	58	48.33
iii)	Rs. 2,00,001 to Above	29	24.17
5.	**Mass media exposure**		
I)	Low (upto 3)	26	21.67
ii)	Medium (4 to 8)	85	70.83
iii)	High (above 8)	09	07.50
	Mean = 5.38	SD = 2.34	
6.	**Extension Contact**		
I)	Low (upto 2)	51	42.50
ii)	Medium (3 to 6)	54	45.00
iii)	High (above 6)	15	12.50
	Mean = 3.67	SD = 2.29	
7.	**Extension Participation**		
I)	Low (upto 3)	18	15.00
ii)	Medium (4 to 9)	81	67.50
iii)	High (above 9)	21	17.50
	Mean = 6.12	SD = 3.04	
8.	**Achievement motivation**		
I)	Low (upto 9)	10	08.33
ii)	Medium (10 to 20)	86	71.67
iii)	High (above 20)	24	20.00
	Mean = 14.60	SD = 5.61	

Sr. No.	Category	Respondents (n=120)	
		Number	Percent
9.	**Economic motivation**		
I)	Low (upto 12)	32	26.67
ii)	Medium (13 to 23)	63	52.50
iii)	High (above 23)	25	20.83
	Mean= 17.20	SD = 5.49	
10	**Innovativeness**		
I)	Low (upto 9)	15	12.50
ii)	Medium (10 to 18)	79	65.83
iii)	High (above 18)	26	21.67
	Mean= 13.58	SD = 4.67	

Further majority of the respondents (71.67%) having medium achievement motivation, followed by 20 per cent of them having high achievement motivation. The remaining 8.33 per cent of the rural youth were having low level of achievement motivation. Achievement motivation is psychological character of an individual which tend him to be risk taker in occupation or profession and achieve some good things from his life.

The data presented in Table 1 revealed that more than half of the respondents (52.50 per cent) had medium level of economic motivation, followed by nearly one third of them (26.67 per cent) were had low level of economic motivation and 20.83 per cent of respondents belonged to high category of economic motivation. It means that rural youth in the study area were mediocre in orientation towards profit maximization in their main occupation. A perusal of Table 1, that majority of the respondents (65.83%) having medium level of innovativeness, followed by 21.83 per cent of them were having high level of innovativeness and remaining 12.50 per cent belonged to low level of innovativeness category.

II. Attitude of rural youth towards agriculture

The attitude of rural youth towards agriculture was found to be at moderately favourable (64.17%). Whereas, 25.83 per cent of the rural youth had less favourable attitude towards agriculture and only 10 per cent of them had high favourable attitude towards agriculture. Similarly, Kitturmath *et al.* (2013) observed that more than 70 per cent of the respondents had moderately favourable attitude followed by less favourable and remaining about 14 per cent with high favourable attitude towards rural development activities in Latur district of Maharashtra. Thus majority expressed either moderately favourable or less favourable attitude towards agriculture as a livelihood activity. This indicates low involvement of youth in agricultural production activities in the area. Youth of Malaysia had negative attitudes toward agriculture as revealed by Jeffrey *et al.* (2010) and viewed agriculture as an unattractive area to work and less remunerative (Abdullah *et al.*, 2012).4.5

Table 2. Distribution of respondent according to their attitude towards agriculture

Sr. No.	Category	Respondents (n=120)	
		Number	Percent
1.	Less favourable (upto 69)	31	25.83
2.	Moderately favourable (70 to 98)	77	64.17
3.	Highly favourable (above 98)	12	10.00
	Total	120	100.00
	Mean= 83.17	SD = 14.52	

III. Determinants of attitude towards agriculture

The discussion about the relationship of the profile of rural youth with attitude is given below.

The data in Table 3 revealed that the variables like education, land holding, annual income, mass media exposure, extension contact, extension participation, achievement motivation, economic motivation and innovativeness were found significantly correlated with the attitude of the rural youth towards agriculture and allied activities. This significant correlation is due to the fact that only those rural youth whose family owned agriculture land was selected for study. This indicates that agriculture is still the primary source of employment in rural areas. However, the marital status was found non-significantly correlated with the attitude of the rural youth towards agriculture and allied activities.

Table 3 : Coefficient of correlation between independent and dependent variable

Sr. No.	Independent Variable	Attitude `r' value		
		Agriculture	Horticulture	Dairy
1.	Education	0.493**	0.211*	0.398**
2.	Marital Status	0.105^{NS}	0.075^{NS}	0.024^{NS}
3.	Land Holding	0.528**	0.491**	0.498**
4.	Annual Income	0.693**	0.483**	0.577**
5.	Mass media exposure	0.739**	0.498**	0.576**
6.	Extension contact	0.517**	0.478**	0.539**
7.	Extension participation	0.524**	0.531**	0.580**
8.	Achievement motivation	0.604**	0.544**	0.565**
9.	Economic motivation	0.627**	0.530**	0.561**
10.	Innovativeness	0.562**	0.440**	0.491**

** Significant at 0.01 level of probability

* Significant at 0.05 level of probability

NS-Non Significant

CONCLUSION

It can be concluded that the attitude of rural youth towards agriculture was found to be at moderately favourable to less favourable attitude towards agriculture. The variable marital status was found non-significantly correlated with the attitude, whereas variables like education, land holding, annual income, mass media exposure, extension contact, extension participation, achievement motivation, economic motivation and innovativeness were found significantly correlated with the attitude of the rural youth towards agriculture and allied activities. Therefore, the administrator and policy measures should aim at encouraging youth belonging to farming families to take up agriculture by providing suitable incentives and related information. The special efforts may be taken based on the findings to attract, train and retain the rural youth towards agriculture as a whole by making it more profitable and remunerative with scientific interventions.

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RESEARCH ARTICLE

Impact of Indo-Israel technology on mandarin growers

Bharti Wadhankar [1], K. T. Lahariya[2], and V. S. Tekale[3]

1. Ex-P. G. Student, Department of Extension Education, Post Graduate Institute,
2. Assistant Professor of Extension Education, 3. Associate Dean, College of Agri., Mul, Dist. Chandrapur,
Dr. Panjabrao Deshmukh Krushi Vidyapeeth, Akola (M.S.) India
Corresponding Author's email : ktlahariya@yahoo.in

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ABSTRACT

The research study on "Impact of Indo-Israel Technology on Mandarin Growers" was conducted in Nagpur and Amravati districts and was confined to Katol and Kalmeshwar Block of Nagpur district and Varud Block of Amrvati districts of Maharashtra state. The experimental research design of social research was used for the present study. In all, 120 respondents were selected by random sampling method i.e. 60 adopter and 60 non-adopter mandarin growers. The data were collected from adopter and non-adopter respondents by personal visit by means of interview schedule. The results pertaining to the research study revealed there was positive impact of Indo-Israel technology to the adopter mandarin growers in terms of change in yield, productivity, annual income, labour employment and social participation. It was also found that there was significant change in yield, productivity, annual income, labour employment and social participation to the tune of 56.09, 82.79, 72.67,-28.66 and 28.99 per cent, respectively in case of adopter over non-adopter mandarin growers as a result of Indo-Israel technology. Thus, it could be inferred that, Indo-Israel technology had created positive impact on adopter mandarin growers.

Key words: Impact, Mandarin, Indo-Israel technology, adopters, non-adopters, yield, productivity, annual income, labour employment, social participation

INTRODUCTION

Citrus is a genus of flowering trees and shrubs in the rue family, Rutaceae. While the origin of citrus fruits cannot be precisely identified, researchers believe they began to appear in Southeast Asia at least 4,000 BC. From there, they slowly spread to Northern Africa, mainly through migration and trade.

During the period of the Roman Empire demand by higher-ranking members of society, along with increased trade, allowed the fruits to spread to Southern Europe. Citrus fruits spread throughout Europe during the middle Ages, and were then brought to the Americas by Spanish explorers. Worldwide trade in citrus fruits didn't appear until the 20th century and trade in mandarin juice developed as late as 1940.

Citrus fruits are notable for their fragrance, partly due to flavonoids and limonoids (which in turn are terpenes) contained in the rind, and most are juice-laden. The juice contains a high quantity of citric acid giving them their characteristic sharp flavour. The genus is commercially important as many species are cultivated for their fruit, which is eaten fresh, pressed for juice, or preserved in marmalades and pickles.

Mandarin is the most common among the citrus fruit occupying nearly two-third of the world total area. The leading mandarin producers are the United States, Brazil, Central and South America South Africa, Japan, China, India and Mediterranean country Mandarin (*Citrus reticulata*) is most

common among citrus grown in India. Area under mandarin in India was 404 thousand hectare and production was 4964 thousand Metric Ton during year 2018-19. The leading mandarins producing states of in India are Punjab, Maharashtra, Assam, Andhra Pradesh, Karnataka, Madhya Pradesh, Tamilnadu, Meghalaya, Tripura, Haryana, Rajasthan and West Bengal. At the first position in the list of top citrus producing states is the state of Maharashtra. The city of Nagpur is especially known for its production of Mandarin. It is known the mandarin city because of its world-famous mandarins which are grown in this city. Mandarin is rich in vitamin C, A, B, and phosphorus. Mandarin is consumed fresh or in form of the juice, jam, squash and syrup. It is the main source of peel oil, citric acid and cosmetics which have international market value. Citrus fruit intake has been associated with a 10% reduction in odds of developing breast cancer. Mandarins were historically used for their high content of vitamin C, which prevents scurvy.

The Indo-Israel agriculture project based on the concept of establishing center of excellence which provide platform for a rapid transfer of technology to the farmers with the aim of increasing the productivity and improving the quality of produce. Based on Israel's unique expertise in Agriculture, India and Israel have signed the Agreement for Agricultural Cooperation in 2006. This evolved into Indo-Israel Agriculture Project (IIAP), implemented by MIDH (Mission for Integrated Development of Horticulture) and MASHAV- Israel's Agency of International Development Cooperation under the Ministry of Foreign Affairs.

The centers of excellence provide a suitable platform to a rapid transfer of technology to the farmers. Knowhow and new agriculture technologies such as protected cultivation, drip irrigation and fertigation are demonstrated at the centers with the aim to be adopted by the farmers. This is done in order to increase their yields and productivity and also to improve the quality of produce. This can result in positive impact on income of the farmers and market prices, as well introducing new variety.

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The 20 centers of excellence are functioning in different states. Notable among these are centers for vegetable in Karnal, Haryana, for mangoes in Dapoli, and for citrus fruit in Nagpur, both in Maharashtra and one for pomegranate in Bassi, Rajasthan. Among the unique projects are a functional centre of excellence for beekeeping in Haryana and centre of dairy which is in the Pipeline. In Maharashtra the first centre set up in Nagpur for citrus, second one in Rahuri in Ahmadnagar district for pomegranate and another at Dapoli in the Konkan region for mangoes.

Centre of Excellence for Citrus was established on 4 September 2010 at Nagpur. Indo-Israel citrus production technology, Maharashtra state adopted this technology on pilot basis in three citrus growing district of Maharashtra State (Nagpur, Amravati and Wardha) under MNAREGA. Farmers of Yavatmal, Washim and Buldana district also demanded for this technology and hence it is also included in the program. This technology was adopted by the innovative farmers on 350 ha area. Planting material was produced in the centre and it is supplied to the farmers on first come first basis. Model

nursery was developed at the Centre of Excellence for citrus, Nagpur. Nursery was also accredited by National Horticulture Board and got three stars ranking for the nursery.

MATERIALS AND METHODS

In present study experimental research design of social research was used. In the experimental research design two groups were selected one adopter and another non-adopter group of Indo-Israel technology of Mandarin. The present study was carried out in Warud tahsil in Amravati disitrict and Katol and Kalmeshwar Block in Nagpur district of Vidarbha region of Maharashtra State, where Indo-Israel technology is adopted by the mandarin growers. It is therefore, in order to find out the impact of Indo-Israel technology on mandarin grower. The present study was frame and conducted in the Nagpur and Amravati district. For selection of villages, the list of Indo-Israel technology adopted mandarin growers was obtained from concerned Taluka Agriculture Officer of the respective block from Amravati and Nagpur district. From these selected villages the Indo-Israel technology adopter farmer will be purposively selected on random basis for collection of data. For comparison, the data will also be collected from non-adopter mandarin growers from the same village selected for present study. The respondents from identified villages were randomly selected and the respondents selected were Indo-Israel technology adopter and non-adopter mandarin growers. The sample comprised of 60 adopter and 60 non-adopter mandarin growers from the purposively selected villages from two each blocks of Amravati and Nagpur district respectively. Thus a sample of 120 Indo-Israel technology adopter and non-adopter mandarin growers was considered as a respondent for the present study.

RESULTS AND DISCUSSION

I. Yield levels of adopter and non-adopter mandarin growers

The results pertaining to the yield of adopter and non-adopter mandarin under present research study are given in table below

Table 1 : Distribution of adopter and non-adopter mandarin growers according to the yield of mandarin

Sl. No.	Yield (Ton/ha)	Adopter (n=60)		Non-adopter (n=60)	
		Frequency	Per cent	Frequency	Per cent
1.	Low	40	66.66	46	76.66
2.	Medium	16	26.66	12	20.00
3.	High	04	06.66	02	03.33
	Total	**60**	**100.00**	**60**	**100.00**

The results pertaining to levels of yield of mandarin presented in Table-1 revealed that, over half of adopter having low yield (66.66%) of mandarin growers, it was followed by 26.66 percent and 6.66 per cent of adopters who were having medium and high level of yield of mandarin crop.In case of non-adopter the having medium level of yield i.e. (76.66%) of mandarin crop, followed by 20.00 per cent and 3.33 per cent of them having medium and low level of yield. It might be due to the reason that, the

initial cost incurred for adoption of Indo-Israel technology is specialized type and high as compared to traditional mandarin growing practices and give fruitful results over time after adoption of Indo-Israel technology.

However it was found to be significant over the yield levels of non-adaptor mandarin growers. It is thus inferred that, the cost of production as well yield levels of adoption of Indo-Israel technology is higher than traditional mandarin growing practices.

III. Productivity of adopter and non-adopter mandarin growers

The results pertaining to the productivity of adopter and non-adopter mandarin growers under present research study are given in table below

Table 2 : Distribution of adopter and non-adopter mandarin growers according to the productivity of mandarin crop

Sl. No.	Yield (Ton/ha)	Adopter (n=60)		Non-adopter (n=60)	
		Frequency	Per cent	Frequency	Per cent
1.	Low	00	00.00	26	43.33
2.	Medium	15	25.00	34	56.66
3.	High	45	75.00	00	00.00
	Total	**60**	**100.00**	**60**	**100.00**

It is revealed from Table 2 that, majority (75.00%) of adopter having high productivity of Mandarin crop, followed by 25.00 per cent of them having medium level of productivity. In case of non-adopter the growers having medium level of productivity i.e. (56.66%) of Mandarin crop, followed by 43.33 per cent of them having low level of productivity.

II. Annual income of adopter and non-adopter mandarin growers

The results pertaining to the annual income of adopter and non-adopter mandarin growers under present research study are given in table below

Table 3. Distribution of the adopter and non-adopter mandarin growers according to their annual income

Sl. No.	Annual income (Rs.)	Adopter (n=60)		Non-adopter (n=60)	
		Frequency	Per cent	Frequency	Per cent
1.	Up to 15,00000/-	53	88.33	57	95.00
2.	15,00001/- to 30,00000/-	06	10.00	03	05.00
3.	Above 30,00000/-	01	01.66	00	00.00
	Total	**60**	**100.00**	**60**	**100.00**
	Mean Annual income (Rs.)	**980038**		**567555**	
	Area under Mandarin (ha.)	**1.5**		**02.2**	

It is observed from Table 3 that, majority (88.33%) of adopter had annual income up to Rs. 15,00000/-, followed by 10.00 per cent adopter had annual income above Rs. 15,00001/- to 30,00000 rupees and only 1.67 per cent had annual income above Rs. 30,00000/-. In case of non-adopter, majority (95.00%) of growers had annual income up to Rs.1500000/-, followed by 5.00 per cent had annual income in between Rs. 1500001/- to Rs. 30,00000/-. Non-adopters have more area under Mandarin crop but their yield is less than adopters. Mean of area under mandarin crop of adopter and non-adopter is 1.5 and 2.2 ha and mean of annual income of adopter and non-adopter Rs. 980038 and Rs. 567555 respectively.

IV. Labour Employment of adopter and non-adopter mandarin growers

The results pertaining to the labour employment of adopter and non-adopter mandarin growers under present research study are given in table below

Table 4 : Distribution of the adopter and non-adopter mandarin growers according to labour employment

Sl. No.	Labour Employment	Adopter (n=60)		Non-adopter (n=60)	
		Frequency	Per cent	Frequency	Per cent
1.	Low	47	78.33	32	55.00
2.	Medium	11	18.33	23	38.33
3.	High	02	3.33	05	08.33
	Total	**60**	**100.00**	**60**	**100.00**

It is evident from Table 4 that majority (78.33%) of adopter had low level i.e. up to 250 man days of labour employment, followed by (18.33%) i.e. 251 to 500 and (03.33%) i.e. above 500 adopter had medium level and low level of labour employment In case of non-adopter, majority (55.00%) of growers had low level of labour employment i.e. up to 250 man days, followed by 38.33 per cent and 08.33 per cent had medium and high level of labour employment i.e 251 to 500 and above 500 respectively.

IV. Social participation of adopter and non-adopter mandarin growers

The results pertaining to the social participation of adopter and non-adopter mandarin growers under present research study are given in table below

Table 5 : Distribution of the adopter and non-adopter mandarin growers according to their social participation of

Sl. No.	Social participation	Adopter (n=60)		Non-adopter (n=60)	
		Frequency	Per cent	Frequency	Per cent
1.	Low	10	16.66	33	55.00
2.	Medium	40	60.00	25	41.66
3.	High	10	16.66	02	03.33
	Total	**60**	**100.00**	**60**	**100.00**

It is revealed from Table 5 that more than half (66.66%) of adopter had medium level of social participation followed by 16.66 per cent each of adopter had low and high level of social participation respectively. In case of non-adopter, majority (55.00%) of growers had low level of social participation, followed by 41.66 per cent had medium level and 3.33 per cent high level of social participation.

VI. Impact of Indo-Israel technology on the adopter and non-adopter mandarin growers

The results pertaining to the Impact of Indo-Israel technology **on** adopter and non-adopter mandarin growers under present research study are given in table below

Table 6 : Impact of Indo-Israel technology on the adopter over non-adopter mandarin growers

Sl. No.	Impact dimension	Mean score		Per cent Change
		Adopter	Non-Adopter	
1.	Yield	43.91	28.13	56.09
2.	Productivity	29.43	13.93	82.79
3.	Annual Income	980038	567555	72.67
4.	Labour employment	197.012	76.16	-28.66
5.	Social Participation	26.96	20.09	28.99
			Mean Impact	**42.38**

The findings presented in Table 6 revealed that, mean score of yield (43.91), productivity (29.43), annual income (Rs.980038), labour employment (Rs. 197.01) and social participation (26.96) of the adopter were found to be higher than mean score of yield (28.13), productivity (13.93), annual income (Rs.567555.55), labour employment (276.16) and social participation (20.09) of the non-adopter. It was also found that there was change in yield, productivity, annual income, labour employment and social participation to the tune of 56.09, 82.79, 72.67,-28.66 and 28.99 per cent respectively of adopter over non-adopter as a result of Indo-Israel technology in Mandarin.

VII. Testing of the means of selected dimensions of impact of Indo-Israel technology on the adopter and non-adopter mandarin growers

The results pertaining to testing of the means of selected dimensions of impact of Indo-Israel technology on the adopter and non-adopter mandarin growers under present research study are given in table below

Table 7 : Testing the significance difference of the means in yield, productivity, annual income, labour employment and social participation of adopter and non- adopter mandarin growers

Sl. No.	Impact dimension	Mean score		'Z' Value
		Adopter	Non-Adopter	
1.	Yield	43.91	28.13	4.37**

Sl. No.	Impact dimension	Mean score		'Z' Value
		Adopter	Non-Adopter	
2.	Productivity	29.43	16.20	13.57**
3.	Annual Income	980038.88	567555.55	04.85**
4.	Labour employment	197.012	276.16	-2.50*
5.	Social Participation	26.96	20.09	03.39**

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

A mere quantitative superiority of the mean score of the adopter over the mean score of the non- adopter is not conclusive proof of its superiority. Hence, the ratio between observed differences was computed as indicated by 'Z' values.

The 'z' values of yield (4.37), productivity (13.57), annual income (4.85), and social participation (3.39) were found significant at 0.01 level of probability. Whereas the results pertaining to the variable labour employment (-2.50) was found to be negatively significant at 0.05 level of probability and this might be due the reason that, as the mechanization increases the requirement of the labour decreases. It could therefore be inferred that, the adopter differ significantly over non-adopter in yield, productivity, annual income, labour employment and social participation. It could therefore affirmed that, there was definite change in yield, productivity, annual income, labour employment and social participation among adopter over non-adopter mandarin growers as result of adoption of Indo-Israel technology for cultivation of mandarin.

The findings of the study inferred that, adoption of Indo-Israel technology for cultivation of Mandarin had a positive and significant impact on the adopter mandarin growers.

CONCLUSION

The findings of the research study concluded that, the adopter farmers differ significantly over non-adopter in yield, productivity, annual income, labour employment and social participation. Further there was definite change in yield, productivity, annual income, labour employment and social participation among adopter mandarin growers over non-adopter manadarin growers as a result of adoption of Indo-Israel technology for cultivation of Mandarin had a positive and significant impact on the adopter mandarin growers.

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RESEARCH ARTICLE

Assessment of quality control among cocoa farmers in ONDO State, Nigeria

O. W. Kareem[1], P. B. Kharde[2], A. K. Daudu[3], T. A. Dolapo[4] & A. O. Shittu[5]

1, 3, 4 & 5. Department of Agricultural Extension and Rural Development, Faculty of Agriculture, University of Ilorin, Nigeria

2. Department of Extension Education, Mahatma Phule Krishi Vidyapeeth, Postgraduate Institute, Rahuri, M.S. India

Corresponding Author's email : pbkharde@gmail.com

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ABSTRACT

It is highly desirable in the context of sustainable modern cocoa production that farmers understand the quality parameters and have a larger role in the quality control by addressing any inadequacies at an optimum moment of taking more responsibility for the quality of their own products. This study examined the assessment of quality control among cocoa farmers in Idanre local government area, Ondo State, Nigeria. A purposive sampling technique was used to select 120 respondents. Data were collected with the aid of well-structured questionnaire and interview schedule. Descriptive and inferential statistics were used to analyze the data. Results of the study indicated that farmers had a mean age of 49.3 years. Majority (68.3%) of the respondents were males while the females accounted for 31.7%. Majority (71.7%) of the respondents were married with an average household size of 7.46. The preponderance (64.2%) of respondents had formal education. Majority (71.6%) of the respondents cultivated 1 to 7 hectares of land with an average annual income of ₦717,016.00. Higher percentage (87.0%) of respondents had contact with their extension agents monthly. The main methods mostly employed by farmers were the use of club for pod breaking (63.3%) and avoidance of foreign materials into the cocoa beans (61.7%). Cocoa farmers perceived regular training (80.8%) and market stability (63.3%) as major benefits derived from observing quality control. But farmers were constrained with insufficient credit facility and inadequate access to required inputs like pesticides. The study further revealed that gender, farmers group and educational level were positively significant ($p<0.005$) with the perceived benefits derived from cocoa quality control. The study therefore recommended that government should re-establish cocoa board for regulation of cocoa quality control and recruitment of teeming unemployed youths into cocoa business to gradually succeeding the ageing population that dominates the business. Then, regular provision of credit facility by the government is important, so that cocoa farmers can expand their business and meet up the demand of licensed buyers.

Keywords: Farmers, Quality Control, Licensed buyers, Marketing, Extension

INTRODUCTION

Cocoa quality control (CQC) is a process by which a body either private or government is empowered to measure the quality of cocoa beans produced in the country to the required standard acceptable to the national and international market. There is no other crop in Nigeria that has much potential to generate income like cocoa; various measures need to be put in place to

flourish and its potential maximized on a sustainable basis, most especially to be able to meet up with world market standard. Nigeria was one of the largest producers of cocoa in Africa before the discovery of petroleum in the past. However, in Nigeria an attempt to increase the tonnage and quality of the produce necessitated various innovations to the farmers. Since colonial era, efforts had been made by the Nigerian government to standardize and increase the quality and quantity of cocoa in the world market. Cocoa quality control addresses the shortcomings in the production of its quality and global market acceptability (ICO, 2017). Perhaps one of the erroneous beliefs of most players in cocoa industries is that cocoa quality control starts from post-harvest to the point of export, in contrary, quality control starts from pre-planting operation through planting of hybrid seedlings, spacing (3m×3m), maintenance of the plantation which include rehabilitation of the old plantation, weeding, pruning, shade management, fertilizer application and control of pests and diseases to avoid infected pods and beans, unlike grading that is only done at the ware-house or cocoa store which may not be as effective as expected. Cocoa beans of good quality are free from insect, holes, smoky and flat beans, they are not excessively acidic, bitter or astringent, and they have uniform sizes. Mankatah (2010), reiterated that cocoa should also be well fermented, have a moisture content of maximum 7.5 %, a free fatty acid content maximum 1.5 % and a cocoa butter content between 45% and 60 %, too much of foreign matters, insects, harmful bacteria and pesticides residues are not allowed. Purple beans, slaty beans and beans with all other defectiveness are grouped; defectiveness among cocoa beans includes flat, moldy and geminated beans (Asare, 2010 & Lockhart, 2010). Cocoa quality control is achievable by following some set of standards throughout the operations. Cocoa quality control starts from making a reasonable decision on the source and types of varieties, choice of seeds or seedlings, land preparation, using of approved pesticide and accurate measurement, method of harvest, pod breaking, proper fermentation, suitable drying method, good storage, suitable and hygienic packaging before, during and after export by the stakeholders in cocoa produce and product (Frederiksberg, 2010). Drying reduces acidity levels in the cocoa beans while raised platform is preferable to prevent contamination of foreign bodies like stones, particles, hen or goat faeces etc. More-so, sustainability contributes to quality control by the use of farming techniques that protect the environment, public health, communities, humans and animal welfare and the production of healthy food (quality-controlled cocoa) without compromising future generations ability to do the same (Akinola, 2015). Good Agricultural Practice (GAP) also contributes to the quality control through the land preparation, pre-planting operation, source of seeds or seedling, pesticide application, harvesting, fermentation, drying, bagging and storing in a way that will help in producing quality-controlled cocoa.

Nigeria suffered a setback in the production of quality cocoa following the market liberalization in 1986 and reduced confidence in the trade, there are continual efforts by the Cocoa Association of Nigeria (CAN) and Cocoa Processors association of Nigeria (CPAN) to raise farmer's awareness on quality parameters on appropriate use of chemicals, proper way of fermentation and drying of beans. Government produce-inspectors, however, pay more attention to revenue capture than to quality grading. Quality issues range from simple cleanliness of the jute bag, preparation by farmers to genetic origins of the beans. Many processors rate flavour (which is a combination of genetic factors influencing

the varieties) as highly important. A study on the effect of farm management practices on cocoa quality carried out in Ondo State concluded that Nigerian cocoa farmers receive low prices for their crops because of poor quality arising from inappropriate farm management practices (Abayomi, 2017). This study therefore sought to assess the quality control among cocoa farmers in Ondo State, Nigeria.

METHODOLOGY

The population for the study comprises cocoa farmers in Idanre Local Government area of Ondo state. Three (3) stage sampling technique was used to select the respondents. The first stage was a purposive selection of three communities; second stage involved a random selection of 5 camps from each of the three communities while the third stage was the selection of 8 farmers from each of the 5 camps from the 3 selected communities. Sample size of 120 respondents was used for this study. Data were collected with the aid of well-structured questionnaire and interview schedule.

The methods employed and the benefits derived by cocoa farmers from quality control were measured on 4-point likert type scale such as Agree (A), Strongly Agree (SA), Disagree (D), Strongly Disagree (SD) while the constraints encountered by the cocoa farmers was placed on 4-point likert type scale; Not a constraint (NC), Very severe (VS), Severe (S), Not severe (NS). Descriptive statistical tools such as frequency counts, percentages and mean were used to describe the objectives, while Pearson Product Moment Correlation (PPMC) was used to test the hypothesis.

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

Table 1 indicates that the farmers were between the ages of 60-69 years with a mean age of 49.3 years. This implies that cocoa farmers were matured and still in their economic active age which would result in positive effect on production while those within 60 years above were engaging or contracting the youths as share-croppers for the business. The gender distribution shows that majority of the respondents where predominantly males accounting to (68.3%) of the respondents while the females only accounted for (31.7%). This indicates that cocoa farming was mostly practiced by male because of the laborious nature and it is more or less becoming part of the tradition that women are only meant to serve as helpers in their husband's farm by not having the freedom to own a cocoa plantation as long as the husband lives. This finding is supported by Donye et al., (2012); Olomola et al., (2012); also said that Male has enough strength and energy for complicated work than women. Of 120 respondents, 71.7% were married and 4.2% were singles, this means that cocoa farming requires a team work which can be properly carried out by the effort of two or more people, that is if the husband is involved in harvesting (plucking) of the pod, the wife and children will be engaged in packing, breaking of pods, fermentation drying and some other operations. The mean household size was 7.46. This implies that the farmers may depend on family labour which could probably serve as an insurance against shortfalls in supply of farm labour. Higher percentage (64.2%) of respondents had formal education while 35.8% had non-formal education. Hence, most of the cocoa farmers attended at least primary school with literacy level that would enable them to understand the intricacies of cocoa business and also predispose them to adopt and use improved farm practices. This finding is in agreement with Oluyole et al. (2009), that a high level of literacy might positively influence the farm business. Secondary

occupation such as trading (43.3%) and farming (37.5%) shows high level of diversification among the cocoa farmers which means that in-case of any eventuality in cocoa cultivation they have other secondary occupation to depend on. Majority (83.4%) of the respondents cultivated between 1 to 7 hectares of farm with an annual income of ₦717,016.00. This implies that cocoa farming is a profitable venture. Preponderance (95%) of cocoa farmers had farming experience of between 1– 20 years. This implies that cocoa production is a sustainable occupation and this is corroborated by Adeoti (2008), who prove that continuous practice of an occupation for a long period presumably makes a person more experienced and more productive in practice. Table 1 further reveals that 97.5% of the respondents belonged to one or two farmers group which signifies that, farmers cannot sell their produce directly to chocolate companies without passing through a union or cooperative society. Respondents' main source of information was extension agents.

Table 1: Distribution of Respondents According to their socio-economic characteristic (N = 120)

Age	Frequency	%	Mean
30-39	27	22.5	
40-49	25	20.8	
50-59	20	16.7	49.32
60-69	37	30.8	
Above 69	11	09.2	
Gender			
Male	82	68.3	
Female	38	31.7	
Marital Status			
Single	05	04.2	
Married	86	71.7	
Widow	21	17.5	
Widower	08	6.7	
Household size			
1-3	14	11.6	
4-6	50	41.7	
7-9	21	17.5	7.46
10-12	14	11.7	
Above 12	21	17.5	
Educational level			
Non formal	43	35.8	
Primary	34	28.3	
Secondary	35	29.2	
Tertiary	08	6.70	
Other occupation			
Trading	52	43.3	
Teaching	05	04.2	
fishing	02	01.7	
Hunting	16	13.3	
Farming	45	37.5	
Farm Size (Ha)			
<1.0	29	24.2	
1.0-2.9	51	42.5	
3.0-4.9	20	16.7	
5.0-6.9	15	12.4	
7.0-8.9	01	0.80	
9.0-10.9	00	0.00	
Above 10.9	04	03.3	
Annual Income (Rs. in Lakh)			
<500,000:00	47	39.2	717,016
500,000-1,000,000:00	49	40.9	
1,000,001-1,500,000:00	16	13.3	
1,500,001-2,000,000:00	03	02.5	
2,000,001-2,500,000:00	01	0.80	
2,500,001-3,000,000:00	01	0.80	
>3,000,000:00	03	02.4	
Membership			
Yes	117	97.5	
No	03	02.5	
Farming Exp (Yr)			
1-20	56	46.7	

21-30	14	11.7	
31-40	27	22.5	
41-50	17	14.2	
Above 50	06	05.0	
Extension Contacts			
Weekly	0.00	0.00	
Fortnightly	15	12.5	
Monthly	105	87.5	
Sources of Information			
Radio	03	02.5	
Print Media	05	04.2	
Extension agent	104	86.7	
Television	08	06.7	
Religion			
Islam	33	27.5	
Christianity	86	71.7	
Traditional	01	08.0	

Various methods employed in quality control by the cocoa farmers

Table 2 shows different methods involved in cocoa production. 49.2% strongly agreed on planting hybrid cocoa seedling or seed while only 3.3% disagreed, this shows that majority of the farmers were aware of the importance of genetics and hybridization in the production of good quality cocoa. 58.3% of the respondents agreed with utilization of integrated pest management and 5.0% disagreed. Meaning that, farmers practicing integrated pest management (IPM) like weeding, pruning, removal of infected pods and parasites from cocoa tree including application of organic practices that protect cocoa trees from pest and diseases. More so, 63.3% of farmers agreed on breaking of pods with club to avert damaging of beans which implies that, farmers were aware that using sharp objects like cutlass and knife can damage the bean by cutting or bruising it. This may equally have negative effects on quality grading of cocoa. On the issue of foreign materials, 61.7% agreed with the removal of foreign materials like placentas, dried pulps, flat and cluster beans from the bean which may results in poor grading. Table also reveals that 49.2% of farmers were in agreement that fermentation takes place while using plantain leaves for 5-6 days and that improper fermentation leads to loss of good aroma and colour which is one of the criteria for grading quality cocoa. Drying on raised platform to prevent foreign materials shows that 62.5% of farmers have not been practicing the innovation; this indicates that farmers in the study area were mainly drying cocoa beans on a bare floor which gives room for animals to defecate on it and also allow some foreign materials like stones and pebbles to mix with the bean. The result shows that 46.7% of the farmers were not storing dry cocoa in jute bags and kept not wooden pallet off the wall to prevent the heat and moisture from getting to it, as the standard moisture content for cocoa in Nigeria should not be more than 7.5% MC.

Table 2: Distribution of farmers according to various methods employed in quality control of cocoa

Methods	Agree		Strongly Agree		Disagree		Strongly Disagree	
	%	F	%	F	%	F	%	F
Planting of hybrid	46.7	5	49.2	5	3.3	4	0.8	1
IPM	58.3	70	36.7	4	5.0	6	0.0	0
Timely harvest	55.8	67	31.7	38	9.2	11	3.3	4

Pod breaking with club	63.3	76	32.5	3	3.3	4	0.8	1
Foreign materials	61.7	74	36.7	44	1.7	2	0.0	0
Fermentation	49.2	59	46.7	56	4.2	5	0.0	0
Drying on raised platform	15	18	6.7	8	62.5	75	15.8	19
Rodent prevention	55.8	67	20	24	24.2	29	0.0	0
Putting on wooden pallet off the wall	15.8	19	7.5	9	46.7	56	30	36

Source: Field survey, 2020

Perceived benefits derived in quality control by the farmers

Table 3 shows that 47.5% of the respondents strongly disagreed with government intervention in the study area. This means that respondents have not been feeling the impact of government on the provision of good road net-work and subsidy. 75.8% of the respondents agreed on availability of market which shows that the issue of who to buy cocoa is not a problem as long as it is of good quality. Regular training of the farmers on good agricultural practices (GAPs) was agreed upon by the majority (80.8%) of the respondents. Larger percentage (70.0%) of the farmers agreed on exposure to mechanization which implies that farmers had migrated from conventional ways of farming to mechanization in order to meet up with higher demand for consumption of good quality cocoa. 53.3% of the farmers disagreed with loan accessibility that is the major problem of farmers in the study area. Price per ton of cocoa in the study area was nothing different from their counterpart in other side of the world as long as the production is standard. Farmers also had access to stable market since licensed buyers are always available without any interference from the middlemen. This is not in tandem with Fadipe et al., 2012, who concluded that, cocoa farmers/producers did not benefit much from the price increase on the world market as the government of Ghana has fixed the prices of the products. Consequently, an increase of the cocoa price on the world market is not likely to stimulate the production. Rather, it discouraged farmers from farm expansion, as they received less from the government, relative to the prevailing prices on the international market.

Table 3 : Distribution of farmers according to perceived benefits derived in quality control of cocoa

Perceived benefits	Agree		Strongly Agree		Disagree		Strongly Disagree	
	%	F	%	F	%	F	%	F
Government intervention	10	12	6.7	8	35.8	43	47.5	57
Provision of pesticide	20.8	25	6.7	8	52.5	63	20.0	24
Availability of market	75.8	91	17.5	21	1.7	2	5.0	6
Regular training	80.8	97	10.8	13	5.0	6	3.3	4
Mechanization exposure	70	84	9.2	11	16.7	20	4.2	5

loan accessibility	14	17	4.2	5	28.3	34	53.3	64
Favourable price	58.3	70	5.0	6	38	31.7	5.0	6
Market stability	63.3	76	21.7	26	11.3	14	3.3	4

Source: Field survey, 2020

The constraints associated with quality control measures among cocoa farmers

Table 4 reveals that poor marketing system, inadequate extension services, low income, inadequate storage facility, poor prices, and lack of share croppers were not constraints in the study area. This has given cocoa farmers a huge opportunity to sustain the business. For instance, marketing system which shows that, there is a system on ground that is regulating the marketing operation, like certification programme for quality control which gives respondents the up-to-date information on the happenings in other communities or states. Although some farmers may lack the knowledge of cocoa marketing due to their absence in several meetings with their agents but their subsequent presence in the same meetings would bridge the gap left behind.

Table 4: Distribution of respondents' according to constraints associated with quality control measures in cocoa production

	Not a Constraint		Very Severe		Severe		Not Severe	
Constraints	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**
Inadequate access to pesticide	22.5	27	47.5	57	24.2	29	5.8	07
Inadequate storage facility	55.0	66	34.2	41	09.2	11	1.7	02
Inaccessibility of viable land	33.3	40	1.70	02	01.7	02	63.3	76
Insufficient credit facility	14.2	17	34.2	41	48.3	58	3.3	04
Poor marketing system	60.0	72	19.2	23	14.2	17	6.7	08
Inadequate extension services	63.3	76	22.5	27	1.7	21	2.5	15
Low income	64.2	77	15.8	19	14.2	17	5.8	07
Poor price	60.0	72	17.5	21	15.0	18	7.5	09
Lack of share-cropper/labourer	58.3	07	07.5	09	3.3	04	30.8	37

Source: Field survey, 2020.

Testing of Hypothesis

Ho_1: There is no significant relationship between socio-economic characteristics of the farmers and perceived benefits of cocoa quality control

Results of PPMC between selected socio-economic characteristics and perceived benefits

Table 5 shows the results of correlation analysis between selected socio-economic characteristics of the farmers and their perceived benefits of cocoa quality control. The results indicated that gender, farmers group and educational level were positively significant with the perceived benefits of cocoa quality control at 5% level

of significance. For the gender, this implies that both male and female farmers participated in the quality control exercise and also had access to benefits accrued from it. Regarding farmers group, it implies that those farmers that belong to cocoa cooperative society were the only one having opportunity to gain more benefits. This implies that, all interventions, subsidy, grants, loans, innovations and selling of produce directly to licensed buyers are done through cooperative society. Farmers' level of education also assisted them to have more benefits, that is, the higher the level of education of the farmers the more the benefits to be accrued from cocoa quality control. This implies that the educated one among the farmers may have more opportunity to attend training, seminar, workshop and certification programme within and without the communities (Baffoe-Asare et al., 2013).

Table 5 : Results of Pearson Product Moment Correlation between Socioeconomic characteristics and Perceived Benefits

Variable Decision	r- value	p-value
Age Not significant	0.304	0.095
Gender Significant	0.728	0.032*
Farmers group Significant	0.527	0.000*
Educational level Significant	0.977	0.003*

*Significant at 5%

CONCLUSION

It can be drawn from the study that the country's cocoa production may be greatly affected due to ageing of experienced cocoa farmers and other related factors. Government needs to recruit more unemployed youths into cocoa rehabilitation programme for training and skill acquisition so that they can succeed the ageing population that presently dominate cocoa business. Lack of government interventions also contribute negatively to the wellbeing of the farmers and quality of cocoa produced. Farmers had access to a raised platform for drying cocoa beans but using instead a bare floor or ground that will allow infiltration of foreign materials into the beans. This requires serious attention of government in the provision of standardized and centralized solar dryers for all cocoa farmers in the study area. Cocoa farmers have exploited all methods and management practices required in the production of quality cocoa beans particularly in pod breaking by using club in order to have smooth and cut-free beans. Moreover, aside from availability of viable land for farming, the study highlighted insufficient credit facility and inputs as major problems that hinder cocoa farmers from meeting up with the quality control requirements. Expectation of farmers from government is very high on the provision of soft loans and credit facility; this will assist them to expand cocoa business with necessary equipment or machinery needed to produce a robust and quality cocoa beans. The study revealed significant relationship in some factors of socioeconomic profile and perceived benefits of quality control which may have positive influence on the attainment of cocoa production and quality control targets in the country.

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RESEARCH ARTICLE

Constraints faced by the farmers for using information and commutation technologies

G. B. Bhosale[1] and R. P. Kadam[2]

Department of Extension Education, College of Agriculture,
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani- 431 402, India.
Corresponding Author's email : govindbhosale@gmail.com

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ABSTRACT

ICT infrastructure has the potential to drastically improve the quality of life and thus it has become an increasingly essential dimension of rural development. ICT in agriculture offers a wide range of solutions to some agricultural problems. The present study explored the constraints faced by the farmers for using ICT and their possible suggestions to overcome these problems. The study was conducted in Marathwada region of Maharashtra state during the year 2020-21. Two districts namely, Parbhani and Hingoli were selected randomly for the study from Marathwada region. The Ex-post-facto research design was used for the study. Responses from the 160 farmers were collected through well-structured interview schedule. It was revealed that constraints such as high cost of ICT gadgets like computers, smart phone etc., low level literacy in rural area, required monthly mobile recharge to access internet facility, lack of uninterrupted power supply in rural area, lack of training and practical exposure towards ICT, poor internet connectivity in rural area, sometimes possibility of misleading information transmitted through internet, lack of sufficient skill to access ICT tools, lack of ICT literacy among farmers, lack of farmer's belief on e-sources, difficulty in understanding the content language of ICT gadgets, and poor maintenance of ICT tools. All these constraints can be overcome by implementing suggestions by farmers like; affordable cost of ICT gadgets like computer, smart phone *etc.*, information centres should be established in the villages, knowledge about ICT should be providing through training and campaigns, educational status of farmers should be improved, strengthen the internet connectivity in rural area, provide uninterrupted power supply in rural area, provide free internet / wifi service in rural area, reduce servicing charges, agriculture related information should be providing in local language, information kiosks should be installed in the village, the use of the technical words should be replaced with local language, appropriate information should be provided.

Key Words: Information and Communication Technology (ICT) tools, constraints and suggestions.

INTRODUCTION

Information and communication technology is an extensional term for information technology (IT) that stresses the role of unified communications and the integration of telecommunication and computers as well as necessary enterprise software, middleware, storage and audio-visual, that enable users to access, store, transmit, understand and manipulate information. It is a broad subject and the concepts are evolving, it covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form (Wikipedia, 2020). The current data shows that with over 560 million internet users, India is the second largest online market in the world, ranked only

behind China. It was estimated that by 2023, there would be over 650 million internet users in the country. However, internet accessibility and use in the country largely varied based on factors like gender and socio-economic divide, it was estimated that in 2019 there were 290 million internet users in rural India compared to 337 million urban internet users. A majority of India's digital population accessed the internet via their mobile phones. In 2018 about 29 percent of countries total population were mobile internet users, an increased availability of cheap data plans along with various government initiatives under the Digital India Campaign worked together to make mobile primary internet access in the country notably 4G networks were the most widely used across urban and rural India in 2019 (Keelery, 2020).

The significance of ICT is that it is a type of technology that enables functions such as access to knowledge, intelligence, and connectivity, both of which are essential in today's economic and social interactions. ICT, particularly the Internet, has a significant impact on all human activities that rely on knowledge, including rural development and other fields. Cost-effective, strong, autonomous, and in the hands of civil society, capable of producing and exchanging knowledge. Farmers have the least expertise and access to information, making it difficult for them to function effectively in a diverse global world. The existing Technology transition processes and key extension projects currently in place are either sluggish or unsuccessful in bridging the gap between researchers and farmers. Besides that, agricultural transformation would necessitate making a developed method more competitive and successful by incorporating cutting-edge technologies. Consequently, consumer force trends affecting agriculture are projected to become more important in the future. As a result, focus your efforts on overcoming concerns about the digital divide.

MATERIALS AND METHODS

The present study was conducted in Marathwada region of Maharashtra state during the year 2020-21. Two districts namely, Parbhani and Hingoli were selected randomly from Marathwada region. Two talukas from each selected district and four villages from each talukas were selected randomly for the study. From each selected village, ten farmers those having mobile phones with internet facilities and engaged in agricultural operations were selected randomly, in this way total 160 respondents were considered for the study.constraints perceived by the farmers while using ICT tools in agriculture and their suggestions to overcome the constraints were studied. The constraint in the present study was operationalized as any condition or factor, which might hinder or restrict the use of it. The data were collected by using a well-structured interview schedule technique. The collected data was analyzed, classified and tabulated by using statistical tools such as frequency, percentage and rank.

RESULTS AND DISCUSSION

Table 1: characteristics of farmers

Sr. No.	Characteristics	Farmers (n = 160)	
		Frequency	Percentage
1	**Age**		
	Young (Up to 28 years)	35	21.87

Sr. No.	Characteristics	Farmers (n = 160)	
		Frequency	Percentage
	Middle (29 to 49 years)	89	55.63
	Old (50 years & above)	36	22.50
2	**Education**		
	Illiterate	2	1.25
	can read & write only	4	2.50
	Primary school level	30	18.75
	Middle school level	71	44.38
	High school level	30	18.75
	Graduate	23	14.37
3	**Land holding**		
	Marginal (up to 1.00 ha)	44	27.50
	Small (01 to 2.00 ha)	67	41.87
	Semi medium (2.01 to 4.00 ha)	41	25.63
	Medium (4.01 to 10.00 ha)	6	3.75
	Large (above 10.00 ha)	2	1.25
4	**Family size**		
	Small (up to 4 members)	49	30.63
	Medium (5 to 8 members)	96	60
	Large (above 8 members)	15	9.37
5	**Annual income**		
	Low (Up to Rs. 41232)	3	1.87
	Medium (Rs. 41233 to Rs. 319268)	140	87.50
	High (above Rs. 319268)	17	10.63
6	**Farming Experience**		
	Low (up to 7 years)	29	18.12
	Medium (8 to 29 years)	97	60.63
	High (above 29 years)	34	21.25
7	**Innovativeness**		
	Low (up to 8)	49	30.62
	Medium (9 to 10)	58	36.25
	High (above 11)	53	33.13
8	**Social participation**		
	Low (up to 4)	28	17.50
	Medium (5 to 6)	82	51.25
	High (7 & above)	50	31.25

Sr. No.	Characteristics	Farmers (n = 160)	
		Frequency	Percentage
9	**Mass media exposure**		
	Low (up to 3)	31	19.37
	Medium (4 to 5)	81	50.63
	High (6 & above)	48	30
10	**Scientific orientation**		
	Low (up to 17)	34	21.25
	Medium (18 to 23)	89	55.62
	High (24 & above)	37	23.13
11	**Extension contact**		
	Low (up to 34)	35	21.87
	Medium (35 to 40)	87	54.38
	High (41 & above)	38	23.75

Table 1 indicated that the characteristics of farmers, majority of the farmers were medium aged (55.63%), educated up to middle school level (44.38%), small land holder (41.87%), medium size family (60%), medium level of annual income i.e. Rs. 41,233 to Rs. 3,19,268 (87.5%), medium farming experience (60.63%), medium level of innovativeness (36.25%), medium level of social participation (51.25%), medium level of mass media exposure (50.63%), medium level of scientific orientation (55.62%), medium level extension contact (54.38%).

1. Constraints faced by the farmers for using ICT

An attempt was made to find out the constraints discerned by the farmers while using ICT tools and presented under table 2. Ranks were given on the basis of frequency and percentage.

Table 2 : Constraints faced by the farmers for using ICT (n- 160)

Sr.No	Constraints	F	%	Rank
1.	High cost of ICT gadgets like computers, Smartphone etc.	136	85.00	**I**
2.	Lack of uninterrupted power supply in rural area.	101	63.12	**IV**
3.	Poor internet connectivity in rural area.	99	61.87	**VI**
4.	Difficulty in understanding the content language of ICT gadgets.	63	39.37	**XI**
5.	Lack of sufficient skill to access ICT tools.	88	55.00	**VIII**
6.	Low level literacy in rural area.	117	73.12	**II**
7.	Poor maintenance of ICT tools.	53	33.12	**XII**
8.	Lack of training and practical exposure towards ICT.	100	62.50	**V**
9.	Required monthly mobile recharge to access internet facility.	106	66.25	**III**
10.	Lack of ICT literacy among farmers.	78	48.75	**IX**
11.	Sometimes possibility of misleading information transmitted through internet.	96	60.00	**VII**
12.	Lack of farmer's belief on e-sources.	73	45.62	**X**

Table 2 indicated that, among the constraints faced by farmers while utilizing ICTs, were high cost of ICT gadgets like computers, Smartphone etc. (85%), low level literacy in rural area (73.12%), required monthly mobile recharge to access internet facility (66.25%), lack of uninterrupted power supply in rural area (63.12%), lack of training and practical exposure towards ICT (62.50%), poor internet connectivity in rural area (61.87%), sometimes possibility of misleading information transmitted through internet (60%), lack of sufficient skill to access ICT tools (55%), lack of ICT literacy among farmers (48.75%), lack of farmer's belief on e-sources (45.62%), difficulty in understanding the content language of ICT gadgets (39.37%), and poor maintenance of ICT tools (33.12%). The result was in line with the earlier findings of Kabir (2015) and Kumar *et al.* (2017).

2. Suggestions of farmers to overcome the constraints

On the basis of constraints, the suggestions were obtaining from the farmers to overcome them and they were presented in table 3. Suggestions were ranked according to their frequency and percentage.

Table 3: Suggestions given by the farmers to overcome the constraints (n=160)

Sr. No.	Suggestions	F	%	Rank
1.	Provide uninterrupted power supply in rural area.	100	62.50	**VI**
2.	Affordable cost of ICT gadgets like Computer, Smartphone *etc.*	135	84.37	**I**
3.	Strengthen the internet connectivity in rural area.	102	63.75	**V**
4.	Provide free internet / wifi service in rural area.	86	53.75	**VII**
5.	Knowledge about ICT should be providing through training and campaigns.	120	75	**III**
6.	The use of the technical words should be replaced with local language.	60	37.50	**XI**
7.	Reduce servicing charges	33	47.50	**VIII**
8.	Information center's should be established in the villages.	126	78.75	**II**
9.	Agriculture related information should be providing in local language.	32	46.25	**IX**
10.	Educational status of farmers should be improved.	119	74.37	**IV**
11.	Appropriate information should be provided.	54	33.75	**XII**
12.	Information kiosks should be installed in the village.	45	39.37	**X**

A thorough review of table 3 indicated that, suggestions were made by the farmers to overcome the constraints such as affordable cost of ICT gadgets like Computer, Smartphone *etc*. (84.37%), information centres should be established in the villages (78.75%), Knowledge about ICT should be providing through training and campaigns (75%), Educational status of farmers should be improved (74.37%), Strengthen the internet connectivity in rural area (63.75%), Provide uninterrupted power supply in rural area (62.5%), Provide free internet / wifi service in rural area (53.75%),

Reduce servicing charges (47.50%), Agriculture related information should be providing in local language (46.25%), Information kiosks should be installed in the village (39.37%), the use of the technical words should be replaced with local language (37.50%), Appropriate information should be provided (33.75%). The result was in line with the findings of Sobalaje & Adigum (2013) and Tiwari *et al*. (2014).

CONCLUSION

Every innovation in the globe is like two sides of the same coin; it has advantages as well as disadvantages. Without a doubt, information and communication technology is a scientific gift. Along with all of the advantages, there are certain drawbacks that the user must deal with on a frequent basis. To overcome the such daily problems majority of the farmers suggested that affordable cost of ICT gadgets like computer, smartphone *etc*., information centres should be established in the villages, knowledge about ICT should be providing through training and campaigns, educational status of farmers should be improved, strengthen the internet connectivity in rural area, provide uninterrupted power supply in rural area, provide free internet / wifi service in rural area, reduce servicing charges, agriculture related information should be providing in local language, information kiosks should be installed in the village, the use of the technical words should be replaced with local language, appropriate information should be provided.

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RESEARCH ARTICLE

Ecological farmers' constraints in accomplishing food security in Nagaland

Lovely Narzary[1] and P. R. Deshmukh[2]

1. PG Student, 2. Associate Professor, Department of Extension Education, Golegaon

Corresponding author's email : lovelynarzary6@gmail.com

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ABSTRACT

Present research study was carried out in Nagaland to determine the challenges that ecological farmers confront in ensuring food security. Phek and Wokha districts were selected randomly. Pfutsero and Wokha Sadar blocks were chosen and four villages were selected randomly from each of the blocks. Total 120 respondents were selected and data were collected through interview schedule. climate change and variability as well as low crop yields were found to be major agro-economic constraints. Weak services in research, extension and finance due to infrastructural constraint. In case of health and physical constraint rapid population growth and high food prices. Political issues were also found to have substantial impact on food security of the farmers. A vast majority of the farmers suggested that training need on post harvest process and food preservation, followed by information about nutrition education should be provided, road connectivity should be improved in order to enhance food security.

Key words : Food security, Constraints, Ecological farmers, Availability.

INTRODUCTION

Food insecurity is caused by inadequate food consumption to meet dietary energy demands on a regular basis. The Covid-19 outbreak has intensified food insecurity, which is a major socio-economic and global health issue. According the Food and Agriculture Organization "The State of Food Security and Nutrition in the world, 2020 report, approximately 14 percent of India's population is malnourished" (India Food Banking Network).

Nagaland's topography and aboriginal farming practices, agriculture sector employs over 73 per cent of the population, with the significant proportion engaged in Jhum cultivation (Kuotsuo, 2014). Hidden hunger exists in Nagaland, particularly among the lower-income farm families. Due to growing agricultural losses, poverty, unemployment, climate variability, high food costs and other challenges, food security is eroding.

Food Security exist when "all people have access to adequate, affordable and nutritious food to maintain healthy and active life at all times" (World Food Summit, 1996). It includes four aspects such as Food availability, Food access, Food utilization and Food stability. When any of this four aspects is disrupted, food insecurity could occur (Agbigbe, 2020). The National Food Security Act (NFSA), 2013 implemented on July 1, 2016, seeks to provide food and nutritional security to targeted beneficiaries at an affordable cost. The priority households under the act will receive five kilograms of food grains at a cost of Rs 3 per kilogram and wheat at a cost of Rs 2 per kilogram.

The present study attempts to analyze the constraints perceived by the ecological farmers' in achieving food security of the households along with suggestions.

METHODOLOGY

The present study was carried out in Nagaland state of the North-Eastern region of India. Nagaland's climate is primarily monsoon-influenced, with high humidity levels. A total of 120 farmers were selected for the present study by using random sampling method. The study was conducted in Phek and Wokha districts of Nagaland and from each of the districts, Pfutsero and Wokha Sadar blocks were selected, respectively. Further four villages namely Pfutseromi, Zapami, Lekromi and Lasumi under Pfutsero block and Wokha village, Longsa, Longsachung and Niroyo under Wokha Sadar were selected randomly from each of the block. Fifteen farmers were selected randomly from each of the villages. Ex-post facto research was used for the study. The data were collected through a pre- tested interview schedule and were tabulated and analyzed using appropriate statistical tools such as frequency and percentage.

RESULTS AND DISCUSSION

Table 1: Constraints of farmers in achieving food security

A. Agro-economic Constraints

Sr. No.	Items	Respondents (N=120)		
		Frequency	Percentage (%)	Rank
1	Climate change and variability	117	97.50	I
2	Limited access to land	87	72.50	III
3	Low crop yields	108	90.00	II
4	Crop/Livestock loss/Failure	63	52.50	IV
5	Shortage of farm labour	22	18.33	VII
6	Market price fluctuation	30	25.00	VI
7	Increase in input prices	52	43.33	V

B. Infrastructural Constraints

Sr. No.	Items	Respondents (N=120)		
		Frequency	Percentage (%)	Rank
1.	Inadequacy and lack of access to improved agricultural inputs (seeds, fertilizer, agro-chemicals and irrigation)	79	65.83	II
2	Lack of labour saving devices	74	61.67	III
3	Poor post-harvest processing and storage technologies	59	49.17	IV
4	Weak support services (research, extension and finance)	86	71.67	I
5	Poor rural infrastructure (roads)	16	13.33	V

C. Political Constraints

Sr. No.	Items	Respondents (N=120)		
		Frequency	Percentage (%)	Rank
1	Political problems (corruption, collusion and nepotism)	96	80.00	I
2	Religious and ethnic conflicts	30	25.00	II

D. Health Constraints

Sr. No.	Items	Respondents (N=120)		
		Frequency	Percentage (%)	Rank
1	Poor health services	14	11.67	V
2	Lack of access to clean water	24	20.00	IV
3	Poor sanitation	27	22.50	III
4	Rapid population growth	79	65.83	I
5	Poor health status	34	28.33	II
6	Chronic diseases such as HIV/AIDS	06	5.00	VI

E. Personal/Physical Constraint

Sr. No.	Items	Respondents (N=120)		
		Frequency	Percentage (%)	Rank
1	Lack of access to market	21	17.50	VI
2	Lack of education and skill	72	60.00	IV
3	Lack of nutrition education	89	74.17	II
4	Food taboos	4	3.33	VII
5	Poor food habits	38	31.67	V
6	High food prices	99	82.50	I
7	Lack of consistent food supply	83	69.17	III

A. Agro-economic constraints

It is observed from Table 1 that the significant constraint (97.50 per cent) reported by the farmers was climate change and variability followed by low crop yields (90 per cent), limited access to land (72.50 per cent), Crop/livestock loss/failure (52.50 per cent), increase in input prices (43.33 per cent), market price fluctuation (25 per cent) and shortage of farm labor (18.33 per cent).

B. Infrastructural constraint

Table 1 shows that the infrastructural constraint weak support services in research, extension, and finance was (71.67 per cent) followed by inadequacy and lack of access to improved agricultural inputs such as seeds, fertilizer, agrochemicals, and irrigation (65.83 per cent), lack of labor-saving devices (61.67 per cent), inadequate post-harvest processing and storage technologies (49.17

per cent) and poor rural infrastructure (13.33 per cent).

C. Political constraints

The political constraints result presented in table 1 reported that the majority (80 per cent) of the farmers faced political problems (corruption, collusion, and nepotism), followed by religious and ethnic conflicts (25.00 per cent).

D. Health constraints

It is observed from the table 1 that the major health constraints rapid population growth (65.83 per cent), poor health status (28.33 per cent), poor sanitation (22.50 per cent), lack of access to clean water (20 per cent), poor health services (11.67 per cent) and chronic diseases such as HIV/AIDS (5 per cent).

E. Personal/Physical constraints

Table 1 shows that high food prices (82.50 per cent) were the major personal constraint followed by lack of nutrition education (74.17 per cent), lack of consistent food supply (69.17 per cent), lack of education and skill (60 per cent), poor food habits (31.67 per cent), lack of access to market (17.50 per cent), and food taboos (3.33 per cent).

The findings of agro-economic, infrastructural, political, health and physical constraints are in line with kalai (2019).

Suggestions given by the farmers in order to overcome constraints in achieving food security

The suggestions provided by the ecological farmers of the study area in order to overcome the constraints to achieve food security were presented in the table 2.

Table 2: Suggestions given by the farmers in order to overcome constraints in achieving food security

Sr. No.	Suggestions	Frequency	Percentage (%)
1	Training on post-harvest process and farm produce preservation	95	79.17
2	Better road connectivity for marketing of produce	45	37.50
3	High return crop knowledge	35	29.17
4	Information about nutrition education should be provided	81	67.50
5	Better income generating farming practices should be adopted	57	47.50
6	Awareness on governmental schemes	42	35.00

Majority (79.17 per cent) of the farmers suggested training need on post harvest process and food preservation, followed by (67.50 per cent) information about nutrition education should be provided, better income generating farming practices (47.50 per cent), better road connectivity for marketing of products (37.50 per cent), awareness on governmental schemes (35 per cent) and high return crop knowledge (29.17 per cent).

CONCLUSION

Majority of the ecological farmers had constraints under agro-economic conditions were climate change and variability. The infrastructural constraint observed was weak support services in research, extension, and finance. Under political constraints, corruption, collusion and nepotism, health constraint included rapid population growth and high food prices in the case of personal or physical constraints.

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RESEARCH ARTICLE

Practices wise extent of adoption of water shed technology of desert development programme in Jodhpur Region of Rajasthan

H. R. Pannu[1], J. P. Yadav[2], and S. Bijarniya[3]

1. Ph.D (Scholar), Department of Extension Education, 2. Professor, Department of Extension Education, 3. Senior Research Fellow, Department of Extension Education, S.K.N. College of Agriculture, Jobner-Jaipur (Rajasthan)-303329

Corresponding Author's email : pannuhr_koyal@rediffmail.com

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ABSTRACT

Watershed management of Desert Development Programme is a scientific approach and now has becomes medium of central and state government for planning of rural development scheme and their execution which includes conservation, development and optimum utilization of natural resources like soil, water, vegetation *etc.*

The study was conducted in Jodhpur and Barmer districts of Jodhpur region. Fifteen watershed area were randomly selected from Jodhpur and twelve from Barmer district. The study find out that the practices of green manuring adopted by the beneficiary farmers was occupied the highest position in soil and water conservation technology, chemical weed control in wheat crop adopted by the beneficiary farmers occupied the highest in production technology and practice like collection of gum for extra earning adopted by the most of the beneficiary farmers and was occupied the highest position in animal husbandry and house hold production system of watershed technology of Desert Development Programme, respectively.

MeTHODOLOGY

The Jodhpur district is administratively divided into ten panchayat amities, out of which five panchayat samities namely Balesar, Shergarh, Osion, Phalodi and Bap were selected randomly. Barmer district comprises eight panchayat samities, out of which four panchayat samities namely Barmer, Baitu, Sheo, and Balotra were selected randomly as per availability of watersheds under Desert Development Programme. Total twenty seven watersheds from nine panchayat samities of both Jodhpur and Barmer district were selected and 100 beneficiary farmers from selected five panchayat samities of district Jodhpur and 80 beneficiary farmers from selected four panchayatsamities of district Barmer were selected randomly. The equal number of non-beneficiary farmers were also selected from nearby non watershed areas who were having similar socio-economic status.

ReSULTS aND DiSCUSSION

To explore the practices wise extent of adoption of watershed technology of Desert Development Programme, total fifty eight practices of watershed technology of Desert Development Programme *i.e.* twenty one practices related to soil and water conservation technology, twenty two practices related to production technology and fifteen practices were related to Animal husbandry and house hold production system were considered which scrutinized by the expert. The practices wise scores (as standard mean scores) were assigned to each adopted practice making a total of 130. On the basis of

the practice wise scores obtained by the respondents by adopting particular practice, the mean scores were worked out for all the practices of soil and water conservation and production technology and animal husbandry and house hold production system.

The mean scores were further converted into percentage for all the 58 practices. The ranks were assigned to each soil and water conservation technology adopted by beneficiary and non- beneficiary.

The ranks were also assigned to each practice of production technology and animal husbandry and house hold production system adopted by beneficiary farmers and non-beneficiary farmers. The over all mean score percentages obtained by beneficiary and non-beneficiary farmers were 51.68 and 46.74, respectively. The mean percentage were considered for distinguishing more or less adopted practices.

Table 1.1 Practice wise extent of adoption of soil and water conservation technology of Desert Development Programme by the beneficiary and non beneficiary farmers

Sr. No.	Name of technology	MPS	Category of respondents					
			BFs (N=180)			NBFs (N=180)		
			MS	Percent	Rank	MS	Percent	Rank
1	Adoption of other practices of Desert Development Programme	1	0.92	92.20	II	0.917	91.70	I
2	Increase the income by watershed technology	1	0.605	60.50	XIII	0.528	52.80	XIII
3	Models of Desert Development Programme	1	0.6778	67.80	XII	0.67	67.80	VIII
4	Use of soil conservation practices	1	0.827	82.80	VII	0.700	70.00	VII
5	Soil erosion control measures	1	0.74	74.40	X	0.533	53.30	XII
6	Adoption of gully control measures	1	0.48	48.80	XV	0.611	61.10	X
7	Activities used for non arable land	4	0.2833	28.30	XVIV	0.294	29.40	XVI
8	Use of contour farming practices	1	0.5944	59.40	XIV	0.628	62.80	IX
9	Use of contour vegetative hedges	1	0.4778	47.8	XVI	0.606	60.60	XI
10	Use of various practices of water conservation practices	7	0.196	19.60	XXI	0.201	20.15	XVIII
11	Use of cheek dam in the area	1	0.866	86.60	V	0.839	83.90	II
12	Use of gypsum in the crops	3	0.266	26.60	XX	0.211	21.11	XVII
13	Tillage practices	4	0.395	39.50	XVIII	0.340	34.00	XIV
14	Green manuring	1	0.944	94.44	I	0.839	83.90	II
15	Practice of afforestation	1	0.755	75.50	VIII	0.700	70.00	VII
16	Pasture development	1	0.744	74.40	IX	0.750	75.00	VI
17	Use of organic matter	1	0.738	73.8	XI	0.756	75.60	V

18	Plantation used for boundary	1	0.833	83.33	VI	0.769	76.70	IV
19	Adoption of traditional water	1	0.872	87.2	IV	0.783	78.30	III
20	Raised vegetative barriers	1	0.900	90.0	III	0.756	75.60	V
21	Use of FYM in field	2	0.413	41.3	XVII	0.325	32.50	XV

MPS = Maximum possible score, BFs = Beneficiary farmers, NBs = Non-beneficiary farmers, MS = Mean score

It is evident from the results given in Table 1.1 indicate that out of twenty one practices of soil and water conservation technology of Desert Development Programme the adoption of green manuring by the beneficiary farmers was occupied the highest position (94.44 per cent), hence it was ranked first. The second and third ranks were occupied by adoption of other practices of Desert Development Programme (92.20 per cent) and raised vegetative barriers (90.00 per cent), respectively. Similarly, adoption of traditional water harvesting practices (87.20 per cent), use of check dam in the area (86.60 per cent), plantation used for boundary (83.33 per cent), use of soil conservation practices (82.80 per cent), practices of afforestation (75.50 per cent), pasture development (74.40 per cent), soil erosion control measures (74.40 per cent), use of organic matter (73.80 per cent), adoption of models of Desert Development Programme (67.80 per cent), increase the income by watershed technology (60.50 per cent), adoption of contour farming practices (59.40 per cent), adoption of gully control (48.80 per cent), use of contour vegetative hedges (47.80 per cent), use of FYM in field (41.30 per cent), tillage practices (39.50 per cent), activities used for non- arable land (28.30 per cent), use of gypsum in the crops (26.60 per cent) were occupied the fourth, fifth, sixth, seventh, eighth, ninth, tenth, eleventh, twelfth, thirteenth, fourteenth, fifteenth, sixteen, seventeenth, eighteenth, nineteenth and twenty ranks, respectively. The last twenty first rank was given to the least adopted practice *i.e.* use of various practices of the water conservation (19.60 per cent).

It could be concluded from the findings that majority of beneficiary farmers had adopted green farming followed by adoption of other practices of Desert Development Programme, raised vegetative barrier, adoption of traditional water harvesting practices, use of check dam in the area.

It may also be concluded from the findings that the lowest adoption was observed about the use of the water conservation practices. Incase of non-beneficiary farmers, almost similar trend was observed except for the few practices *i.e.* use of organic matter (75.60 per cent), adoption of models of Desert Development Programme (67.80 per cent), adoption of contour farming practices (62.80 per cent), adoption of gully control (61.10 per cent) and use of contour vegetative hedge (60.60 per cent) which showed slight variation than beneficiary farmers.

The data given in table 1.2 reveal that the chemical weed control in wheat crop adopted by the beneficiary farmers occupied the highest (89.40 per cent) position among all twenty two practices of production technology, hence, it was ranked first. The second rank was assigned to use of HYV of crop (76.10%). Third fourth, fifth, sixth, seventh, eight, nine, tenth, eleventh, twelfth, thirteenth, fourteenth, fifteenth, sixteenth, seventeenth, eighteenth, nineteenth, twenty and twenty one ranked were assigned to the practices i.e. of plantation of agro forestry plants (75.00 per cent), use of fertilizers in

dry land conditions (72.20 per cent), use of safe grain storage measures (70.50 per cent), plantation of horticultural plants (65.50 per cent), adoption of kitchen gardening (62.70 per

Table 1.2 Practice wise extent of adoption of production technology of Desert Development Programme by the beneficiary and non-beneficiary farmers

Sr. No.	Name of technology	MPS	Category of respondents					
			BFs (N=180)			NBFs (N=180)		
			MS	Percent	Rank	MS	Percent	Rank
1	Use of drip irrigation	1	0.622	62.20	VIII	0.394	39.40	X
2	Use of recommended varieties of wheat	1	0.583	58.30	XI	0.461	46.10	VII
3	Use of fertilizers is dry land conditions	1	0.722	72.20	IV	0.594	59.40	IV
4	Termite control	4	0.225	22.50	XX	I0.20	520.50	XX
5	Use of FIR technique for seed treatment	3	0.233	23.30	XX	0.27	27.00	XVIII
6	Growing of fodder crops	5	0.266	26.60	XVIII	0.276	27.60	XV
7	Chemical weed control in wheat crop	1	0.894	89.40	I	0.544	54.40	V
8	Use of short duration crops	7	0.346	34.60	XIV	0.353	35.30	XII
9	Adoption of inter cropping pattern	1	0.588	58.80	X	0.506	50.60	VI
10	Control of disease in *kharif* pulses	1	0.66	0.00	IX	0.66	0.00	III
11	Use of safe grain storage measures	1	0.705	70.50	V	0.428	42.80	VIII
12	Rate control measures	4	0.291	29.10	XVI	0.251	25.10	XIX
13	Plantation of agro-forestry plants	1	0.75	75.00	III	0.617	61.70	II
14	Plantation of fruit plant in the area	4	0.315	31.50	XV	0.28	28.00	XVI
15	Use of HYV of crop	1	0.761	76.10	II	0.272	27.20	XVII
16	Use of recommended seed rate	4	0.487	48.70	XII	0.408	40.80	IX
17	Growing of cover crops	4	0.161	16.10	XXII	0.159	15.90	XXII
18	Plantation of horticultural crops	1	0.655	65.50	VI	0.656	65.60	I
19	Adoption of kitchen gardening	1	0.627	62.70	VII	0.383	38.30	XI
20	Use of weedicide in the field crops	4	0.256	25.60	XIX	0.181	18.10	XXI
21	Control of pearlmillet disease	3	0.359	35.90	XIII	0.298	29.80	XIII
22	Control of mungbean diseases	3	0.29	29.00	XVII	0.285	28.50	XIV

MPS=Maximum possible score, BFs=Beneficiary farmers, NBs=Non-beneficiary farmers, MS = Mean score

cent), use of drip irrigation (62.20 per cent), control of disease in kharif pulses (60.00 per cent), adoption of inter cropping pattern (58.80 per cent), use of recommended variety of wheat (58.30 per cent), use of recommended seed rate (48.70 per cent), control of pearl millet diseases (35.90 per cent), use of short duration crops (34.60 per cent), plantation of fruit plants in the area (31.50 per cent), rate control measures (29.10 per cent), control of mungbean diseases (29.00 per cent), growing of fodder crop (26.60 per cent), use of weedicide in the field crop (25.60 per cent) use of FIR technique for seed treatment (23.30 per cent) and termite control (22.50 per cent), respectively. The last twenty second rank was awarded to the practice growing of cover crops (16.10 per cent).

It could be concluded from the findings that majority of the beneficiary farmers were using chemical weed control in wheat crop, followed by use of HYV of crop, plantation of agro- forestry plants, use of fertilizers in dry land conditions, use of safe grain storage measures, plantation of horticultural crops and adoption of kitchen gardening. High adoption of chemical weed control in wheat crop used by the beneficiary farmers might be due to the fact that they might have knowledge about the problems or losses caused by heavy infestation of weeds in wheat crop and also well awared about importance and production enhancement of the wheat crop in weeds free condition. It may also be concluded from the finding that lowest adoption was found about growing of cover crops. This might have occurred due to low rainfall and scarcity of the ground water for the irrigation which might have encouraged the beneficiary farmers to grow the cover crop in the area. Similar trends with regards to adoption of watershed technology by non- beneficiary farmers were also observed except for the use of HYV of crop (27.20 per cent), control of disease of kharif pulses (60.00 per cent), plantation of horticultural crops (65.60 per cent) and adoption of inter cropping pattern (50.60 per cent) which showed a slight variation than the beneficiary farmers.

It is evident from the data given in Table 1.3 indicate that out of fifteen practices of animal husbandry and house hold production technology. The practice like collection of gum for extra earning adopted by the most of the beneficiary farmers and was occupied the highest position (93.30 per cent), hence it was ranked first. The second and third ranks occupied by the practices of control of important diseases of animals (86.60 per cent) and use of crops for hay making (84.40 per cent), respectively. Similarly, rope making for self employment and income generation (75.50 per cent), preparation of swal for sheep wool (65.00 per cent), benefits derived by yojna (61.60 per cent), adoption of castration method for animals (51.10 per cent), adoption of house hold production system (42.30 per cent), used of improved breeds of goat (33.70 per cent), pasture development through grasses (32.00 per cent), use of improved breeds of sheep (29.10 per cent), adoption of poultry farming practices (20.50 per cent), use of artificial insemination techniques (18.40 per cent) and adoption of live stock development activities (13.30 per cent) were occupied the fourth, fifth, sixth, seventh, eighth, nineth, tenth, eleventh, twelved, thirteenth and fourteenth ranks, respectively. The last fifteenth rank was awarded to the practices i.e. castration of scrub bulls (11.80 per cent).

Table 1.3 : Practice wise extent of adoption of animal husbandry and house hold production technology of watershed technology of Desert Development Programme by the beneficiary and non beneficiary farmers

Sr. No.	Name of technology	MPS	Category of respondents					
			BFs (N=180)			NBFs (N=180)		
			MS	Percent	Rank	MS	Percent	Rank
1	Benefits derived by yojna	1	0.616	61.60	VI	0.622	62.20	IV
2	Adoption of castration method for animals	1	0.511	51.10	VII	0.561	56.10	V
3	Adoption of Live stock development activities	3	0.133	13.30	XIV	0.157	15.70	XIII
4	Castration of scrub bulls	4	0.118	11.80	XV	0.131	13.10	XIV
5	Use of artifical insemination technology	4	0.184	18.40	XIII	0.166	16.60	XII
6	Control of important diseases of animals	1	0.866	86.60	II	0.811	81.10	I
7	Use of improved breeds of sheep	4	0.291	29.10	XI	0.226	22.60	XI
8	Use of improved breed of Goat	4	0.337	33.70	IX	0.265	26.50	IX
9	Use of crops for hay making crop	1	0.844	84.40	III	0.728	72.80	II
10	Pasture development through grasses	4	0.320	32.00	X	0.290	29.00	VIII
11	Adoption of poultry farming practices	4	0.205	20.50	XII	0.234	23.40	X
12	Adoption of house hold production system	4	0.423	42.30	VIII	0.461	46.10	VII
13	Collect the gum for extra earning	1	0.933	93.30	I	0.811	81.10	I
14	Rop making for self employment and income generation	1	0.755	75.50	IV	0.661	66.10	III
15	Preparation swal from sheep wool	1	0.650	65.00	V	0.528	52.80	VI

MPS=Maximum possible score, BFs=Beneficiary farmers, NBs=Non-beneficiary farmers, MS = Mean score

It could be concluded that majority of beneficiary farmers had adopted the practices *i.e.* collection of gum for extra earning followed by control of important diseases of animals use of crops for hay making and rope making for self employment and income generation.

High adoption of the practices i.e. collection of gum for extra earning might be due to the fact that extra cost might have not incurred in collection of gum which increased their income without any expenses. It may also be concluded that the lowest adoption was of castration of scrub bulls was observed. This might have occurred due to the fact that most of the farmers were illiterate having conservative mind and unawared about techniques/ method of

castration and benefits of castration of scrub bulls.

In case of non beneficiary farmers the similar trends was also found in adoption of animal husbandry and house hold production system except for the few practice *i.e.* benefits derived by yojna (62.20 per cent), adoption of castration method for animals (56.10 per cent), pasture development through grasses (29.00 per cent) and adoption of poultry farming practices (23.40 per cent) which have shown slight variation than beneficiary farmers.

It could be concluded that in general beneficiary farmers and non- beneficiary farmers had given almost similar priorities in their ranks of adoption of watershed technology of Desert Development Programme. However, as shown in table 5.5, 5.6 and 5.7, they differed appreciably in their aggregate extent of adoption. Although, it needs to raise the adoption of all the practices of watershed technology of Desert Development Programme specially for the practices like adoption of various practices of water conservation, use of gypsum in the crops, activities used for non arable land, tillage practices, use of FYM in the field, growing of cover crops, termite control, use of FIR technique for seed treatment, use of weedicide in the field crop, growing of fodder crops, castration of scrub bulls, adoption of livestock development activities, use of artificial insemination technique, adoption of poultry farming practices and use of improved breeds of sheep as they secured lower ranks. Because these practices are complicated in nature hence needed special knowledge and skills which the respondents might be lacking.

CoNCLUSION

Among soil and water conservation technology of Desert Development Programme, the adoption of green manuring and adoption of other practices of Desert Development Programme by the beneficiary farmers was occupied the first rank, among production technology, chemical weed control in wheat crop practice was adopted by the 90 per cent beneficiary farmers and ranked first and animal husbandry and house hold production system,the practices adopted by the beneficiary farmers was collection of gum for extra earning adopted by the most of the beneficiary farmers and occupied the highest position. It was summarized from the finding that beneficiary and non-beneficiary farmers had almost similar priorities in their ranks of adoption of watershed technology of Desert Development Programme, although they differed appreciably in their aggregate extent of adoption.

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RESEARCH ARTICLE

Performance of improved rice technologies: experiences from frontline demonstrations program

S. Arun Kumar[1], Shaik N.Meera[2], Amtul Waris[3] and P Muthuraman[4]

ICAR-Indian Institute of Rice Research (ICAR-IIRR), Hyderabad-500 030.

Corresponding author's email : arunswarnaraj@gmail.com

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ABSTRACT

Frontline demonstrations (FLDs) are considered to be the most effective and useful extension activity to demonstrate the latest technologies developed at research stations to the ultimate clientele namely farmers, in their own fields. Frontline Demonstrations have tremendous impact on the diffusion and adoption of improved technologies. FLD program on Rice is an approved component of the National Food Security Mission to augment production of food grains in the country and these FLDs are conducted by the ICAR/SAUs/NGO systems. In the year 2019-20, a cafeteria of new and improved varieties, hybrids and various other management technologies were demonstrated in 20 States. The present paper documents and analyses the performance of this cafeteria of improved rice technologies that were demonstrated in the 20 states covering various ecosystems. Out of 852 FLDs reported, about 67.7% were conducted in irrigated rice ecosystem; whereas about 12.56% of FLDs were conducted in rainfed uplands. More than 9% of FLDs were organized in shallow lowlands and 7.98% in hill ecologies. The mean yield advantage was the highest in semi deep ecologies (42.46%) followed by Problem Soils/Coastal Saline (30.81%), hills (30.65%). Finally, 50 promising technologies are identified and enlisted for the benefit of the extension professionals to design and implement a viable extension plan with a target of improving the livelihoods of the rice farmers.

Key words: Rice, Frontline Demonstrations, Technological performance, Promising rice technologies

INTRODUCTION

Technology targeting for large scale adoption of recently released varieties through nation level programmes like frontline programmes have helped in bridging the yield gaps, improving the income levels of the farmers, seed replacement, access to quality seeds, seed replacement. The yield gaps in rice between potential and farmers' yields are still substantially high due to the combination of factors like, bio physical, poor management and low socio-economic conditions of farmers and lack of resources, especially credit and knowledge (Meera et al., 2014). Demonstration mediated technology targeting for specific agro-climatic and other conditions helps to overcome most of the agricultural constraints faced by the farmers namely biotic and abiotic stresses at farmers' level. To address the problems of stagnating food grain production and need to bridge the yield gaps, Government of India has launched the Centrally Sponsored Scheme, 'National Food Security Mission' (NFSM) in August 2007. The major objective of this scheme is to increase production and productivity of rice, wheat and pulses on a sustainable basis so as to ensure food security of the country. The approach is to bridge the yield gap through dissemination of improved

technologies and farm management practices. The Frontline Demonstrations (FLDs) for Rice is an approved component of the National Food Security Mission to augment production of food grains in the country and are conducted by the ICAR/SAUs system. The ICAR-Indian Institute of Rice Research, Hyderabad, is the nodal Institution for organizing the FLDs on rice.

The main reason for low productivity of rice in India is that rice is grown under various production ecologies mainly grouped as irrigated and rainfed systems. While former is considered most favourable, rainfed system has again a wide range of subsystems like shallow, mid and deep water rainfed lowlands and rainfed uplands. Productivity in these systems varies widely. This warrants regular identification of the promising technologies suitable for these ecosystems that could be promoted on large scale.

Frontline Demonstration is a form of applied research through ICAR/SAUs system on latest notified/released varieties along with full package of practices on selected farmers' fields with a view to demonstrate the potentiality of the technologies to (a) participating farmers (b) neighbouring farmers and other agencies; (c) to analyze the production (d) performance of the technologies for scientific feedback.

Frontline Demonstrations (FLDs) on Rice helps to identify the suitable and promising technological solutions for different ecosystems based on their performance in the farmers' conditions in comparison with the technologies

Figure 1: Identifying promising technologies under FLD programme

METHODOLOGY

As per the guidelines of the NFSM funded Frontline demonstrations programmes, improved technology along with its comprehensive package consisting of new seed (variety/hybrid) and recommended cultivation and plant protection practices, etc., is demonstrated to farmers by the technology developers/technology developing institute. During the entire demonstrations, the scientists are actively involved for providing requisite technical guidance on regular basis to the farmers in implementing the recommended technologies. The effect of demonstration is up-scaled through conduct of field days. Every care is taken while selecting strategic locations for a cluster of 20–30 demonstrations is an integral part of these demonstrations to enhance its effectiveness as it provides farmers an opportunity to interact with subject matter specialist to understand the demonstrated improved technologies. Technologies demonstrated addressed the various issues of productivity, profitability and sustainability in rice production. The performance of the technology under demonstration is compared with the existing set of technologies that are conventionally grown by the farmers. The programme supports the demonstrating farmer financially for critical inputs such as seed, fertilizer, weedicide, pesticide, etc. This paper considers the demonstration result data of the one year namely 2019-20 where demonstrations were conducted in 20 states and six major ecosystems (Meera *et al.*, 2020).

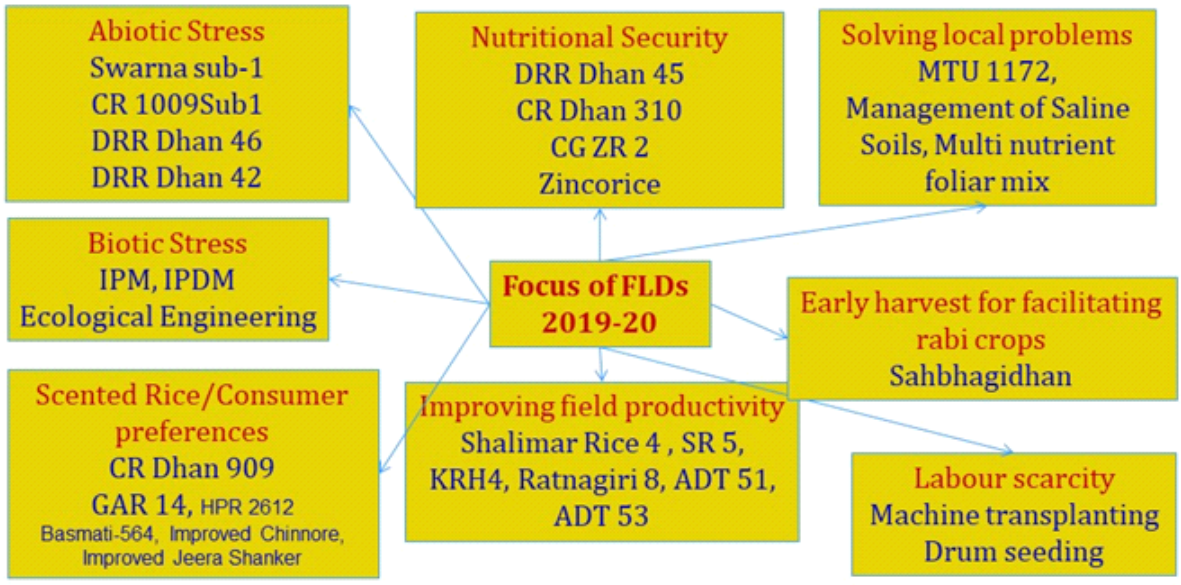

Figure 2. Focus of Rice Frontline Demonstrations 2019-20

Results and Discussion:

During the year, 2019-20 through FLD programme, to address various issues cafeteria of rice technologies were demonstrated in 852 hectare area covering 20 states and six major rice ecosystems of the country (Table 1).

Table 1. Details of the Rice Frontline Programme organised in the year 2019-20

Sr. No.	State	Ecosystem	Technologies demonstrated
1.	Andhra Pradesh	Flood prone low land	Ksheera (MTU 1172) flood tolerant rice variety
		Irrigated	Varam (MTU 1190) medium slender fine grainvareity
		Irrigated	BPT 2295 (2018)
		Irrigated	Integrated Weed Management
2.	Assam	Rainfed lowland	CR Dhan 909, CR Dhan 310
3.	Bihar	Irrigated low land	CR Dhan 909
4.	Chhattisgarh	Irrigated	CGZR1, CGZR2, Zincorice
		Irrigated and shallow	CG Sugandhitbhog, Dubraj Selection1,
		low land	CG Devbhog, Tarunbhog selection 1, Badsahbhog selection 1, Vishnubhog selection 1
		Rainfed Shallow Low lands	CG Rice Hybrid 2
		Upland and transplanted	Samleshwari
5.	Gujarat	Irrigated	Mahisagar GAR 14 (Scented variety)
		Irrigated & Rainfed	GNR-5, Purna, GNRH-1, GNR 7, GNR

6.	15 Himachal	Hill	HPR 2720, HPR 2795, HPR 2880, HPR
7.	Pradesh Jammu & Kashmir		2656
		Hill	Shalimar rice 4 &Shalimar rice 5
		Irrigated	Basmati 564, SJR 129 (Jammu Basmati),
8.	Jharkhand	Rainfed upland	DSR Sahbhagi Dhan, Abhishek, DRR Dhan 42
		Midland rainfed	Weed Management in DSR BVD 203 , BVS -1, DRR Dhan 42,rice
		Rainfed lowland and	cultivation direct seeded technology DRR Dhan 42, CR Dhan-310, CR
9.	Karnataka	mid land	Dhan-311
		Irrigated	Alternate wetting and drying
		Irrigated	Improved Samba Mahsuri
		Irrigated	IPM in rice with latest variety
		Aerobic	Daksha , KMP-175, ICM
		Irrigated	Alternate wetting and drying, Direct
		Irrigated	seeding in Rice Rice yield maximization using IPNI
10.	Kerala		nutrient expert system
		Double cropping	Rice farm mechanization
		Irrigated	PTB 61 (Supriya), PTB 62 (Akshaya)
		Irrigated	KAU Pournami (MO23)
		Irrigated	Multi nutrient foliar mix application
		Irrigated	Post emergent management of weedy
		Irrigated	rice using KAU Weed Wiper Conservation of natural enemies – use
			of biopesticides and botanical insecticides
11.	Madhya	Irrigated	Management of glume discoloration
		Semi irrigated	JRB.1, JR 81, Improved Chinnore
12.	Pradesh Maharashtra	Improved	Jeera Shanker
		Rainfed	Karjat 10, Karjat 9
		Rainfed	INM + High yielding varieties
		Rainfed upland/irrigated	Sakoli-9 and other BPH resistant varieties
		Irrigated	Ratnagiri-8
13.	Manipur	Irrigated	Sticky rice variety
14.	Odisha	Shallow lowland	Popularization of Mrunalini
		Rainfed shallow low land	Popularization of variety Hasantha
		Upland, lowland	All newly released varieties of NRRI ,
15.	Tamil Nadu		newly released hybrids of NRRI
		Irrigated	ADT 51, ADT 53

		Irrigated	IPDM with ADT 51
		Irrigated	CO 52
		Irrigated Upland	DRR Dhan 44, DRR Dhan 45, DRR
			Dhan 49
		Irrigated	TKM 13
16.	Telangana	Irrigated Upland	DRR Dhan 44, DRR Dhan 45,
			BINA Dhan 17, BRRI 75, DSR ICM
		Irrigated Upland	DRR Dhan 44, DRR Dhan 45, IPM
		Irrigated	Rice straw management and problem
			soil management
		Irrigated	BINA Dhan 17, BRRI 75
		Irrigated	Mechanization, AWD, Chemical Weed
			Management
		Irrigated	WGL 347, WGL 739
		Irrigated	EcologySRI and water saving
	technologies		
17.	Tripura	Lowland upland	Gomati, Tripura, Nirog,Tripura
			Chikandhan, Hakuchuk 2, Khara Dhan
			1 + ICM
18.	Uttar Pradesh	Irrigated	Narendra sona, NDR 2101 INM,SSNM
		Irrigated condition	SHIATS-Dhan-3, SHIATS DHAN-4, SHIATS DHAN-5
		Midland irrigated	Integrated Nutrient Management (INM), Appropriate Crop Establishment methods like Double Planting (Sunda Planting), Direct Sown Rice (DSR), Aerobic Rice, Varieties- HUR 4-3,
			HUR-105, HUBR 2-1, Improved Samba
			Mahsuri, DRR-44, HUBR 10-9
19.	Uttarakhand	Hills	VL Dhan 48
20.	West Bengal	Rainfed/ irrigated	MUKTA SHREE, Sukumar, Goasaba 5, Gosaba 6, Rajdeep, Kanak, Weed
			Management in DSR
			Machine Transplanting

In majority of the demonstrated fields the yield advantages recorded by the FLD technologies were significant. Out of 852 FLDs reported, about 67.7% were conducted in irrigated rice ecosystem; whereas about 12.56% of FLDs were conducted in rainfed uplands. More than 9% of FLDs were organized in shallow lowlands and 7.98% in hill ecologies. The Table 2 reveals that the mean yield advantage was the highest in semi deep ecologies (42.46%) followed by Problem Soils/Coastal Saline (30.81%), hills

(30.65%). The results indicate that there is a tremendous scope to bridge the yield gaps (particularly Yield gap-II) in case of Rainfed uplands (11.63% mean yield advantage), Shallow lowlands (16.35 %) and irrigated ecologies (22.91%). This needs effectively coordinated extension strategies and programmes for upscaling the adoption of the demonstrated technologies.

Table 2. Performance of different technologies in different ecosystems

Ecosystem	Total FLDs (ha)	%	Mean FLD Yield (t/ha)	Mean Check Yield (t/ha)	Mean % Yield Advantage
Irrigated	577	67.72	4.99	4.06	22.91
Shallow Lowlands	85	9.98	4.84	4.16	16.35
Rainfed Upland	107	12.56	3.84	3.44	11.63
Hills	68	7.98	4.22	3.23	30.65
Semi-deep	2	0.23	4.73	3.32	42.46
Problem Soils/ Coastal Saline	13	1.53	5.31	4.06	30.81
Total or Mean	852		4.65	3.71	25.80

Promising Rice Technologies Identified from FLDs 2019-20 Programme

Experiences of conducting frontline demonstration programme nationwide provides location specific insights in tackling local issues. An effort was made to identify the some of the promising technologies identified under the FLD programme during the year 2019-20 that can be effectively deployed in location specific extension programmes. In total 50 technologies have been identified from 20 states. The criteria adopted to identify these technologies are relative yield advantages over the existing technologies and the kind of local problem the technology tried to address. The inventory of promising technologies for the year 2019-20 is only indicative enlisting technologies that can be up-scaled in respective states and ecosystem.

Table 3. Inventory of promising technologies identified from FLD programme 2019-20

Sr. No.	State	Ecosystem	Technologies demonstrated	% Yield Advantage
1.	Andhra Pradesh	Irrigated	Integrated Weed Management	15.55
2.	Assam	Rainfed lowland	CR Dhan 310	32.65
3.	Bihar	Irrigated low land	CR Dhan 909	25.86
4.	Chhattisgarh	Rainfed Shallow Lowlands	IGKV R 1	13.86
5.	Chhattisgarh	Upland	Samleshwari	68.00
6.	Gujarat	Irrigated	GNR-7	15.63
7.	Gujarat	Irrigated	GAR-14	20.27
8.	Himachal Pradesh	Hills	HPR 2880	35.25

9.	Himachal Pradesh	Hills	HPR 2612	32.59
10.	Himachal Pradesh	Hills	HPR 2795	26.09
11.	Himachal Pradesh	Hills	HPR 2656	23.89
12.	Jammu & Kashmir	Hills	Shalimar Rice 5 (for higher altitudes)	24.94
13.	Jammu & Kashmir	Hills	Basmati-564	40.91
14.	Jammu & Kashmir	Hills	SJR-129	52.26
15.	Jharkhand	Rainfed drought prone	Sahbhagi Dhan with DSR	31.25
16.	Jharkhand	Rainfed drought prone	IR 64 Drt.1 with DSR	25.00
17.	Jharkhand	Rainfed drought prone	Abhisekh with DSR	30.00
18.	Jharkhand	Rainfed lowland	BVS-1, IR-64 drt-1, Sahbhagidhan, BVD-110	21.88
19.	Karnataka	Irrigated	Daksha (KMP-175) under aerobic conditions	25.00
20.	Karnataka	Irrigated	B.R.R.I. Dhan-75	37.50
21.	Karnataka	Irrigated	BINA Dhan-17	43.75
22.	Kerala	Irrigated	MO 23 (Pournami)	20.13
23.	Kerala	Low land'	KAU Weed Wiper'	29.17
24.	Kerala	Irrigated	Management of glume discoloration	24.32
25.	Madhya Pradesh	Irrigated	JRB 1	16.34
26.	Madhya Pradesh	Irrigated	JR 81	18.28
27.	Maharashtra	Rainfed	Sakoli-9	19.72
28.	Maharashtra	Irrigated	Ratnagiri-8	28.29
29.	Manipur	Hills	RCM 13, RCM 7	32.6
30.	Odisha	Irrigated	CR Dhan 206	18.35
31.	Odisha	Irrigated	CR Dhan 304	17.65
32.	Odisha	Irrigated	CR Dhan 306	25.00
33.	Odisha	Irrigated	CR Dhan 601	20.46
34.	Odisha	Rainfed	Shallow Lowland Hasanta	19.78
35.	Tamil Nadu	Irrigated	IPDM with ADT 51	44.90
36.	Tamil Nadu	Irrigated	CO 52	15.99
37.	Tamil Nadu	Irrigated	TKM 13	13.33
38.	Telangana	Irrigated	WGL 44 (Siddhi)	25.00
39.	Telangana	Irrigated	CGZR 2	39.43
40.	Telangana	Irrigated	Protozin	34.29
41.	Telangana	Problem Soils	Sodic soil management	37.20
42.	Uttar Pradesh	Irrigated	Sambha Sub-1/ INM	35.47
43.	Uttar Pradesh	Irrigated	NDR 2101/ New Variety	39.90
44.	Uttar Pradesh	Irrigated	NDR 2101/ INM	42.93
45.	Uttar Pradesh	Irrigated	SHIATS Dhan 1	27.82
46.	Uttarakhand	Irrigated	VL Dhan 68	21.86
47.	West Bengal	Irrigated	Machine Transplanting	25.06
48.	West Bengal	Irrigated	Ajit	37.80
49.	West Bengal	Rainfed	Semideep Improved Variety – Kanak	67.20
50.	West Bengal	Rainfed Shallow Land	Integrated Weed Management	37.50

The identified technologies will help either in withstanding abiotic stresses (Sambha Sub-1 + INM for submergence, DRR Dhan 42 for drought tolerance, Daksha for aerobic condition), improving the field productivity (Samleshwari, SJR-129, BINA Dhan-17, Kanak, Ajit, Ratnagiri-8, Shalimar Rice 40), solving the local problems (Problem soil management, KAU Weed Wiper), labour scarcity (Machine transplanting), early harvest for facilitating rabi crops (Sahbhagi dhan), better basmati options for farmers (Basmati 564), consumer preferences (RC Maniphou-13), replacing the popular varieties (CO 52, TKM 13, CR Dhan 909) etc., But a viable extension strategy should be planned and followed for the promising technologies to make a difference in the livelihoods of farmers.

It may be noted that, a technology with highest percentage of yield advantage may not necessarily be a technology that has wider adaptability. In such cases, the yield advantage may help in enhancing the farm level productivity. A technology with average percentage of yield advantage may have wider adaptability, which may result in enhancing the production in larger area. Hence, the development professionals may consider these technologies to take up popularization programmes in much larger areas.

CONCLUSION

Demonstrations are a long term educational activity conducted in a systematic manner in farmers' fields to show worth of a new practice/ technology. The impressive yield advantage obtained in the various ecosystems reiterates the fact that this method can support the nation's food security by increasing the area under improved technologies that can bridge the yield gaps and increase the rice productivity. This can happen when efforts are made to increase the multiplier effect of frontline demonstrations. Follow-up activities should be taken up so that the large scale adoption of demonstrated varieties/hybrids/technologies is realized. To make visible impacts, it should be assured that complete package of practices (POP) are adopted in the demonstration plots. In the absence of complete package, the potential yield of demonstrated technology will not be perceived by the farmers. Wherever possible innovations of the farmers may be included along with the demonstrated package of practices.

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RESEARCH ARTICLE

Utilization pattern of grape master app by grape growers

P. B. Kharde [1], G. K. Waman[2] and S. P. Arbat [3]

[1]Professor of Agril. Extn. (CAS), [2] Assistant Professor of Agril. Extn. & [3] M.Sc. (Agri.) Scholar
Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India
Corresponding Author's email : pbkharde@gmail.com
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ABSTRACT

Grape Master is a leading privately owned and paid consulting service firm in the field of grape cultivation throughout Maharashtra started in 2016. Today, more than five thousand of the grape growers use Grape Master App for qualitative grape production. It provides vital information regarding various stages of grape farm about disease management, pest management, nutrient management etc. The data findings revealed that a large majority (96.00%) of the grape growers obtain information about maximum and minimum temperatures, humidity, wind speed and atmospheric pressure related information. They also replied that they get five days early weather updates of their area in which Grape Master App provide wind speed and humidity related information which is essential in grape farming.

Introduction

Agriculture is vital to Indian economy with 58 per cent of rural households rely on it as primary source of income as it contributes significantly to India's Gross Domestic Product (GDP) along with fisheries and forestry. The importance of timely access to information for decision-making in agriculture and related industries cannot be overstated. It is clear that Information and Communication Technologies (ICTs) have the potential to enable farmers' access to and exchange of information. Among the ICTs, the use of mobile phones is expanding, which is affecting the agricultural communication process. New services and applications have emerged as a result of the adoption of mobile phones. These include access to market information, weather information, plant health monitoring, education and other services in the agriculture sector. In the literature, the most important sources of productivity increase have been recognized as research, extension, literacy and infrastructure (Mittal and Kumar, 2000). Market development increases the input-output market interface which is critical for productivity growth. According to studies, mobile phones have a favorable impact on long-term poverty reduction with accessibility being the greatest barrier to realizing their full potential (Bhavnani *et al*, 2008). According to Sasidhar and Sharma (2006), the application of Information and Communication Technology (ICT) tools has the potential to transform India's livestock, agriculture and rural economies. The acceptance of information by the farming community is widely recognized as one of the most important components in achieving efficient and productive agricultural decisions (Galloway and Mochrie, 2005).

Agricultural companies are

providing services through payment by contract farming, marketing of high value crops by commercially export companies, value addition and charged based service centers for farmers. Several corporations at present involved in agro-commodity trading, processing, exports have tried to establish systems to ensure timely and consistent supply of raw material of desired quality and at low cost. Some of the agri-business companies like e-choupal, Mahindra Samriddhi, Mahindra Shubhlabh, Tata Kisan Kendra and Chambal Uttam Bandhan in their unique model are also involved in transfer of technology with market support. Software applications designed to operate on smart phones, tablets and other mobile devices are known as mobile apps. Users use a variety of different mobile apps for varied purposes. These smart phone apps are used for a variety of purposes including entertainment, information sharing, agricultural information and much more.

Grape Master is a leading privately owned and paid consulting service firm in the field of grape cultivation throughout Maharashtra started in 2016. Today, more than five thousand of the grape growers use Grape Master App for qualitative grape production. It provides vital information regarding various stages of grape farm about disease management, pest management, nutrient management etc. Grape Master team consists of experienced agribusiness professionals. Initially used by grape growers in Nashik districts has been now used by farmers from various districts of Maharashtra and also used by farmers in Karnataka. Grape Master App is a paid subscription app having subscription fees of Rs.3000 per year. They provide daily schedule of the registered farm in the app and virtual solution to farm problems in addition to farm visits. With this background the study was conducted to ascertain the utilization of Grape Master App by grape growers.

METHODOLOGY

The present study was conducted in Dindori and Niphad tahsils of Nashik district. These two tahsils were purposively selected as exposure to Grape Master App in these tahsils is more. Fifteen villages from Dindori and fifteen villages from Niphad tahsils were selected. Total 150 grape growers were randomly selected which constituted the sample of study. The Ex-post-facto research design of social research was used for the present study. Keeping in view the objective of the study, an interview schedule was prepared and data were collected. Appropriate statistical methods were used for analysis of data and interpretation of the results.

RESULTS AND DISCUSSION

Utilization refers to the extent and purpose of utilization of Grape Master App by grape growers. Accordingly, the information pertaining to the level of utilization of Grape Master App by grape growers was collected, analyzed and tabulated in Table 1.

Table 1. Distribution of grape growers according to utilization of Grape Master App

Sr. No.	Utilization extent	Frequency (N=150)	
		Yes	No
1.	Get information about weather forecasting from Grape Master App.	144 (96.00)	6 (04.00)
2.	Get information about disease management of grapes.	143 (95.33)	7 (04.67)
3.	Get information about pest management of grapes.	131 (87.33)	19(12.67)
4.	Get information about nutrient management of grapes.	134 (89.33)	16 (10.67)
5.	Get daily updates regarding grape farming.	135 (90.00)	15 (10.00)
6.	Grape Master App provide suggestions after observation of grape plot.	143 (95.33)	7 (04.67)
7.	Grape Master App provide schedule and package of practices for grapes.	146 (97.33)	4 (02.67)

(Figure in parentheses indicate the percentage)

The data in Table 1 revealed that a large majority (96.00%) of the grape growers obtain information about maximum and minimum temperatures, humidity, wind speed and atmospheric pressure related information. They also replied that they get five days early weather updates of their area in which Grape Master App provide wind speed and humidity related information which is essential in grape farming. Further, a large majority (95.33%) of the respondents reported that they get information regarding disease management through chemical measures, biological measures and cultural measures in grape cultivation. In chemical measures they also provide information about new chemicals available in the market. While, grape growers use this information by applying this measures to their plots. They also said that Grape Master App provide the feature of sending field photos of infected crop plot and thereby they get their solutions. They added that Grape Master App team visit their farms on various occasions and provide necessary solutions immediately on the field. The data pointed that majority (87.33%) of the grape growers get information about major pests in grape such as mealy bugs, thrips and mites in PDF format. Occasionally the updates from NRC Grapes are also provided. They also provide information regarding biological control through preservation of natural enemies and egg parasitoids and also suggest about cultural control such as clearing the field residues and soil solarisation.

The data in above table revealed that a large majority (89.33%) of the grape growers after submitting the soil report on Grape Master App, they provide the guidance on the basis of requirements of soil, hence, minimizing the extra expenditure on fertilizers. They also provide information about integrated nutrient management. Grape growers used this guidance by making changes to their traditional methods of farming by accepting the suggestions of Grape Master App. A large majority (90.00%) of the grape growers pointed that they get regular updates regarding grape

cultivation such as daily scheduling of spraying, irrigating field, harvesting stages and information before damage in crop. They provide market information and also provide information from National Research Centre of Grapes occasionally. The data further revealed that large majority (95.33%) of the respondents get to know about precise solution on their crop damages as well as deficiencies of certain nutrients and information about how to maintain standard quality grapes after observation of their plot by subject matter specialist. Finally, it was observed from utilization of Grape Master App that majority (97.33%) of the grape growers get schedule of their farm practices on daily basis starting from day one. After registration of plot daily schedule is updated on the app providing information about which operations needs to be done on that day. Majority of the grape growers use this schedule by doing those operations on particular day. These findings are in line with Aboh (2008), Patil (2016) and Shelke (2020).

CONCLUSION

From the research findings it was observed that Grape Master App is providing private consultancy services in grape cultivation. Its usage by user farmers has benefited the farmers and its medium to high utilization indicated that other similar crop specific apps can be designed by government institution free of cost for consultancy in Nashik district such as for onion and other vegetables crop which are prone to heavy post-harvest and management losses. This will enhance the participation of small and marginal farmers in farm consultancy services.

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RESEARCH ARTICLE

Attitude of beneficiary farmers towards Pradhan Mantri Krishi Sinchai Yojana

Pranali S. Kulkarni[1] and U. D. Jagdale[2]

1. PG student, College of Agriculture, Pune (M.S.) 2. Assistant Professor of Agril. Extension, College of Agriculture, Pune (M.S.)

Corresponding author's email- uttamdjagdale@gmail.com

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ABSTRACT

The present study was conducted in two tehsils of Sangli district of Maharashtra state. Data were collected by personally interviewing 120 beneficiary farmers. Majority (65.84 per cent) of the beneficiary farmers had moderately favourable attitude. The 63.34 per cent of the beneficiary farmers were indecisive about the statement that PMKSY enhances the livelihood security in the rural areas while 62.50 per cent beneficiary farmers were agreed upon the statement that PMKSY helps the farmers to improve overall status. About 74.17 per cent of beneficiary farmers were indecisive about the statement that no change in cropping pattern due to PMKSY while 68.33 per cent of the beneficiary farmers were indecisive about the statement that PMKSY is not beneficial where ground water is available in sufficient quantity. 54.16 per cent beneficiary farmers were indecisive about the statement that only few farmers are benefited by PMKSY while 47.50 per cent of beneficiary farmers were strongly agree to the statement that PMKSY helps to use irrigation water judiciously. Near about 59.16 per cent of the beneficiary farmers were agreed upon the statement that PMKSY could generate new employment opportunities for skilled and unskilled persons while 56.66 per cent of the beneficiary farmers were indecisive about the statement that activities implemented under PMKSY are not relevant to the needs of small and marginal farmers. About 55.00 per cent of the beneficiary farmers were strongly agree to the statement that higher water use efficiency can be obtained by PMKSY.

Keywords : Attitude, Pradhan Mantri

INTRODUCTION

From 1st April 2015, Micro Irrigation component of On Farm Water Management has been subsumed under Pradhan Mantri Krishi Sinchayee Yojana and launched on 1st July, 2015 with the motto of "Har Khet Ko Pani". The Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) is being implemented to expand cultivated area with assured irrigation, reduce wastage of water and improve water use efficiency. PMKSY not only focuses on creating sources for assured irrigation, but also creating protective irrigation by harnessing rain water at micro level through "Jal Sanchay" and "Jal Sinchan". Micro irrigation is also incentivized through subsidy to ensure "Per drop-More crop".

METHODOLOGY

The study was conducted in two tehsils of Sangli district of Maharashtra state. Six villages from each tehsil were selected based on highest and moderate total net irrigated area respectively. Ten beneficiary farmers were selected from each village randomly. Data were collected by personally interviewing 120 beneficiary farmers with the help of interview schedule. Statistical tools such as frequency, percentage, mean,

standard deviation and Karl Pearson's coefficient of correlation were used for grouping the data.

RESULTS AND DISCUSSION

It is observed from table 1 that, majority (65.84 per cent) of the beneficiary farmers had moderately favourable attitude followed by (19.16 per cent) had less favourable attitude and only (15.00 per cent) of beneficiary farmers had highly favourable attitude towards Pradhan Mantri Krishi Sinchayee Yojana. It is concluded that majority of the beneficiary farmers had moderately favourable attitude towards Pradhan Mantri Krishi Sinchayee Yojana. It is might be due to their medium level of knowledge. Similar findings are reported by Gayki (2019).

Table 1: Distribution of beneficiary farmers according to their attitude

Sr. No.	Attitude	Respondents (n=120)	
		Frequency	Percentage
1.	Less favourable (Up to 36 score)	23	19.16
2.	Moderately favourable (37 to 58 score)	79	65.84
3.	Highly favourable (59 score and above)	18	15.00
	Total	**120**	**100.00**

Table 2: The statement wise findings on attitude of beneficiary farmers

Sr. No.	Statement	Response				
		SA	A	UD	DA	SDA
1.	PMKSY is a boon for small and marginal farmers	41 (34.10)	50 (41.16)	5 (04.16)	19 (15.83)	5 (04.16)
2.	The procedure of getting benefits from PMKSY is complex	16 (13.33)	9 (07.50)	64 (53.34)	27 (22.50)	4 (03.33)
3.	PMKSY helps the farmers to improve overall status	21 (17.50)	75 (62.50)	7 (05.83)	17 (14.16)	00 (00.00)
4.	PMKSY is a means for proper water distribution management	35 (29.10)	53 (44.16)	27 (22.50)	5 (04.16)	00 (00.00)
5.	PMKSY enhances the livelihood security in the rural areas	5 (04.16)	34 (28.33)	76 (63.34)	5 (04.16)	00 (00.00)
6	PMKSY is a good initiative by the government to help farming community	26 (21.60)	70 (58.34)	18 (15.00)	6 (05.00)	00 (00.00)
7.	PMKSY is not a farmer friendly approach	22 (18.30)	25 (20.84)	56 (46.66)	17 (14.16)	00 (00.00)
8.	For the development of small farmers PMKSY is a good thing and worthwhile	47 (39.17)	49 (40.83)	23 (19.16)	1 (00.89)	00 (00.00)
9	Only few farmers are benefited by PMKSY	4 (03.34)	14 (11.66)	65 (54.16)	21 (17.50)	16 (11.66)

10	Irrigation intensity is increased through PMKSY	42 (35.00)	45 (37.50)	10 (08.33)	23 (19.16)	00 (00.00)
11.	PMKSY helps to use irrigation water judiciously	57 (47.50)	31 (28.83)	30 (25.00)	1 (00.83)	1 (00.83)
12.	No change in cropping pattern due to PMKSY	5 (04.16)	7 (05.83)	89 (74.17)	19 (15.83)	00 (00.00)
13.	Agricultural production has considerably increased during last few years through PMKSY	7 (05.83)	36 (30.00)	46 (38.34)	31 (28.83)	00 (00.00)
14.	PMKSY is not beneficial where ground water is available in sufficient quantity	0 (00.00)	24 (20.00)	82 (68.33)	14 (11.66)	00 (00.00)
15.	Higher water use efficiency can be obtained by PMKSY	66 (55.00)	11 (09.17)	12 (10.00)	3 (02.50)	00 (00.00)
16.	Activities implemented under PMKSY are not relevant to the needs of small and marginal farmers	7 (05.83)	23 (19.16)	68 (56.66)	00 (18.33)	00 (00.00)
17.	Majority of the farmers have not received the benefit given under PMKSY	9 (07.50)	55 (36.66)	20 (16.66)	46 (38.33)	1 (00.83)
18.	PMKSY could generate new employment opportunities for skilled and unskilled persons	0 (00.00)	71 (59.16)	38 (31.66)	11 (09.16)	0 (00.00)
19.	Little work and more propaganda done by PMKSY	0 (00.00)	38 (31.66)	38 (31.66)	39 (32.50)	5 (04.16)

SA - Strongly Agree; A - Agree; UD - Undecided; DA - Disagree; SDA - Strongly Disagree

(Figures in parenthesis indicates percentage)

It is evident from the distribution in table 2 that the 63.34 per cent of the beneficiary farmers were indecisive about the statement that PMKSY enhances the livelihood security in the rural areas while 62.50 per cent beneficiary farmers were agreed upon the statement that PMKSY helps the farmers to improve overall status. About 58.34 per cent beneficiary farmers were agreed upon the statement that PMKSY is a good initiative by the government to help farming community while 53.34 per cent beneficiary farmers were indecisive about the statement that the procedure of getting benefits from PMKSY is complex. About 44.16 per cent of the beneficiary farmers were agreed that PMKSY is a means for proper water distribution management and 41.16 per cent of the beneficiary farmers were agreed upon the statement that PMKSY is a boon for small and marginal farmers. About 74.17 per cent of beneficiary farmers were indecisive about the statement that no change in cropping pattern due to PMKSY while 68.33 per cent of the beneficiary farmers were indecisive about the statement that PMKSY is not beneficial where ground water is available in sufficient quantity. 54.16 per cent beneficiary farmers were indecisive about the statement that only few farmers are benefited by PMKSY while 47.50 per cent of beneficiary farmers were strongly agree to the statement that PMKSY helps to use irrigation water judiciously. About 46.66 per cent beneficiary farmers were indecisive about the statement that PMKSY is not a

farmer friendly approach, 40.83 per cent of the beneficiary farmers were agreed upon the statement that for the development of small farmers PMKSY is a good thing and worthwhile and 38.34 per cent of the beneficiary farmers were indecisive about the statement that agricultural production has considerably increased during last few years through PMKSY. About 37.50 per cent beneficiary farmers were agreed upon the statement that irrigation intensity is increased through PMKSY. Near about 59.16 per cent of the beneficiary farmers were agreed upon the statement that PMKSY could generate new employment opportunities for skilled and unskilled persons while 56.66 per cent of the beneficiary farmers were indecisive about the statement that activities implemented under PMKSY are not relevant to the needs of small and marginal farmers. About 55.00 per cent of the beneficiary farmers were strongly agree to the statement that higher water use efficiency can be obtained by PMKSY, 38.33 per cent of the beneficiary farmers were disagree with the statement that majority of the farmers have not received the benefit given under PMKSY and 32.50 per cent of the beneficiary farmers were disagree with the statement that little work and more propaganda done by PMKSY.

CONCLUSION

Most of the beneficiary farmers had moderately favourable attitude towards Pradhan Mantri Krishi Sinchayee Yojana. Hence, the concerned departments (The Water Resource Department, Department of Agriculture, Co-operation and Farmers Welfare and Department of Land Resources) should converge and streamline their transfer of technology mechanisms and efforts. Trainings and method demonstrations should be imparted to the beneficiary farmers for betterment of their knowledge and skills regarding the use of the system effectively and efficiently. Technical guidelines should be conveyed to them through frequent visits of extension workers to the farmers fields.

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RESEARCH ARTICLE

Trends of production and export of organic products in India

Devyanee K. Nemade[1], R.T. Katole[2], Swati A. Gawande[3] and Jayshri Wasule[4]

1.Assistant Professor(Agricultural Economics),Department of Agricultural Economics & Statistics,
2.Associate Professor(Extension Education) 3.Assistant Professor (Extension Education),
Department of Extension Education, 4.Junior Research Assistant,
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola
Corresponding Author's email :sagawande7@gmail.com

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ABSTRACT

The first scientific approach to organic farming dates back to the Vedas of the later Vedic period, the essence of which is to live in harmony with, rather than exploit, Mother Nature. There is brief mention of several organic inputs in our ancient literatures like Rigveda, Ramayana, Mahabharata, Kautilya Arthashathra etc. In fact, organic agriculture has its roots in traditional agricultural practices that evolved in countless village's and farming communities over the millennium. India produced 1.70MT certified organic produce during 2017-18. In recent years, however limitations of agriculture based on chemical use and intensive irrigation have become apparent and there has been a resurgence of interest in organic agriculture. Currently, India ranks 9th in terms of World's Organic Agricultural land and 1stin terms of total number of producers(FIBL and IFOAM year book), 2018).

This research focuses on the present status and prospects of organic farming in India. Keeping in view of this study has been undertaken with following objectives.

1. To study the area, production of organic farming in India.
2. To examine the trends in production and exports of organic products in India.

The data was collected from the secondary sources i.e International federation of organic farming movements (IFOAM), International Trade Centre (ITC), National programme of organic production (NPOP), APEDA (Agricultural processed food products & export development, Reports, Journals, Periodicals and newspapers etc. for the period 2002-03 to 2018-19.The present study analyses variability of Area, production and Export of organic products through coefficient of variations. Compound growth rate (CGR) was estimated using the exponential regression model to examine the trends in production and exports of organic products in India.

The result was concluded that, the total area of both organic & wild collection in India has increased from 2.57 million hectares in 2005 to 3.43 million hectares in 2018-19. Among all the states, In percentage Madhya Pradesh (34.67 per cent) has covered largest area under organic respectively. The per cent change of India of organic product volume and value of export was 51.12 per cent to 47.96 per cent and 17.25 per cent to 39.38 per cent respectively during certification followed by Maharashtra (14.43 per cent)) and Rajasthan(10.06 per cent) 2002-03 to 2018-19. India is exporting organic products to all the continents of the world of which the largest share goes to European Union(38.85 %) followed by USA(37.87 %). An attempt made to analyze the importance of Organic farming and exports of organically produced product in India. Organic product are exported to European Union, Canada, USA, Switzerland, Australia, New Zealand etc.

Key words : Organic Farming, Production & Exports

INTRODUCTION

The concept of organic agriculture is not alien to India. The first scientific approach to organic farming dates back to the Vedas of the later Vedic period, the essence of which is to live in harmony with, rather than exploit, Mother Nature. There is brief mention of several organic inputs in our ancient literatures like Rigveda, Ramayana, Mahabharata, KautilyaArthasashthra etc. In fact, organic agriculture has its roots in traditional agricultural practices that evolved in countless village's and farming communities over the millennium. India produced 1.70MT certified organic produce during 2017-18. Madhya Pradesh has highest area under organic farming followed by Rajasthan, Maharashtra and Uttar Pradesh. The State of Uttarakhand and Sikkim have declared their states as 'organic states' The demand for organic food products is growing in these regions due to high purchasing power and huge presence of health conscious consumers. Keeping in view of this study has been undertaken with following objectives.

1. To study the area, production of organic farming in India.
2. To examine the trends in production and exports of organic products in India.

METHODOLOGY

This research is based on secondary data. Information about organic farming and its practices made both in India and aboard were collected from the published sources such as publications of European union, international federation of organic farming movements (IFOAM),International Trade Centre (ITC), National programme of organic production (NPOP), APEDA (Agricultural processed food products & export development, Reports, Journals, periodicals and newspapers etc.

The present study analyses variability of production and exportof organic products through coefficient of variations. Compound growth rate (CGR) was estimated using the exponential regression model to examine the trends in production and exports of organic products in India.

Co-efficient of Variation:

Where, CV = Co-efficient of Variation
= Standard Deviation
= Arithmetic Mean

In the present study, compound growth rate of area, production, yield and export of organic products for each period were estimated to study the growth in area, production yield and export of organic products. Compound growth rate were estimated with the help of following exponential model.

$Y = ab^t + e$

Where,

Y = Dependent variable for which growth data is estimated.

a = Intercept.

b = Regression coefficient.

t = Time variable.

e = Error term.

The logarithmic form of the above equation estimated thecompound growth rate

$\log Y = \log a + t \log b$

The compound growth rate (g) was estimated by using

$g = [\text{Anti log of log}(b) - 1]\ 100$

RESULTS AND DISCUSSION

In India major organic foodwere produced namely cereals like Rice, Wheat,spices like Cardamom, Black pepper, white pepper, ginger, turmeric, vanilla, mustard, tamarind, clove, cinnamon, nutmeg, mace chilly,pulses like Red Gram, Black Gram,fruits like Mango, Banana, Pineapple, Grape, Passion fruit, Orange, Cashew nut, Walnutand vegetables like Okra, Brinjal, Garlic, Onion, Tomato, Potato,Oilseeds likeSesame, castor, sunflowerand other crop likeCotton,Tea, Coffee.

Table: 1 Major Products Produced in India by Organic Farming

Sr. No.	Type	Products
1	Cereals	Rice, Wheat
2	Spices	Cardamom, Black pepper, white pepper, ginger, turmeric, vanilla, mustard, tamarind, clove, cinnamon, nutmeg, mace chilly
3	Pulses	Red Gram, Black Gram
4	Fruits	Mango, Banana, Pineapple, Grape, Passion fruit, Orange, Cashew nut, Walnut
5	Vegetables	Okra, Brinjal, Garlic, Onion, Tomato, Potato
6	Oilseeds	Sesame, castor, sunflower
7	Others	Cotton,Tea, Coffee

Growth of Organic Area in India:

India has tremendous potential, largely untapped; for a major breakthrough in organic agriculture. Table-2 indicates that India's organic area in 2005 was 0.186 million hectares and wild collection area was 2.38 million hectares that has increased to 1.09 million hectares and 2.03 million hectares respectively in 2018-19. The total area of both organic & wild collection in India has increased from 2.57 million hectares in 2005 to 3.43 million hectares in 2018-19. The compound growth rate of India's organic area and wild collection area was 10.45% and 12.87 % respectively during 2005 to 2018. The compound growth rate of India's total organic area including wild collection was 12.52% and coefficient of variation was25.89% during the same period. It is clear that the change in variation of wild collection area has increased more than the actual organic area in India.

Table: 2. Growth of Organic Area in India.

Year	Organic Area (A)	Annual growth rate	Wild Collection (B)	Annual Growth rate	Total Organic Area(A+B)	Annual Growth rate
2005	185937.00	--	2385963.00	--	2571900.00	--
2006	432259.00	132.48	2385963.00	0.00	2818222.00	9.58
2007	1030311.00	138.36	1769689.00	-25.83	2800000.00	-0.65
2008	1018000.00	-1.19	2781530.00	57.18	3799530.00	35.70
2009	1180000.00	15.91	3360000.00	20.80	4540000.00	19.49
2010	780000.00	-33.90	3650000.00	8.63	4430000.00	-2.42
2011	1084266.00	39.01	4477526.00	22.67	5561792.00	25.55
2012	500000.00	-53.89	4700000.00	4.97	5200000.00	-6.50
2013	510000.00	2.00	5180000.00	10.21	5690000.00	9.42
2014	720000.00	41.18	4173851.00	-19.42	4893851.00	-13.99
2015	1180000.00	63.89	4530384.00	8.54	5710384.00	16.68
2016	1490000.00	26.27	2962987.00	-34.60	4452987.00	-22.02
2017	1780000.00	19.46	1786538.00	-39.70	3566538.00	-19.91
2018	1097074.39	-38.37	2331564.38	30.51	3428638.77	-3.87
CV	**46.89**		**34.35**		**25.89**	
CGR	**10.45**		**12.87**		**12.52**	

State-wise area and production under Organic farming during 2018-19:

Table-3 indicates the state wise area production and productivity of organic products and its ranking in India in 2018-19. Madhya Pradesh has highest certified area under organic cultivation i.e. 3.80 million hectares followed by Maharashtra 1.59 million hectares andRajasthan 1.10 million hectares in 2018-19. In terms of organic production, Maharashtra rank first858734.61MT, followed by Madhya Pradesh 738877.75 MT,and Rajasthan 134611.23 MT. However in terms of yield Karnataka(6.42 MT/ha)) rank first followed by Maharashtra(5.43 MT/ha, Bihar(4.71 MT/ha) etc. Among all the states, Maharashtra has highest production and yield of organic crops 2nd rank of Maharashtra in India during 2018-19. The certified organic product includes all varieties of food products namely Sugarcane, Cotton, Oil Seeds, Basmati rice, Pulses, Spices, Tea, Fruits, Dry fruits, Vegetables, Coffee and their value added products. The production is not limited to the edible sector but also produces organic cotton fiber, functional food products etc. Among all the states, In percentage Madhya Pradesh (34.67 per cent) has covered largest area under organic certification followed by Maharashtra (14.43 per cent)) and Rajasthan(10.06 per cent) respectively.

Table 3. Selected State-wise Area and Production under Organic Farming during2018-19.

S.N.	State	Area (Ha)	Percent of share	Production (Metric Tonns)	Percent of share	Yield MT/Ha	Rank base on Area
1	Madhya Pradesh	379996.68	34.67	738877.75	28.43	1.94	1
2	Maharashtra	158097.14	14.43	858734.61	33.04	5.43	2
3	Rajasthan	110240.21	10.06	134611.23	5.18	1.22	3
4	Odisha	73124.10	6.67	88948.06	3.42	1.22	5
5	Gujarat	60185.40	5.49	66106.20	2.54	1.10	6
6	Karnataka	57018.08	5.20	365848.35	14.08	6.42	7
7	Sikkim	73654.88	6.72	423.81	0.02	0.01	4
8	Uttar Pradesh	44802.36	4.09	142511.56	5.48	3.18	8
9	Meghalaya	1612.69	0.15	699.34	0.03	0.43	23
10	Kerala	19232.89	1.75	25434.58	0.979	1.32	10
11	Uttarakhand	20052.26	1.83	29601.81	1.139	1.48	9
12	Andhra Pradesh	13763.38	1.26	11400.33	0.439	0.83	13
13	Assam	15223.47	1.39	38456.72	1.480	2.53	12
14	Jammu & Kashmir	17558.76	1.60	33878.95	1.303	1.93	11
15	Jharkhand	2977.17	0.27	0.99	0.000	0.00	20
16	Tamil Nadu	4314.61	0.39	14803.02	0.570	3.43	19
17	Chhattisgarh	7356.54	0.67	14364.67	0.553	1.95	16
18	Goa	10696.37	0.98	2454.55	0.094	0.23	14
19	Himachal Pradesh	8527.13	0.7781	6958.21	0.268	0.82	15
20	Arunachal Pradesh	627.15	0.0572	590.55	0.023	0.94	24

21	Punjab	317.75	0.0290	744.27	0.029	2.34	25
22	Telangana	6322.92	0.5769	2108.69	0.081	0.33	17
23	Nagaland	2751.17	0.2510	189.53	0.007	0.07	21
26	West Bengal	4984.20	0.4548	19791.66	0.761	3.97	18
27	Haryana	2291.85	0.2091	1215.13	0.047	0.53	22
29	Bihar	1.20	0.0001	5.66	0.000	4.71	28
30	Tripura	203.56	0.0186	326.02	0.013	1.60	26
32	Pondicherry	2.84	0.0003	2.50	0.000	0.88	27
	Total	**1095936.76**	**100.00**	**2599088.74**	**100.000**	**2.37**	-

Organic Food Export from India:

The increasing demand for organic produce has created new export opportunities and many developing countries have started to tap lucrative export markets for organic produce. Indian organic farming industry is almost entirely export oriented, running as contract farming under financial agreement with contracting firms. Moreover majority of farmers in India are opting this practice motivated by attractive markets and price margins (Sharma, 2001). The increasing demand for organic food products in the developed countries and the extensive support by the Indian government coupled with its focus on agri-exports are the drivers for the Indian organic food industry. Organic food exports from India are increasing with more farmers shifting to organic farming. With the domestic consumption being low, the prime market for Indian organic food industry lies in the US and Europe. India has now become a leading supplier of organic herbs, organic spices, organic basmati rice, etc.

Table- 4 reveals that an export of organic products from India in 2002-03 was 4161MT that went up to 614089.61 MT in 2018-19. Similarly the export value of organic products was Rs.619.6 crores in 2002-03 which has increased toRs. 5150.90crores in 2018-19. The per cent change of Indiaof organic product volume and value of export was 51.12 per cent to 47.96 per cent and 17.25 per cent to 39.38 per cent respectively during 2002-03 to 2018-19. India exported 135 products last year (2018-19). Large export earnings from organic produce are increasing over the years. European Union is the major importer of organic produce in quantity as well as in value terms. The total volume of export during 2018-19 was 614089.61 MT.

Table No. 4: Export of Organic products from India.

S.N.	Year	Export Volume (Metric Tons)	Per cent Change	Export value (Rs. Crores)	Per cent Change
1	2002-03	4161.00	-	619.63	-
2	2003-04	6288.00	51.12	726.60	17.25
3	2004-05	8344.00	32.70	953.30	31.22
4	2005-06	7953.00	-4.69	1281.60	34.44
5	2006-07	NA	-	NA	-
6	2007-08	37533.00	371.94	498.00	-61.14
7	2008-09	44476.00	18.50	537.00	7.83

8	2009-10	58408.00	31.32	526.00	-2.05
9	2010-11	69837.00	19.57	699.00	32.89
10	2011-12	147800.00	111.64	1866.33	167.00
11	2012-13	165262.06	11.81	2106.81	12.89
12	2013-14	194088.00	17.44	2563.08	21.66
13	2014-15	285663.00	47.18	2099.00	-18.11
14	2015-16	263687.01	-7.69	1975.87	-5.87
15	2016-17	309766.94	17.48	2477.96	25.41
16	2017-18	458339.00	47.96	3454.00	39.38
17	2018-19	614089.61	33.98	5150.90	49.13
	CV	**115.32**		**89.88**	

Country-wise Export of Organic Product:

Table 5 indicates the country wise export of organic product from India.The organic food export realization was around 5038.18crores. Organic products are exported to European Union, USA, Canada, Switzerland, Australia, New Zealand, Pakistan etc. Table 5 reveales that total export of organic products from India in 2018-19 was 601618.89 MT and total export value Rs. 5038.18 crores. India is exporting organic products to all the continents of the world of which the largest share goes to European Union(38.85 %) followed by USA(37.87 %). An attempt made to analyze the importance of Organic farming and exports of organically produced product in India.

Table 5 : Country wise Export of Organic products under NPOP.

Country	2015-16		2016-17		2017-18		2018-19	
	Qty (MT)	Value (Crores)	Qty (MT)	Value (Crores)	Qty (MT)	Value (Crores)	Qty (MT)	Value (Crores)
Canada	**42938**	**197.41**	**42739**	**193.1**	**92133**	**347.1**	**101942.91**	**466.5**
	16.34	**10.06**	**14.07**	**7.88**	**20.10**	**10.08**	**16.94**	**9.26**
European Union	102071	880.25	124398	1143.15	129546	1398.53	155255.11	1517.2
	38.85	44.87	40.95	46.63	28.26	40.61	25.81	30.11
New Zealand	1520	8.34	1783	9.85	1282	9.96	1977.9	14.46
	0.58	0.43	0.59	0.40	0.28	0.29	0.33	0.29
Switzerland	9072	53.52	9427	66.46	8925	74.86	6199.1	67.24
	3.45	2.73	3.10	2.71	1.95	2.17	1.03	1.33
USA	99492	784.63	116595	994.9	223854	1571.74	334113.11	2922
	37.87	39.99	38.38	40.59	48.83	45.64	55.54	58.00
Pakistan	5898	1.29	7111	1.49	0	0	0	0
	2.24	0.07	2.34	0.06	0.00	0.00	0.00	0.00
Australia	1735	36.53	1732	42.42	2690	41.56	2130.76	50.78
	0.66	1.86	0.57	1.73	0.59	1.21	0.35	1.01
Total	**262726**	**1961.97**	**303785**	**2451.37**	**458430**	**3443.75**	**601618.89**	**5038.18**
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Data provided by National Programme for Organic Production (NPOP)

Table 6 : Commodity wise Export of Organic produced from India in year 2018-19.

Sr. No.	Item/Commodity	Quantity exported (MT)	Percentage Share	Value of export in US$ million	Percentage Share
1	Oil cake/ meal	273786.22	44.58	176.91	23.36
2	Oil seeds	170745.13	27.80	124.25	16.40
3	Processed food	2429.88	0.40	122.76	16.21
4	Cereals and Millets	67847.45	11.05	63.51	8.38
5	Plantation crops	8969.002	1.46	60.08	7.93
6	Spices and Condiments	6783.68	1.10	43.17	5.70
7	Dry Fruits	3804.77	0.62	40.41	5.34
8	Sugar/ sugar crop products	41125.94	6.70	29.82	3.94
9	Medicinal/ Herbal/Aromatic	2759.14	0.45	20.25	2.67
10	Fruits/ juices/pulps and concentrates	12195.92	1.99	19.542	2.58
11	Essential oils/ oils/ other oils	5619.07	0.92	17.14	2.26
12	Vegetables and Products	2251.03	0.37	12.03	1.59
13	Others	8249.00	1.34	11.23	1.48
14	Pulses	5158.22	0.84	8.65	1.14
15	Flowers	551.45	0.09	5.40	0.71
16	Fodder crops	1569.65	0.26	1.31	0.17
17	Tuber crops	204.6	0.03	0.53	0.07
18	Seeds	24.43	0.0040	0.24	0.03
19	Aromatic oils	2.015	0.0003	0.14	0.02
20	Ornamental plant/ products	7.19	0.0012	0.1	0.01
21	Miscellaneous	5.687	0.0009	0.012	0.0016
22	Honey	0.12	0.00	0.0008	0.0001
	Total	**614089.61**	**100**	**757.4967**	**100**

Source: Data provided by National Programme for Organic Production (NPOP)

India is one of the most important producers of organic food. Table 6reveals the 22categories of organic products out of 135 organic products have been exported in various countries. The share of export volume of oil crops from India was highest(73.30 %), followed by Cereals & millets(11.0 %) during the period of 2018-19.

Importance of Organic Agriculture in India:

Organic farming is gaining gradual momentum across the world. Growing awareness of health and environmental issues in agriculture has demanded production of organic food which is emerging as an attractive source of rural income generation. Organic agriculture has made a credible performance during the past ten years. Both, the 11th plan document on organic sector and the report of the National Commission on farmers have recommended it as a tool for second

green revolution in the country in particular for agro- eco zones comprising rain fed areas, hilly areas and areas experiencing ecological backlash of green revolution. Organic agriculture can become low cost, sustainable option of farming in the country, particularly by the small farmers in rain fed areas and helps to improve their food and income security. It helps to produce and supply adequate safe and nutritious food to the producers and consumers of the nation. Environmental benefits, health aspects and farmers empowerment are other important factors influencing farmers to shift to organic agriculture. Some of the important benefits of organic farming are Organic fertilizers are completely safe and does not produces harmful chemical compounds.

CONCLUSION

Agriculture is the base of economic policies and is the ultimate driver of national economic growth and poverty alleviation in many developing countries including India. It has vast opportunity for rural employment and livelihood security. Organic agriculture is gaining momentum as an alternative method to the modern system. Many countries have been able to convert significant per cent of their cultivated areas into organic farming. Indian agriculture evolved principally as an ecologically sustainable approach using natural inputs for enhancing crop yield. The demand for organic products is growing fast in countries like USA &European Union. India has the potential to become a major organic M. S. Deshmukh, Nitin Babar- Present Status and Prospects of Organic Farming in India producing country given the international demand for our farm products, different agro-climatic regions for the cultivation of a number of crops.

The result was concluded that, the total area of both organic & wild collection in India has increased from 2.57 million hectares in 2005 to 3.43 million hectares in 2018-19.

Among all the states, In percentage Madhya Pradesh (34.67 per cent) has covered largest area under organic certification followed by Maharashtra (14.43 per cent)) and Rajasthan(10.06 per cent) respectively. The per cent change of Indiaof organic product volume and value of export was 51.12 per cent to 47.96 per cent and 17.25 per cent to 39.38 per cent respectively during 2002-03 to 2018-19. India is exporting organic products to all the continents of the world of which the largest share goes to European Union(38.85 %) followed by USA(37.87). An attempt made to analyze the importance of Organic farming and exports of organically produced product in India.

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RESEARCH ARTICLE

Constraints and suggestions of the farm labourer in Vidarbha region

P. J. Pada[1] and P. K. Wakle[2]

1. Ph.D. Scholar, Department of Extension Education, Dr. PDKV, Akola (M.S.)
2. Professor, Directorate of Extension Education, Dr. PDKV, Akola (M.S.)

Corresponding author's email : pranitaext@gmail.com

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ABSTRACT

The research was carried out in the Akola and Amravati districts. Twenty-four villages were chosen randomly. A total of 240 labourer were chosen from each community. The information was gathered through personal interview. Majority 75.83 per cent of respondents expressed the constraints lack of minimum facilities at work place, 66.25 per cent of respondents expressed the constraints lack of awareness about spraying kit and majority 62.08 per cent of respondents expressed the constraints of lack of training, skill and technical knowledge. Majority 62.08 per cent of respondents suggested to provide the proper training to improving their skill and knowledge for better work.

Key word - Constraint, suggestions, farm labourer

INTRODUCTION

Labourer is one of the most important factors of production. Labourer contributes to the production process through its productivity and by activating the other factors of production. Farm labourers constituting about 23% of whole rural population have been existing in sub-human conditions for centuries. Till the dawn of Independence nothing was actually done to improve their lot. Under the Indian Constitution, everyone will have to be given equal opportunity in education, employment, etc. Further, the Constitution demands that the Government shall be helpful to those sections of the society which are weak and backward. The Government has special responsibility for improving the economic conditions of the farm labourer.

The Nation's wealth and strength is located in its human resources. However, it is observed that since immemorial time our planners, economists, administrators, scientists of various technologies, educators and social scientists have given proportionately more attention to mobilize financial resources and improve the land rather than training the manpower for improving their skills and livelihood status which is one of the major parameters of the agricultural development. Consequently, it has not helped directly to build up the essential infrastructure for the benefit of rural poor which comprises landless labourer, small/marginal farmer people belonging to scheduled caste, scheduled tribes, wage earners, village artisans, agricultural labourer and resource poor farmers who are the major segment of our Indian rural society (Gaikwad 2011).

Importance of study

Agriculture is a backbone of our country. Labourer is a play an important role in agriculture activity. Labourer is one of the most important source of farm power in regions where traditional system of

agriculture is practiced. It is essential for raising their status in society. Labourer faced the problems such as low wages, illiteracy, lack of training and low socio-economic status of labourers. So, this study focus on constraints faced by labourers.

Objectives of study

1. To study the constraint faced by the farm labourer in farming.
2. To obtain the suggestions of farm labourer to avoid the constraints.

METHODOLOGY

The present research investigation was carried out in two districts i.e. Akola and Amravati of Western Vidarbha region of Maharashtra state considering the area the labourer intensive cropping pattern in selected two districts. The selection of these district was done on the basis of maximum labour force utilized. Four tahsil were selected namely Akola, Amravati, Balapur and Achalpur. From each selected tahsil, 6 villages were selected Total 24 villages were selected randomly i.e. lottery method. 240 respondents were selected randomly from selected villages. Exploratory research design of social research was used for the study.

RESULTS AND DISCUSSION

Table 1 : Distribution of the respondents according to the constraints faced by the farm labourer

Sl. No	Constraints	Frequency	Percentage	Rank
1	Lack of continuity of work	140	58.33	V
2	Lack of training, skill and technical knowledge	149	62.08	IV
3	Lack of minimum facilities at work place	182	75.83	II
4	Wage discrimination	240	100.00	I
5	Lack of awareness about spraying kit	159	66.25	III
6	Low literacy level	123	51.25	VII
7	Poor housing condition	113	47.08	VIII
8	Lack of confidence about social activity	133	55.41	VI

The Table 1 indicated that there has been great majority 100.00 per cent of respondents expressed the constraints about wages followed by 75.83 per cent of respondents expressed the constraints lack of minimum facilities at work place, 66.25 per cent of respondents expressed the lack of awareness about spraying kit, 62.08 per cent of respondents expressed the constraints of lack of training, skill and technical knowledge and 58.33 per cent of respondents expressed the lack of continuity of work.

It is also noted that 55.41 per cent of respondents expressed the constraints of lack of confidence about social activity, 51 25 per cent of respondents low literacy level, 47. 08 per cent of respondents expressed the constraints of poor housing condition.

Table 2 : Distribution of the respondents according to their suggestion to overcome the problem

Sl. No	Suggestions	Frequency	Percentage
1.	Creating alternative sources of employment	140	58.33

Sl. No	Suggestions	Frequency	Percentage
2.	Proper training for improving the skills of farm labourers	149	62.08
3.	Improving the working condition	182	75.83
4.	Paid as per minimum wages act	240	100.00
5.	Providing the special schemes and policies for overall development	113	47.08

The Table 2 reported that great majority (100.00%) of respondents suggested that paid wages maximum and it should be improved their economic condition and for better management of house. Majority i.e. 75.83 per cent of respondents suggested that improving their working condition, whereas 62.08 per cent of respondents suggested to provide the proper training to improving their skill and knowledge for better work, 58.33 per cent of respondents suggested that provide the alternative source of employment because of farm cultivation are seasonal work. Maximum 47.08 per cent of respondents suggested that the government provide the special schemes and policies for more benefitted to improving their standard of life.

CONCLUSION

The present study indicated that farm labour is an important factor in agriculture. Government has to take interest in solving their problems Government should not only invert the schemes but they have to see whether the schemes are working successfully or not. Low wages this is the most important constraints of the labourer and also lack of awareness about the spraying kit so provide the training. By this the farm labourer will come out of these problems and can lead a better life. 62.08 per cent of respondents suggested to provide the proper training to improving their skill and knowledge for better work and also suggested to 58.33 per cent of respondents provide the alternative source of employment because of farm cultivation are seasonal work.

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RESEARCH ARTICLE

Preference of digital tools among farmers and extension agents

Alan Jolly Sebastian[1], Jayalekshmi. G[2] Allan Thomas[3]

[1] M Sc. Scholar, Department of Agricultural Extesnion, College of Agriculture, Vellayani, Thiruvananthapuram, Kerala- 695522,

[2]Associate Professor& Head Krishi Vigyan Kendra, Kumarakom, Kottayam, Kerala- 686563,

[3]Associate Professor& Head Krishi Vigyan Kendra, Wayanad, Kerala- 673593

Correspondance Author email ID :

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ABSTRACT

Agriculture has improved its growth phase from subsistence to sustainable form with the help of proper transfer of information through and fro from Extension agents andFarmers. The use of digital tools can accelerate this process to the next level. The study was conducted among the farmers and Extension agents of Kerala who were using various digital tools, during the year 2018-2019. The sample of the study consist of 120 farmers 30 Extension agents from three zones of Kerala. Based on the results obtained it was found that the order of preference for digital tools were found similar for farmers and Extension agents with Mobile phone and Social Media as the most preferred tools. The extent of preference was found higher for extension agents (33.33%) compared to farmers (0.83%). Farmers preferred mobile phone for more useful for crop production and crop protection aspects and social media for marketing whereas extension agents found social media more convenient for these aspects.

Key words: Digital tools, Information and Communication Technology, Awareness, Preference, Profile Characteristics, Farmers, Extension Agents, Kerala

INTRODUCTION

Communication got a pivotal role in the development of every sector and agriculture is no exception for it. Proper and timely information helps farmers in every aspects from production of the crops to the marketing of the produce. But a huge agrarian country like India is facing a huge problem in bridging this gap since there is a clearly visible shortage in the number of extension agents with respect to the number of farmers. Farmer to Extension agent ratio is about 1162:1 and the South Indian states including Kerala are inadequate in the number of extension agents. Doubling Farmers Income Vol XI (2017).This brings us to know about the current status of awareness and preference for various digital tools by farmers and extension agents. The preference for various digital tools by Farmers and Extension agents was found and a comparative analysis was done for the extent to which those tools were preferred.

METHODOLOGY

The study was conducted in three districts of Kerala namely Kannur, Thrissur and Thiruvanathapuram representing the northern, central and southern zones of Kerala. 40 farmers and 10 extension agents were selected based on purposive random sampling a total comprising of 120 farmers and 30 extension agents. About 13 tools were identified for the study based on the expert opinion

RESULTS AND DISCUSSIONS

Experience in handling digital tools by farmers

Sl. No.	Digital Tool	Weighted Average	Rank
1	Television	4	1
2	Mobilephone	2.85	2
3	Computer	1.467	3
4	Social media	1.66	4

Television was the most experienced digital tool used by the farmers followed by mobile phone and social media. Computer and related devices were the least experienced digital tools. Television was introduced in India during 1959 and presently each and every house hold in Kerala owns a television. This might be the reason for higher experience for the same compared to other tools.

Extend of knowledge about digital tools farmers

Sl. No.	Categories	Frequency	Percentage
1.	Below Mean (<6.22)	68	56.67
2.	Above Mean (>6.22)	52	43.33
3.	Mean score	6.22	

More than half of the farmers (56.67 %) were below mean category and the remaining respondents (43.33 %) belonged to above mean category. Even though the usage of certain digital tools are found promising among farming community the extent to which they are used for agricultural purpose is less. This implies the need to create knowledge among the farming community about the digital tools. The results were in agreement with study done by Agwu et al. (2018).

Accessibility and Adoption of various digital tools by Farmers

Sl. No.	Digital Tools	Accessibility		Adoption	
		Freq	Per (%)	Freq	Per (%)
1	Television	120	100	118	98.33
2	Mobile Phone	120	100	120	100
3	Computer	67	58.33	58	48.33
4	Internet	120	100	116	96.67
5	Social media	120	100	120	100
6	Information Kisok	9	7.5	5	4.17
7	e Mail	120	100	80	66.67
8	Search Engines	120	100	76	63.33
9	Agricultural websites	57	47.50	30	25
10	Video Conferencing	62	51.67	45	37.50
11	Agricultural expert systems	31	25.83	2	1.67
12	Mobile agricultural applications	108	90	67	55.83
13	e Newspaper	109	90.83	86	71.67

Cent per cent farmers (100 per cent) were accessible to various tools such as television, mobile phone, internet services, social media, e mail and search engines, which were accessible with a smart phone with internet connection. This was followed by e newspaper (90.83 per cent) and mobile agricultural applications (90 per cent), computer (58.33 per cent), video conferencing (51.67 per cent), agricultural websites (47.50 per cent), and agricultural expert systems (25.83 per cent). Information kiosk was least accessible (7.5 per cent) for farmers. The findings were having similarity with the results put forward by Kumar (2016).

It was perceived that mobile phone and social media were adopted by all the respondents whereas more than ninety per cent of the farmers adopted television and internet. Search engines, e mail and e newspapers were adopted by more than sixty per cent of the respondents and more than half of the respondents adopted mobile agricultural applications followed by computer (48.33 per cent), video conferencing (37.50 %) and agricultural websites (25 %). Information kiosk and agricultural expert systems were adopted by 4.17 and 1.67 per cent respondents. Higher level of adoption of digital tools like mobile phone and social media may be due to the ease of use and access of these tools. The results were in agreement with the study of Pal (2018).

Experience in handling digital tools by extension agents

Sl No	Digital Tool	Weighted Average	Rank
1	Television	4	1
2	Mobile phone	2.8	2
3	Computer	1.83	3
4	Social media	1.37	4

Television was the most experienced tool followed by mobile phone, computer and social media. The higher experience in using computer than social media may be due to the familiarity with computers for office works.

Accessibility for various digital tools by Extension Agents

Sl No	Digital Tools	Accessibility	
		Freq	Per (%)
1	Television	30	100
2	Mobile Phone	30	100
3	Computer	30	100
4	Internet	30	100
5	Social media	30	100
6	Information Kisok	5	16.67
7	e Mail	30	100
8	Search Engines	30	100
9	Agricultural websites	30	100
10	Video Conferencing	21	70
11	Agricultural expert systems	22	73.33
12	Mobile agricultural applications	30	100
13	e Newspaper	30	100

Tools like television, mobile phone, computer, internet, social media, e mail, search engines, agricultural websites, mobile agricultural applications, e newspapers were accessible for all the respondents. These tools were also found to be the most popular tools available to the respondents at the time of investigation. Information kiosk was the least accessible digital tool for the extension agents. Accessibility towards information kiosk was observed in 16.67 per cent of respondents. Related findings were observed in the study of Gangadharan (2015).

Effectiveness of digital tools in solving agricultural problems

Sl .No.	Farm info	Highly Appropriate	Appropriate	Inappropriate
1	Land preparation	0	76.67	23.33
2	Seed/variety	36.67	60	3.33
3	Sowing time	16.67	70	13.33
4	Manures & fertilizers	50	50	0
5	Water management	0	53.33	46.6
6	Plant protection	46.67	53.33	0
7	Weed management	6.67	73.33	20
8	Harvesting	6.67	66.67	26.67
9	Storage	3.33	43.33	53.33
10	Weather information	26.67	70	3.33
11	Market information	26.67	70	3.33

Most appropriate information were obtained for manures and fertilizers (50 %) as well as plant protection measures (46.67 %). The data obtained for water management and storage were the least appropriate information from digital tools. The results

Sl No	Digital Tools	Wt. Avg	Rank (Farmers)	Wt. Avg	Rank (Extn Agents)
1	Television	2.47	3	2.33	5
2	Mobile Phone	2.88	1	3.00	1
3	Computer	1.51	9	2.30	6.5
4	Internet	2.38	4	2.73	3
5	Social media	2.63	2	2.87	2
6	Information Kisok	1.04	12	1.13	13
7	e Mail	1.58	7	2.50	4
8	Search Engines	1.68	6	2.30	6.5
9	Agricultural websites	1.23	10.5	2.07	9
10	Video Conferencing	1.23	10.5	1.53	11
11	Agricultural expert systems	1.02	13	1.33	12
12	Mobile agricultural applications	1.57	8	2.07	9
13	e Newspaper	2.0	5	52.07	9
			r = 0.856		

A comparative analysis on the order of preference among the various digital tools was done with the help of Spearman's Rank correlation to find out whether there is similarity in the

preference for various digital tools between farmers and extension personnel. It is clear that the rank correlation value obtained between the orders of preference for digital tools by the respondents were nearer to one, which indicated that there is a similarity between the order of preference for the digital tools by farmers and extension agents. The similarities for the order of preference between the respondents may be due to the popularity of the tools which were commonly used for communication and to gather and share information.

Comparative analysis on extent of preference for digital tools between farmers and extension agents

	Low (13-22)	Medium (22-31)	High (31-39)	Average score
Farmers (%)	31.67	67.5	0.83	23.39
Extension Agents (%)	06	6.67	33.33	28
		Z value		5.064
		p value		0.000

To find the extent of preference for digital tools between farmers and extension agents Mann-Whitney U Test was used. It was found that the calculated p value is less than 0.05, which implies that there was significant difference between the preference for digital tools between farmers and extension agents. The average score obtained for preference on digital tools was found to be more for extension agents.

Farmers and Extension agents prefers digital tools such as mobile phone and social media which were found to be most convenient for both of the groups. But the extent of usage was found more for Extension agents than farmers. Extension agents used social media and mobile phones more to disseminate information about crop production and plant protection aspects whereas farmers were more into the marketing aspects of the produce.

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RESEARCH ARTICLE

Profile of trained mushroom growers

Rajgolkar Priya J.[1], U. D. Jagdale[2] and Jyoti P. Walke[3]

1. PG student, College of Agriculture, Pune, MS (India), 2. Assistant Professor, Department of Agril. Extension and Communication, College of Agriculture, Pune, MS (India).

Corresponding Author's email : uttamdjagdale@gmail.com

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ABSTRACT

The present study was conducted in Western Maharashtra. Data were collected personally from 60 farmers from 7 districts viz., Pune, Kolhapur, Satara, Sangli, Solapur, Ahmednagar and Nashik to study the profile of trained mushroom growers. The findings of the research revealed that majority (70.00 per cent) of the respondents are young aged, more than one-third (33.33 per cent) of respondents were having diploma or graduation education, 1.67 per cent of the respondents had marginal size of land holding (Up to 1.00 ha), majority (63.33 per cent) of the respondents belonged to small family size (up to 4 members) more than half (51.67 per cent) of respondents had farming and mushroom as a family occupation, more than half (56.66 per cent) of respondents had high annual income of Rs.2,00,001 and above, half (56.66 per cent) of the respondents had medium level of sources of information, more than half (55.00 per cent) of the respondents had 'medium' social participation, majority (63.33 per cent) of the respondents had medium level of knowledge, more than half (51.66 per cent) of the respondents had attended one training more than half (53.34 per cent) of the respondents belonged to low experience in mushroom enterprise.

Keyword: Trained Mushroom grower

INTRODUCTION

Mushroom production is important not only from nutritional and medicinal point of view but for export and recycling of agro-based waste. Mushroom cultivation in India is cheap due to diverse agro-climatic condition suitable for growing different mushrooms. At present, the total mushroom production in India is approximately 1.13 lakh metric tonnes. In India, three types, namely button, oyster and paddy straw mushroom are extensively cultivated on commercial scale. All India Co-ordinated Project on Mushroom which is run by Mahatma Phule Krishi Vidyapeeth, Rahuri at College of Agriculture, Pune with the objectives to develop production technology of different types of mushroom,to popularize mushroom cultivation and producing training facilities and technical supports in terms of providing spawn to the farmers. Objective of the study is to study profile of trained mushroom growers.

METHODOLOGY

The present study was conducted in Western Maharashtra consisted of 7 districts viz.,Pune, Kolhapur, Satara, Sangli, Solapur, Ahemadnagar and Nashik. With the help of All India Co-ordinated Project on Mushroom, detailed information of mushroom growers was collected. Then by adopting randomized method of sampling, 60 growers were selected for the study from Western Maharashtra.

RESULTS AND DISCUSSION

1. Profile of trained mushroom growers

Table 1: Distribution of the respondents according to age group

Sr. No.	Age group	Respondents (n=60)	
		Number	Percentage
1	**Young (Up to 35 years)**	**42**	**70.00**
2	Middle (36 to 55 years)	11	18.33
3	Old (56 years and above)	07	11.67
	Total	**60**	**100.00**

Table 1 shows that, majority (70.00 per cent) of the respondents are young aged followed by middle aged (18.33 per cent) and old aged (11.67 per cent). From the table it could be concluded that the maximum number of respondents was from young aged group which are considered as actively working age groups of mushroom growers. The results were in conformity with the studies done by Rajni (2006).

Table 2: Distribution of the respondents according to level of education

Sr. No.	Education level	Respondents (n=60)	
		Number	Percentage
1	Primary level (I to V)	5	8.33
2	Higher primary (VI to VIII)	4	6.67
3	Secondary level (IX to X)	3	5.00
4	Higher secondary (XI and XII)	16	26.67
5	**Diploma or graduation**	**20**	**33.33**
6	Post-Graduation	12	20.00
	Total	**60**	**100.00**

Table 2 shows that more than one-third (33.33 per cent) of respondents were having diploma or graduation education, followed by higher secondary (26.67 per cent), post- graduation (20.00 per cent), primary (8.33 per cent), higher primary (6.67 per cent) and secondary education (5.00 per cent),respectively .It could be concluded that maximum respondents were having diploma or post-graduation education due to availability of good educational facility.The results were found to be on the same lines with Nagraj *et al.* (2017).

Table 3: Distribution of the respondents according to Land holding

Sr. No.	Family occupation (Score)	Respondents (n=60)	
		Number	Percent
1	**Farming+ Mushroom (3)**	**31**	**51.67**
2	Service + Mushroom (2)	20	33.33
3	Mushroom (1)	09	15.00
	Total	**60**	**100.00**

Table 3 shows that about 41.67 per cent of the respondents had marginal size of land holding (Up to 1.00 ha) followed by 20.00 per cent, 15.00 per cent and 13.33 per cent of the respondents who had small (1.01 to 2.00 ha), landless (0.00 ha) and medium (2.01 to 4.00 ha) size of land holding, respectively. Only 10.00 per cent of farmers had large size of land holding (4.01 ha and above).It could be concluded that the maximum number of respondents were having marginal size of land holding (up to 1.00 ha.) due to most of the farmers are living in urban areas. The findings were similar with Radhakrishnan A. (2014).

Table 4: Distribution of mushroom growers according to size of family

Sr. No.	Size of family	Respondents (n=60)	
		Number	Percent
1	**Small (Up to 4)**	**38**	**63.33**
2	Medium (5 to 7)	14	23.33

Sr. No.	Size of family	Respondents (n=60)	
		Number	Percent
3	High (8 and above)	08	13.34
	Total	**60**	**100.00**

Table 4 shows that majority (63.33 per cent) of the respondents belonged to small family size (up to 4 members) followed by 23.33 per cent respondents belonged to medium family size (5 to 7 members) and 13.34 per cent belonged to large family size (8 and above).

It could be concluded that the maximum number of respondents was from small size of family due to most of the families are nuclear type. The findings were similar with the Bharali (2016).

Table 5: Distribution of mushroom growers according to family occupation

Sr No	Land holding	Respondents (n=60)	
		Number	Percentage
1	Landless (No land)	09	15.00
2	**Marginal (Up to 1.00 ha)**	**25**	**41.67**
3	Small (1.01 to 2.00 ha)	12	20.00
4	Medium (2.01 to 4.00)	08	13.33
5	Large (4.01 and above)	06	10.00
	Total	**60**	**100.00**

Table 5 shows that more than half (51.67 per cent) of respondents had farming and mushroom as a family occupation, whereas one third (33.33 per cent) of the respondents had service and mushroom as a family occupation and 15.00 per cent of respondents had only mushroom as a family occupation. It could be concluded that the maximum number of respondents were having farming and mushroom as a family occupation due to most of the farmers are having land holding up to 1.00 ha. So that, subsidiary occupation as mushroom production is taken to increase their income and fulfill their requirements. The findings were similar with Jamtani *et al.* (2003).

Table 6: Distribution of mushroom growers according to annual income

Sr. No.	Annual income (Rs.)	Respondents(n=60)	
		Number	Percentage
1	Low (Up to Rs.1,00,000/-)	10	16.67
2	Medium (Rs.1,00,001/- to 2,00,000/-)	16	26.67
3	**High (Rs.2,00,001/- and above)**	**34**	**56.66**
	Total	**60**	**100.00**

Table 6 shows that more than half (56.66 per cent) of respondents had high annual income of Rs.2,00,001 and above, whereas 26.67 per cent of the respondents had medium annual income of Rs. 1,00,001 to 2,00,000. About 16.67 per cent of respondents were found in low income group i.e. up to Rs.1,00,000. It could be concluded that the maximum number of respondents were having high annual income Rs. 2,00,001 and above which are depend on farming and mushroom enterprise. The findings were similar with Archana and Natikar (2014).

Table 7: Distribution of mushroom growers according to use of sources

Sr. No	Use of sources of information (score)	Respondents (n=60)	
		Number	Percentage
1	Low (Up to 14)	16	26.67
2	**Medium (15 to 26)**	**34**	**56.66**

Sr. No	Use of sources of information (score)	Respondents (n=60)	
		Number	Percentage
3	High (27 and above)	10	16.67
	Total	**60**	**100.00**

From table 7 revealed that more than half (56.66 per cent) of the respondents had medium level of sources of information followed by farmers with low (26.67 per cent) and high (16.67 per cent) level of sources of information. It could be concluded that majority of the respondents were having medium level of sources of information such as mostly used internet, from training institutes getting of information from progressive farmers, newspaper, etc. which can provide information about mushroom production technology to the growers. The findings were similar with Gaikwad(2008).

Table 8: Distribution of mushroom growers according to social participation

Sr. No.	Social participation	Respondents(n=60)	
		Number	Percentage
1	Low (Up to 5)	16	26.67
2	**Medium (6 to 11)**	**33**	**55.00**
3	High (12 and above)	11	18.33
	Total	**60**	**100.00**

Table 8 indicated that more than half (55.00 per cent) of the respondents had 'medium' social participation, followed by 26.67 per cent of the respondents had 'low' social participation and 18.33 per cent of the respondents had 'high' social participation.

Thus, it could be concluded that more than half (87.14 per cent) of the respondents had medium social participation as mostly are well educated and are interested in getting information about new technology. The above findings were in line with the findings of Mehtab Ali (2010).

Table 9: Distribution of mushroom growers according to knowledge

Sr. No.	Knowledge (Score)	Respondents(n=60)	
		Number	Percentage
1	Less (Up to 20)	18	30.00
2	**Medium (21 to24)**	**38**	**63.33**
3	More (25 and above)	04	06.67
	Total	**60**	**100.00**

Table 9 shows that majority (63.33 per cent) of the respondents had medium level of knowledge, followed by low (30.00 per cent) and high (6.67 per cent) level of knowledge.It could be concluded that maximum number of respondents having medium level of knowledge about mushroom production technology as they get information from training institutes, internet, etc. The findings were similar to Thippeswamy (2007).

Table 10: Distribution of mushroom growers according to training received

Sr. No.	No. of training received	Respondents(n=60)	
		Number	Percentage
1	**1**	**31**	**51.66**
2	2	22	36.67
3	3 and above	07	11.67
	Total	**60**	**100.00**

Table 10 shows that more than half (51.66 per cent) of the respondents had attended one training followed by two (36.67 per cent) and 11.67 per cent respondents had attended 3 and above number of trainings.

This might be due to the fact that little training had been arranged in the villages and the small and marginal farmers were not in

reach of organizations arranging such trainings in the villages. The findings were similar with Chaudhari (2006).

Table 11: Distribution of mushroom growers according to their experience

Sr. No.	Experience	Respondents(n=60)	
		Number	Percentage
1	**Low (Up to 1 year)**	**35**	**58.34**
2	Medium (2 to 5 years)	14	23.33
3	High (Above 5 years)	11	18.33
	Total	**60**	**100.00**

Table 12 shows that more than half (53.34 per cent) of the respondents belonged to low experience in mushroom enterprise followed by medium (23.33 per cent) and high (18.33 per cent) experience in mushroom enterprise, respectively. The results showed that maximum number of respondents were having low experience in mushroom enterprise because they just started mushroom production unit as a subsidiary business. The findings were supported with Nunoo (2015).

CoNCLUSION

Majority of the respondents are from young age group, having diploma or graduation education level, marginal land holding, belongs to small size of family, doing farming plus mushroom as occupation, high income level, use medium sources of information, medium level of social participation, attended one training and having low experience. In this way, study noticed the profile of trained mushroom growers.

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RESEARCH ARTICLE

Adoption gap in recommended practices of wheat cultivation

A. S. Ghuge[1], S. P. Lambe[2], S. A. Gawande[3] and S. D. More [4]

1.M.Sc.(Agri.) student,2 Associate Professor,3 & 4 Assistant Professor

Department of Extension Education, Dr. P D K V, Akola

Corresponding Author's email : sagawande7@gmail.com

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ABSTRACT

The present study was under taken in Washim and Malegaontahsil of Washim district in Vidarbha region of Maharashtra State. Twelve villages fromWashim and Malegaontahsil were selected purposivelyfor this study. The exploratory research design of social research was used for this study. The data from 120 wheat growers were collected with the help of interview schedule.

The findings revealed that, majority (50.00%) of wheat growers belonged to middle age group, 45.83 per cent wheat growers had high school level education, 46.67 per cent wheat growers belonged to semi medium land holding, 41.67 percent of the wheat growers had annual income ranging from Rs. 1,00,001/- to Rs. 1,50,000/-, 55.00 per cent of the wheat growers had medium family size (4 to 6 members), maximum (63.33%) wheat growers use well/tube well as a source of irrigation, majority (54.17%) of the wheat growers were having area under wheat crop in the range of 1.01 to 2.00 ha. majority of wheat growers(57.50%) had medium level of social participation, maximum (58.33%) wheat growers had medium level of extension contact, majority (75.83%) of wheat growers had medium level of economic motivation, majority(58.33%) of wheat growers had medium level of knowledge and 55.00 percent had medium level of adoption of recommended practices of wheat cultivation.

The constraints faced by the wheat growers were high cost of inputs(79.17%), low market price of wheat(70.83%), crop damage by wild animal(67.50%), weather uncertainty(65.83%), non-availability of input(62.50%), high labour wages(60.33%), unavailability of labour(52.50%) etc.

INTRODUCTION

Wheat (*Triticum aestivum L.*) is the most important cereal crop for the majority of world's populations. It is the most important staple food of about two billion people (36% of the world population). wheat (*Triticum species*) is a crop of global significance. India is the second largest producer of wheat after China.In India wheatis cultivated on an area of 30.8 m ha with 98.6mt of production and productivity 3200 kg/ha in 2017-18. (FAOSTAT database) The notable wheat growing first five state in India are Uttar Pradesh (33.00%), Punjab (19.27%), Haryana (13.27%) Madhya Pradesh (9.66%), and Rajasthan (9.30%).

In Maharashtra it is grown on 12.73 lakh ha area with production of 22.16 lakh tonnes in 2017-18 year and productivity of 1740 kg/ha. (Krishi.maharashtra.gov.in). Hence, development of cultivation technologies for wheat is getting prime attention for increasing crop production. By carrying out research for many years improved cultivation technologies has been evolved at various centres, State Agriculture Universities including Dr. PDKV, Akola.

In Vidarbhawheat is grown on 4.71

lakh ha area with production 7.31 lakh tonnes in 2017-18 and productivity of 1558 kg/ha.(Krishi.maharashtra.gov.in) India's per capita production is 67 kg against per capita consumption of 73 kg/year. Thus, around 15 mt.of wheat production has to be increased by adopting improved production practices.

However, there is still a wide gap technology and its adoption by farmers. The adoption gap is major problem in efforts of increasing agricultural production in the country. A need of a day is to reduce the adoption gap between agriculture technology recommended by scientist and its acceptance by the farmers on their fields. Higher the adoption gap lesser was utilization of research recommendations. This was ultimately lower the agricultural production. Wheat crop also is not exception to this existing scenario. Therefore, this study was undertaken to ascertain the adoption gap with the following objectives.

1. To study the profile of the wheat growers
2. To study the knowledge of wheat growers about recommended practices of wheat cultivation
3. To study the adoption gap of recommended practices of wheat cultivation
4. To identify the constraints faced by the wheat growers in the use of recommended practices of wheat cultivation

METHODOLOGY

An exploratory design of social research was used for the present investigation.The present study was conducted in Washim district of Vidarbha region of Maharashtra state. Out of six taluka,Washim and Malegaon talukas were selected on the basis of maximum area under wheat crop.

A sample of 10 wheat growers from each village was selected purposively considering the higher areaunder this crop. Thus, a sample of 120 wheat growers was selected purposively from the twelve villages of selected two talukas,who were growing wheat from last 3 year.The data was collected using the interview schedule and subjected to the statistical analysis.

RESULTS AND DISCUSSION

The findings of the study as well as relevant discussion have been summarized under the following heads

Profile of Wheat growers

The selected characteristics ofwheat growers have been summarized in Table 1.

Table 1: Distribution of profile of Wheatgrowers

Sl. No.	Profile of black gram growers		Respondents (n=120)	
			Frequency	Per cent (%)
1	Age	Young	35	29.17
		Middle	60	50.00
		Old	25	20.83
2	Education	Illiterate	05	04.17
		Primary school	27	22.50
		Middle school	21	17.50
		Secondary school	55	45.83

		Higher secondary school	09	07.50
		College and above	03	02.50
3	Land holding	Marginal	04	03.33
		Small	35	29.17
		Semi-medium	56	46.67
		Medium	19	15.83
		Large	06	05.00
4	Annual income	Up to Rs. 50,000	00	00.00
		Rs. 50,001 to Rs.1,00,000	25	20.83
		Rs. 1,00,001 to Rs. 1,50,000	61	50.83
		Rs. 1,50,001 to Rs. 2,00,000	23	19.17
		Above 2,00,000	11	09.17
5	Family size	Small (Up to 03)	33	27.50
		Medium (04 to 06)	66	55.00
		Large (Above 06)	21	17.50
6	Source of irrigation	No source	00	00.00
		River	23	19.17
		Tube well / Well	76	63.33
		Dam / Canal	21	17.50
7	Area under wheat crop (ha.)	Up to 1.00 ha.	30	25.00
		1.01 to 2.00 ha.	65	54.17
		2.01 to 3.00 ha.	19	15.83
		Above 3.00 ha.	06	05.00
8	Social participation	Low (up to 0.57)	24	20.00
		Medium (0.58 to 4.69)	69	57.50
		High (Above 4.69)	27	22.50
9	Extension Contact	Low (Up to 12.24)	23	19.17
		Medium (12.25 to 22.42)	70	58.33
		High (Above 22.42)	27	22.50
10	Economic motivation	Low (Up to 21.07)	13	10.84
		Medium (21.08 to 26.81)	91	75.83
		High (Above 26.81)	16	13.33
11	Knowledge level	Low (Up to 20.92)	21	17.50
		Medium (20.93 to 32.98)	70	58.33
		High (Above 32.98)	29	24.17

From Table 1 it is observed that majority(50.00%)of wheatgrowers had middle age category, 45.83 per cent wheat growers were educated up to high school level education. Similar findings were observed by Raut (2014), Kale *et al.* (2015) andBhabhor*et. al.* (2017).

it is also observed that, majority (46.67%) of wheat growers had semi-medium category of land holding (2.01 to 4.00 ha.) and majority (50.83%) of wheat growers had annual income between Rs.1,00,001/- to Rs.1,50,000/- . Similar finding were observed byAhire (2018).

Majority (55.00%) of the wheat growers had medium family size (04 to 06 members),and 63.33 per cent of the wheat growers had well or tube well as their source of irrigation, Similar types of finding were observed by Gavade (2013) and Ghube (2014). As the wheat crop requires irrigation facility for better production, farmers used to grow it on limited area despite having more land.Thus, it is concluded from above table that majority (54.17%)of wheat growers 1.01 to 2.00 ha area under wheat crop, similar types of finding were observed by Dhenge*et al.* (2014)

Majority of wheat growers (57.50%) had medium participation in any social organizationand majority of wheat growers i.e. 58.33 per cent had medium level of extension contact.Majority (75.83%) of wheat growers had medium level of economic motivation, similar findings of Raut (2014) and Nirwan (2016).

It was also found that majority (58.33%)of the wheat growers had medium level of knowledge, similar findings was observed by Raut (2014) and Nirwan (2016).

Adoption gap

Adoption gap indicates the present status of adoption of recommended practices by the wheat growers. The results obtained after analysis of data about adoption in recommended practices by wheat growers are as below.

Sl. No.	Recommended cultivation practices of wheat crop	Individual practice score (240)	Adoption gap among respondents (%)
A	**Soil selection**		
1	Medium to heavy with good drainage	202	15.83
B	**Preparatory tillage**		
1	One deep ploughing	227	5.41
2	Harrowing (1 to 2)	233	2.91
3	10 to 15 tonnes of well rotted FYM / compost applied 4 to 6 weeks before sowing	145	39.58
C	**Recommended varieties**		
1	Irrigated timely sowing : a) AKW 1071 (Purna) b) AKAW 3722 (Vimal) c) LOK 1	211	12.08
2	Irrigated late sowing : a) AKW 381 b) HI 977 c) AKAW 4627 d) PDKV- Sardar	48	80.00

D	**Seed rate and seed treatment**		
1	Irrigated timely sowing Seed rate 100 kg/ha .	190	20.83
2	Irrigated late sowing Seed rate 150 kg/ha	56	76.66
3	Bold seeded Seed rate 125 kg/ha	65	72.91
4	Seed treatment with Thirum @ of 2.5 g/kg seed	165	31.25
E	**Sowing**		
1	Sowing time a) Irrigated timely sown: 1 – 15 Nov. b) Irrigated late sown : 16 Nov- 25 Dec.	192	20.00
2	Depth of sowing : 5 cm	192	20.00
3	Sowing method a) Use broadcasting method b) Use fertilize seed drill c) Behind local plough	216	10.00
4	Spacing between two rows a) Irrigated timely sown : 23 cm b) Irrigated late sown : 18 cm	189	21.50
F	**Irrigation**		
1	Crown root initiation stage :18 to 20 DAS	174	27.50
2	Tillering stage : within 30 to 35 DAS	163	32.08
3	Late jointing stage : within 45 to 50 DAS	172	28.33
4	Flowering stage : within 65 to 70 DAS	164	31.67
5	Milk stage: 80 to 85 DAS	158	34.17
6	Dough stage : within 95 to 100 DAS	174	27.50
G	**Interculture**		
1	Hand weeding (1 to 2 times)	188	21.67
2	Weedicide 2-4 D (Sodium salt) 1kg/500ltr. water Algrip (Metasulphuron methyl) @20 gm/ ha/500ltr. water Isoproturon50% @ 1.5 kg (25 to 30 DAS)	117	51.25
H	**Fertilizer application**		
1	Irrigated condition timely sown NPK 120:60:60	206	14.17
4	Irrigated condition late sown NPK 80:40:40	50	79.17

K	**Pest control**		
1	Termites –Chlorpyrifos 20% EC @ 2-3 lit/ha soil application or Fipronil 0.3% GR @ 20 kg/ha mix it well in the soil at time of last ploughing before sowing .	52	78.33
2	Mites, Aphids and Leaf hoppers Quinalphos 25EC@1.25liters per hectare is 1000 liters of water. Dimethoate 30EC 500 ml/ha/ 500 ltr water	66	72.50
3	Stem borer Apply 50%WP of Carbaryl @40gm in 10 liters of water.	63	73.75
4	Fields rats – Close all burrows in the evening and fumigate the reopened borrows of rate in the morning time with Bromadiolone at the rate of 1tablet of 0.5gm per small burrow and 3.0 per large burrow. In case or re-appearance in the same field bait with Bromadiolone at the rate of 1kg of prepared bait (1 part of cumarin :19 part wheat or maize flour , 1 part molasses and 1 part mustard oil).	92	61.67
L	**Disease control**		
1	Rust Grow rust resistance varieties of wheat :HD-2189, Purna, AKAW 3722, AKAW 4627 and HI 977 etc.	69	71.25
2	Brown rust Spraying of 0.2% Zineb or Mancozeb.	76	68.33
3	Black rust Treat seed with Vitavax@2.5 gm/kg of seed before planting.	56	76.67
4	Alternaria leaf blight Seed born infection controlled by treating seed with Vitavax@2.5gm/kg seed 0.2% zineb/mancozeb 75WP sprays.	66	72.50
M	**Harvesting**		
	About 15 per cent moisture in grain. Grain in hard dough stage. Yellowing of spikelets.	213	11.25

From Table 2, In case of soil selection practice, 15.83 per cent of the wheat growers had adoption gap in medium to heavy with good drainage soil practice. Whereas, wheat growers had adoption gap in preparatory tillage practices viz. one deep ploughing(5.41%), Harrowing (2.91%), FYM application (39.58%). While, wheat growers had adoption gap in recommended varieties viz. Irrigated timely sowing (12.08%), Irrigated late sowing (80.00%).

In case of seed rate and seed treatment practices, maximum (76.66%) adoption gap was found in irrigated latesowing seed rate, followed by 72.91 per cent in bold seeded seed rate and 20.83 per cent in irrigated timely sowing seed rate. Whereas, 31.25 percent adoption gap was found in seed treatment practices. While, in case of sowing 21.50, 20.00, 20.00 and 10.00 per cent adoption gap was found in practices like spacing between two rows, Sowing time, Depth of sowing and sowing method, respectively.

In case of irrigation practices maximum (34.17%) of adoption gap was found in milk stage, followed by 32.08 per cent tillering stage, 31.67 per cent flowering stage, 28.33 per cent late jointing stage and 27.50 per cent adoption gap was found in both crown root initiation and dough stage.

While, in case of inter-culture operation, 21.67, and 51.25 percent adoption gap was found in hand weeding and weedicide application, respectively. Whereas, in case of fertilizer application 79.17, and 14.17 percent adoption gap found in Irrigated condition late sown and irrigated condition timely sown, respectively.

In case of pest control 78.33, 73.75, 72.50 and 61.67 percent of adoption gap was found in termites' control, stem borer control, mites, aphids and leaf hoppers control, fields rats control practices, respectively. Whereas, disease control76.67, 72.50, 71.25 and 68.33 percentadoption gap was found in black rust control, alternaria leaf blight control, rust control and brown rust control measures, respectively. Whereas, 11.25 and 8.33 per cent of adoption gap was found in harvesting practices, respectively.

From Table 2, It is clear that maximum (80.00%) adoption gap was found in practices like Irrigated late sowing, Irrigated condition late sown fertilizer application (79.17%), TermitesPest control (78.33%), Irrigated late sowing seed rate (76.66%), control measure of black rust (76.67%), stem borer control (73.75%),bold seeded seed rate (72.91%), pest control for mites, aphids, leaf hoppers (72.50%), control measure of rust (71.25%) and control measure of brown rust (68.33%).

From above it is clear that, maximum adoption gap was found in recommended late sown varieties, seed rate, fertilizer application, pest and disease control so for recovering that adoption gap there is need of conducting programme like awareness campaign regarding late sown varieties, seed rate, fertilizer application, pest and disease control.

Constraints

The data relating to constraints faced by the wheat growers in adoption of recommended technology are shown Table 4.

Table 4: Distribution of respondents according to the constraints by them adoption of recommended practices wheat cultivation

Sl. No.	Constraints	Freq. (n=120)	percentage	Rank
1	Non availability of input	75	62.50	V

Sl. No.	Constraints	Freq. (n=120)	percentage	Rank
2	Non availability of money at proper time	60	50.00	IX
3	High labour wages	73	60.33	VI
4	High cost of inputs	95	79.17	I
5	Lack of knowledge about seed treatment	30	25.00	X
6	Non availability of improved varieties.	35	29.17	XI
7	Non availability of labour	63	52.50	VII
8	Lack of transport facilities	62	51.66	VIII
9	Low market price of wheat	85	70.83	II
10	Crop damage by wild animal	81	67.50	III
11	Weather uncertainty	79	65.83	IV

It is observed from Table 4, majority (79.17%) of the wheat growers reported that constraints of high cost of inputs, followed by 70.83 percent in low market price of wheat. Whereas, 67.50 per cent of wheat growers were reported that there is crop damage by wild animal, 65.83 per cent wheat growers reported that weather uncertainty, 62.50 per cent wheat growers had said that there non availability of input.

While, 60.33 per cent of wheat growers reported that, high labour wages, followed by 52.50 per cent of wheat growers had non availability of labour, 51.66 per cent lack of transport facilities, 50.00 per cent of wheat growers reported that, non availability of money at proper time, 25.00 per cent wheat growers had lack of knowledge about seed treatment and 29.17 non availability of improved varieties.

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RESEARCH ARTICLE

Corelates of adoption of soybean cultivation practices under farmers field school

M. R. Sonone [1], R. T. Katole[2], S. A. Gawande[3] and D. K. Nemade[4]

1.M.Sc.(Agri.) student, 2 Associate Professor , 3. Assistant Professor and
4. Assistant Professor Department of Extension Education and Dept. of Agril. Economics
Dr. Panjabrao Deshmukh Krushi Vidyapeeth, Akola
Corresponding Author's email : sagawande7@gmail.com

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ABSTRACT

The study was conducted in three tehsils of Akola district and from each tehsil four villages were selected respectively, thus total 12 villages were selected. The data was collected from 60 beneficiary and 60 non-beneficiary farmers, thus the sample of 120 farmers were drawn and information from each beneficiary and non-beneficiary farmers were collected with the help of structured and pretested interview schedule. The ex-post-facto design of social research was used for the present study.

The findings revealed that, majority of beneficiary and non-beneficiary farmers were from middle age group, had education up to secondary school, possessed semi-medium land holding, had annual income between Rs. 1,00,001/- to Rs. 2,00,000/- with medium level of farming experience, the average area under Soybean crop was 1.01 ha to 2.00 ha and the source of information, scientific orientation and economic motivation were found to be medium level in case of beneficiary and non-beneficiary farmers.

In case of beneficiary farmers, land holding, annual income, farming experience, sources of information, scientific orientation and area under soybean had positive and highly significant relationship with adoption at 0.01 level of probability and education, economic motivation at 0.05 level of probability Whereas, Age had no significant relationship with adoption. In case of non-beneficiary, education, source of information and economic motivation found to be positively significant with adoption at 0.05 level of probability. Whereas all other variables having no significant relationship with adoption

INTRODUCTION

Soybean is the richest, cheapest, and easiest source of high-quality proteins and lipids, with a wide range of applications in food and industry so it is called as "Wonder crop" or "Miracle crop"

Glycine max (L.) Merill, or soybean, is one of the world's oldest cultivated crops. The first reference of this crop can be found in Chinese literature, where it is referred to as one of China's five sacred grains. Because of its high protein content, the ancient yogis of the Indus Valley civilization used this bean to augment their meatless diet. Soybean is a major grain legume crop used in most parts of the world for a variety of purposes including food, feed, and beverages.

Soybean is one of the cash crops grown in Akola district. The Farmers Field Schools in the district are demonstrating the cultivation practices and IPM of soybean crop. However, the cultivation of Soybean is gambling with the monsoon as most of the farmers in Akola district are depended on rain. Farmers Field Schools provides all the necessary information required by the farmers in order to get good production. Examines whether the recommended

practices are adopted by farmers or not, is the question that arises. This study has been designed mainly to focus on the contribution of the personal, socio-economic, communication and psychological characteristics of farmers towards the Knowledge, adoption, productivity and annual income of farmer participants of FFS.

Farmers Field School aims to empower farmers with knowledge and skills to make them experts in their own fields, to sharpen the farmers ability to make critical and informed decisions that render their farming profitable and sustainable.

The Farmer Field School (FFS) has become an innovative, participatory and interactive model approach for farmer's education. "The aim of Farmer Field School is to build farmers capacity to analyse their production systems, identify problems, test possible situations and eventually adapt the practices most suitable to their farming system." The knowledge acquired during the learning process enables farmers to adopt their technologies to be more productive, profitable and responsive to changing conditions or to test and adopt new technologies.

Objectives

1. To study the personal, socio-economic, communication and psychological characteristics of Soybean growers of Farmers Field School
2. To study the adoption of recommended cultivation practices of soybean crop under Farmers Field School
3. To analyse the relationship between selected characteristics of Soybean growers of Farmers Field School with adoption of recommended cultivation practices

METHODOLOGY

The present study was conducted in Akola district in Vidarbha region of Maharashtra state. It was carried out in three talukas namely Akola, Murtizapur and Balapur of Akola district. In Akola district, Farmers Field Schools were organized for the farmers.

From each taluka 20 beneficiary and 20 non beneficiary farmers were selected of cotton growers. From each selected talukas, four villages was purposively selected on the basis of Farmers Field School conducted in these village and from each selected village 5 beneficiary and 5 non beneficiary farmers were selected of cotton growers. Thus, total 60 beneficiary and 60 non beneficiary cotton growers were selected purposively. The data was collected using the interview schedule and subjected to statistical analysis. An ex-post-facto research design of social research was used for present study.

RESULTS AND DISCUSSION

The findings of the study as well as relevant discussion have been summarized under the following heads

Profile of beneficiary and non-beneficiary farmers

The selected characteristics of soybean growers have been summarized in Table 1

Table 1: Distribution of profile of cotton growers

Sl. No.	profile of cotton growers	Beneficiary farmers (n=60)		Non-beneficiary farmers (n=60)	
		Frequency	Per cent	Frequency	Per cent
	Age				
1	Young	13	21.67	05	08.33

Sl. No.	profile of cotton growers	Beneficiary farmers (n=60)		Non-beneficiary farmers (n=60)	
		Frequency	Per cent	Frequency	Per cent
2	Middle	38	63.33	41	68.33
3	Old	09	15.00	14	23.34
	Education				
1	Illiterate	01	01.67	03	05.00
2	Primary school	03	05.00	13	21.67
3	Middle school	06	10.00	11	18.34
4	Secondary school	29	48.33	23	38.33
5	Higher Secondary School	14	23.33	08	13.33
6	College	07	11.67	02	03.33
	Land holding				
1	Marginal	02	03.33	07	11.67
2	Small	14	23.33	20	33.33
3	Semi-medium	26	43.33	24	40.00
4	Medium	17	28.34	09	15.00
5	Large	01	01.67	00	00.00
	Annual income				
1.	Low	16	26.67	31	51.67
2.	Medium	33	55.00	23	38.33
3.	High	11	18.33	06	10.00
	Farming experience				
1	Low	05	08.34	13	21.67
2	Medium	35	58.33	37	61.67
3	High	20	33.33	10	16.66
	Area under soybean cultivation(ha)				
1	Small (Up to 1.00)	25	41.67	35	58.33
2	Medium (1.01to 2.00)	31	51.67	25	41.67
3	High (Above 2.00)	04	06.66	00	00.00
	Source of Information				
1	Low	00	00.00	11	18.33
2	Medium	37	61.67	43	71.67
3	High	23	38.33	06	10.00
	Scientificorientation				
1	Low	00	00.00	28	46.67
2	Medium	46	76.67	32	53.33
3	High	14	23.33	00	00.00

	Economic motivation				
1	Low	00	00.00	20	33.33
2	Medium	35	58.33	37	61.67
3	High	25	41.67	03	05.00

From Table 1, it has been observed that 63.33 per cent of beneficiary farmers belonged to middle age group i.e. 36 to 50 years of age and non-beneficiary farmers old age group i.e. above 50 years to extent of 68.33 per cent, the majority of beneficiary and non-beneficiary farmers were from middle age group, with no distinction in their age group.

Majority of the of beneficiary farmers (48.33%) were educated up to secondary school level and regarding non-beneficiary farmers, 38.33 per cent were found educated up to secondary school level.

It is revealed from Table 1 that, 43.33 per cent beneficiary farmers possess semi-medium land holding i.e.2.01-4.00 ha,and the non-beneficiary farmers, 40.00 per cent of them possess semi-medium land holding i.e. 2.01- 4.00 ha, It could be concluded that, the majority of beneficiary and non-beneficiary farmers had semi-medium land holding and in case of annual income majority of the of beneficiary farmers 55.00 per cent of beneficiary farmers were found in medium level of annual income and in case of non-beneficiary farmers, 38.33 per cent from low level.

It could be seen from the Table 1 that, beneficiary farmers 58.33 per cent and non-beneficiary farmers, 61.67 per cent of them having medium level of farming experience i.e. 13 to 24 years and in case of area under soybean cultivation 51.67 per cent of the beneficiary farmers and 41.67 per cent non-beneficiary farmers has area under soybean cultivation up to 1.01to 2.00 ha. Majority of beneficiary farmers 61.67 per cent and, 71.67 per cent of non-beneficiary farmers uses medium level of source of information.

In scientific orientation majority of 76.67 per cent of beneficiary farmers and 53.33 per cent of non beneficiary farmers having medium level of scientific orientation, and economic motivation and It could be seen that, more than half i.e. 58.33 per cent of beneficiary farmers and 61.67 per cent non-beneficiary farmers having medium level of economic motivation, It could be concluded that, majority of beneficiary and non beneficiary farmers of soybean had medium level of economic motivation.

Adoption

Distribution of the beneficiary and non-beneficiary farmers according to their practice wise adoption of recommended cultivation practices of soybean crop

It is evident from Table 2 that, among cultural practices, (100%) i.e all the beneficiary soybean growers of Farmers Field School had completely adopted optimum seed rate @75 kg/ha. followed by (73.33%) of the soybean growers had completely adopted the summer ploughing for killing hibernating insects in pupal and larval stage followed by (70.00%) had completely adopted sowing operations before second week of July, 63.33 per cent farmers had complete adoption of healthy and improved seeds or recommended seeds, followed by (48.33%) farmers had adopted recommended fertilizer dose of NPK and Zinc Sulphate, (36.67%) had adopted intercropping with pigeon pea or cotton and also (36.67%) farmers had complete adoption of seed treatment with rhizobium.

Table 2. Distribution of the beneficiary and non-beneficiary farmers according to their practice wise Adoption about recommended IPM practices of soybean crop

A.	Cultural Practices	Beneficiary farmers			Non – Beneficiary farmers		
		Complete Adoption	Partial Adoption	No Adoption	Complete Adoption	Partial Adoption	No Adoption
1.	Deep summer ploughing to destroy resting stages of pest of Soybean exposing them to hot sunlight and predating birds.	44 (73.33)	16 (26.67)	00 (00.00)	37 (61.67)	23 (38.33)	00 (00.00)
2.	Complete sowing operation before 2nd week of July.	42 (70.00)	18 (30.00)	00 (00.00)	33 (55.00)	27 (45.00)	00 (00.00)
3.	Optimum seed rate @ 75 Kg/ ha.	60 (100)	00 (00.00)	00 (00.00)	45 (75.00)	15 (25.00)	00 (00.00)
4.	Seed treatment with rhizobium and PSB @ 5 + 5 gm/Kg seed	22 (36.67)	27 (45.00)	11 (18.33)	08 (13.33)	29 (48.34)	23 (38.33)
5.	Use of resistant variety JS-335, JS 93-05, JS 20-34, MAUS 71.	38 (63.33)	14 (23.33)	08 (13.34)	27 (45.00)	20 (33.33)	13 (21.67)
6.	Avoid monocropping. Used intercropping with pigeon pea or cotton.	22 (36.67)	27 (45.00)	11 (18.33)	12 (20.00)	22 (36.67)	26 (43.33)
7.	Apply fertilizer dose NPK @ 30:75:30 Kg/ha. And Zinc sulphate @ 10	29 (48.33)	20 (33.34)	11 (18.33)	23 (38.33)	18 (30.00)	19 (31.67)

	Kg/ha.						

(Figure in parenthesis indicate percentage)

B.	**Mechanical Practices**	**Beneficiary farmers**			**Non – Beneficiary farmers**		
		Complete Adoption	**Partial Adoption**	**No Adoption**	**Complete Adoption**	**Partial Adoption**	**No Adoption**
1.	Collection and destruction of girdle beetle infested plant parts, egg masses.	08 (13.33)	45 (75.00)	07 (11.67)	00 (00.00)	28 (46.67)	32 (53.33)
2.	Rouging of yellow mosaic infected plants and sclerotium affected seedlings.	14 (23.33)	40 (66.67)	06 (10.00)	02 (03.33)	32 (53.33)	26 (43.34)
3.	Erection of bird perches @ 10-12/ha.	37 (61.67)	23 (38.33)	00 (00.00)	24 (40.00)	28 (46.67)	08 (13.33)
4.	Installation of pheromone traps for early monitoring of *Spodoptera litura.*	06 (10.00)	26 (43.33)	28 (46.67)	00 (00.00)	05 (08.33)	55 (91.67)
5.	Use of Castor crop as trap crop for tobacco caterpillar and Dhaincha for Girdle beetle.	00 (00.00)	28 (46.67)	32 (53.33)	00 (00.00)	11 (18.33)	49 (81.67)

(Figure in parenthesis indicate percentage)

C.	Biological Practices	Beneficiary farmers			Non – Beneficiary farmers		
		Complete Adoption	Partial Adoption	No Adoption	Complete Adoption	Partial Adoption	No Adoption
1.	Spray of NSKE @ 5 % for management of pest.	13 (21.67)	40 (66.67)	07 (11.66)	00 (00.00)	19 (31.67)	41 (68.33)
2.	Spray SlNPV @ 250 LE/ha.	00 (00.00)	04 (06.67)	56 (93.33)	00 (00.00)	00 (00.00)	60 (100.00)
3.	Conservation of biological control agents.	15 (25.00)	38 (63.33)	07 (11.67)	00 (00.00)	17 (28.33)	43 (41.67)
4.	Use of natural pesticides such as Darshiparni arka, Jeevamrut.	12 (20.00)	28 (46.67)	20 (33.33)	00 (00.00)	14 (23.33)	46 (76.67)
5.	Use of biopesticides.	00 (00.00)	00 (00.00)	60 (100.00)	00 (00.00)	00 (00.00)	60 (100.00)
D.	**Chemical Practices**						
1.	Seed treatment for healthy and proper growth of crops. Eg:- Trichoderma and thiram as fungal antagonists.	22 (36.67)	27 (45.00)	11 (18.33)	08 (13.33)	29 (48.34)	23 (38.33)
2.	Keep close watch and regular survey of crop. If pests population level is above ETL use suitable insecticides with recommended dose/ha.	19 (31.67)	26 (43.33)	15 (25.00)	00 (00.00)	10 (16.67)	50 (83.33)
3.	Use Dichlorvos 76 EC 5 ml/ 10 lit water	43 (71.67)	17 (28.33)	00 (00.00)	34 (56.67)	26 (43.33)	00 (00.00)
4.	Use Triazophos 40 EC & 20 EC @ 12.5 ml/ 10 lit water.	38 (63.33)	22 (36.67)	00 (00.00)	32 (53.33)	28 (46.67)	00 (00.00)
5.	Use Hexaconazole @ 10 ml/ 10 lit water.	52 (86.67)	08 (13.33)	00 (00.00)	44 (73.33)	16 (26.67)	00 (00.00)

(Figure in parenthesis indicate percentage)

Distribution of the beneficiary and non-beneficiary farmers according to their practice wise adoption of recommended cultivation practices of soybean crop have been furnished in Table 2.

It is evident from Table 24 that, among cultural practices, (100%) i.e all the beneficiary soybean growers of Farmers Field School had completely adopted optimum seed rate @75 kg/ha. followed by (73.33%) of the soybean growers had completely adopted the summer ploughing for killing hibernating insects in pupal and larval stage followed by (70.00%) had completely adopted sowing operations before second week of July, 63.33 per cent farmers had complete adoption of healthy and improved seeds or recommended seeds, followed by (48.33%) farmers had adopted recommended fertilizer dose of NPK and Zinc Sulphate, (36.67%) had adopted intercropping with pigeon pea or cotton and also (36.67%) farmers had complete adoption of seed treatment with rhizobium.

Regarding mechanical practices about IPM practices of soybean (61.67%) farmers had complete adoption of the erection of bird perches @ 10-12/ha, followed by (23.33%) farmers had complete adoption of rouging of yellow mosaic infected plants and sclerotium affected seedlings and (13.33%) farmers had adopted the practice of collection and destruction of girdle beetle infested plant parts, egg masses, followed by (10.00%) farmers had complete adoption of installation of pheromone traps for early monitoring of *Spodoptera litura.*

However in case of biological practices, (25.00%) farmers had adopted conservation of biological control agents, followed by (21.67%) farmers had adoption of spray of NSKE @ 5 % for management of pest, followed by (20.00%) farmers use the botanical extracts such as Darshiparni arka, Jeevamrut etc. In case of chemical practices, (86.67%) farmers used hexaconazole, (71.67%) farmers used Dichlorovos, followed by (63.33%) farmers used Triazophos, followed by (36.67%) farmers had adopted seed treatment with thiram and trichoderma before sowing for healthy and proper growth of crops, followed by (31.67%) farmers keep close watch and regular survey of crop.

Table 3. Distribution of beneficiary and non-beneficiary farmers according to the Adoption level about recommended IPM practices of soybean crop

Sl. No.	Adoption	Beneficiary farmers (n=60)		Non-beneficiary farmers (n=60)	
		Frequency	Per cent	Frequency	Per cent
1.	Low	00	00.00	14	23.33
2.	Medium	25	41.67	35	58.33
3.	High	35	58.33	11	18.34
	Total	**60**	**100.00**	**60**	**100.00**

Data with regards to the level of adoption about recommended IPM practices for soybean crop of beneficiary and non-beneficiary farmers have been furnished in Table 3. It is indicated that, 58.33 per cent of beneficiary farmers found to have high adoption level, followed by 41.67 per cent had medium adoption level. None of the farmers found in low adoption level.

In case of non-beneficiary farmers, 58.33 per cent of them were found in medium level of adoption about recommended IPM

practices, followed by 23.33 per cent in low adoption level. Whereas,18.34 per cent of the farmers found in high adoption level.

It could be inferred from Table 3, that majority of beneficiary farmers were found in high level of adoption, whereas majority of non-beneficiary farmers found in medium level of adoption.

Coefficient of correlation between selected characteristics of beneficiary and non-beneficiary farmers of Farmers Field School with their Adoption

Table 4. Coefficient of correlation between selected characteristics of beneficiary and non- beneficiary farmers of Farmers Field School with their Adoption

Sl. No.	Characteristics	'r' value	
		Beneficiary farmers	Non-beneficiary farmers
1.	Age	0.175	0.365
2.	Education	0.264*	0.174*
3.	Land holding	0.395**	0.101
4.	Annual Income	0.451**	0.169
5.	Farming experience	0.242**	0.202
6.	Area under Soybean Cultivation	0.391**	0.135
7.	Sources of information	0.490**	0.396*
8.	Scientific orientation	0.590**	0.174
9.	Economic motivation	0.279*	0.267*

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

NS- Non Significant

The coefficients of correlation between selected characteristics of beneficiary and non-beneficiary farmers have been presented in Table 4.

It was noted from the Table 4 that, land holding, annual income, farming experience, sources of information, scientific orientation and area under soybean had positive and highly significant relationship with adoption at 0.01 level of probability and education, economic motivation at 0.05 level of probability Whereas, age had no significant relationship with adoption.

In case of non-beneficiary, education, source of information and economic motivation found to be positively significant with adoption at 0.05 level of probability. Whereas all other variables having no significant relationship with adoption.

CONCLUSION

In case of beneficiary farmers, land holding, annual income, farming experience, sources of information, scientific orientation and area under soybean had positive and highly significant relationship with adoption at 0.01 level of probability and education, economic motivation at 0.05 level of probability Whereas, Age had no significant relationship with adoption.

In case of non-beneficiary, education, sources of information and economic motivation found to be positively significant with adoption at 0.05 level of probability. Whereas all other variables having no significant relationship with adoption.

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RESEARCH ARTICLE

Impact of farmers field school on cotton growers

R. M. Agme[1], S. A. Gawande[2], R. T. Katole[3], D. K. Nemade[4] and P. M. Todasam[5]

1.M.Sc.(Agri.) student, 2.Assistant Professor, 3.Associate Professor and 4.Assistant Professor Dept of Extension Education and 4.Dept of Agril. Economic, 5. Senior Research Assistant
Dept of Extension Education, Dr. Panjabrao Deshmukh Krushi Vidyapeeth, Akola
Corresponding Author's email : sagawande7@gmail.com

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ABSTRACT

This study was conducted in Akola district of Vidarbha region of Maharashtra state. Farmer Field School is necessary to give proper guidance to the farmers. It is also important to know the proper management of farmer regarding the cultivation of crop. Farmer Field Schools are also necessary to know the constraints face by farmers.

The findings revealed that, majority of beneficiary and non-beneficiary farmers were from middle age group, had education up to secondary school, possessed semi-medium land holding, with medium level of farming experience, the average area under cotton crop was up to 0.89 to 1.32 ha and the source of information, the economic motivation and scientific orientation were found to be medium level in case of beneficiary and non-beneficiary farmers.

Constraints in Farmers Field School, which were faced by the farmers, were unavailability of pesticide on subsidized rate (60.00%), unavailability of biological agent (48.33%), unavailability of inorganic fertilizer on subsidized rate (40.00%), unavailability of good quality seed at reasonable price (43.33%), unavailability of subsidy in terms of financial assistance (41.67%).moderately perceived constraints were government has to give cotton MSP on the basis of cost of cultivation(40.00%), unavailability of Captain/ Thrum/ Carbendazium before sowing (30.00%), unavailability properly guidance of fertilizer application(28.33%).

INTRODUCTION

A Farmers Field School (FFS) is a group-based learning process. The FFS model was designed for groups of farmers who meet routinely with a trained facilitator in practical, field-based sessions during an entire production cycle. Accordingly, the FFS can be expected to have wide-ranging effects on rural livelihoods; effects that go beyond those of linear extension services. The objective of this qualitative study is to review the available evidence on FFS effects across the human, social, natural and financial capital domains of the sustainable livelihoods approach in order to inform operational programmes about the types and pathways of effects that can practicably be expected.

Cotton is essentially produced for its fibre, which is universally used as a textile raw material. Cotton is known for its versatility, performance and natural comfort. Cotton's strength and absorbency makes it an ideal fabric to make clothes and home wares, and industrial products like tarpaulins, tents, hotel sheets, army uniforms, and even astronauts' clothing choices when inside a space shuttle. Cotton is an important commodity in the world economy. Grown in more than 100 countries, cotton is a heavily traded agricultural commodity, with over 150 countries involved in exports or imports of cotton.

The Farmers Field School approach

is an effective approach to technical education and capacity building, which enable them to analyze their own production practices and identify solutions to their problem and implements his or her own decision in his or her field. Field School serve as means to better extension work, the main objective of Farmers Field School is to help the farmers to solve the problem of not only today but also for insight on future problem and to develop farmers skill, knowledge, attitude in identifying problem and taking decision of adoption on their own basis as to get a healthy crop.

Objectives

1. To study the personal, socio-economic, communication and psychological characteristic of Cotton growers of Farmers Field School.
2. To study the Impact of Farmers Field School on Cotton growers.

METHODOLOGY

The study was conducted in Akola district of Vidarbha region of Maharashtra state. An experimental research design of social research was used for present study.

Out of seven panchayat samitis in Akola district, three panchayat samitis namely, Akola, Akot and Murtizapur were selected on the basis of maximum Farmers Field School conducted on cotton crop.

From each taluka 20 beneficiary and 20 non beneficiary farmers were selected of cotton growers. From each selected talukas, four villages was purposively selected on the basis of Farmers Field School conducted in these village and from each selected village 5 beneficiary and 5 non beneficiary farmers were selected of cotton growers. Thus, total 60 beneficiary and 60 non beneficiary cotton growers were selected purposively. The data was collected using the interview schedule and subjected to statistical analysis.

RESULTS AND DISCUSSION

The findings of the study as well as relevant discussion have been summarized under the following heads

Profile of beneficiary and non-beneficiary farmers

The selected characteristics of cotton growers have been summarized in Table 1.

Table 1: Distribution of profile of cotton growers

Sl. No.	profile of cotton growers	Beneficiary farmers (n=60)		Non-beneficiary farmers (n=60)	
		Frequency	Per cent	Frequency	Per cent
	Age				
1	Young	09	15.00	09	15.00
2	Middle	30	50.00	24	40.00
3	Old	21	35.00	27	45.00
	Education				
1	Illiterate	02	03.33	06	10.00
2	Primary school	03	05.00	14	23.33
3	Middle school	07	11.67	09	15.00
4	Secondary school	30	50.00	25	41.67
5	Higher Secondary School	09	15.00	03	05.00
6	College	09	15.00	03	05.00

	Land holding				
1	Marginal	03	05.00	06	10.00
2	Small	17	28.33	21	35.00
3	Semi-medium	27	45.00	22	36.67
4	Medium	10	16.67	09	15.00
5	Large	03	05.00	02	03.33
	Annual income				
1.	Low	24	40.00	28	46.67
2.	Medium	30	50.00	24	40.00
3.	High	06	10.00	08	13.33
	Farming experience				
1	Low	02	03.33	02	03.33
2	Medium	31	51.67	30	50.00
3	High	27	45.00	28	46.67
	Area under cotton cultivation(ha)				
1	Up to 0.44	14	23.33	15	25.00
2	0.45 to 0.88	12	20.00	10	16.67
3	0.89 to 1.32	32	53.33	26	43.33
4	1.33 to 1.76	01	01.67	05	8.33
5	Above 1.76	01	01.67	04	6.67
	Source of Information				
1	Low	11	18.33	15	25.00
2	Medium	38	63.34	31	51.67
3	High	11	18.33	14	23.33
	Scientificorientation				
1	Low	12	20.00	23	38.33
2	Medium	31	51.67	30	50.00
3	High	17	28.33	07	11.67
	Economic motivation				
1	Low	07	11.67	17	28.33
2	Medium	31	51.67	26	43.34
3	High	22	36.66	17	28.33

From Table 1, it has been observed that 50.00 per cent of beneficiary farmers belonged to middle age group i.e. 36 to 50 years of age and non-beneficiary farmers old age group i.e. above 50 years to extent of 45 per cent, the majority of beneficiary and non-beneficiary farmers were from middle age group, with no distinction in their age group.

Majority of the of beneficiary farmers (50%) were educated up to secondary school level and regarding non-beneficiary farmers, 41.67 per cent were found educated up to secondary school level.

It is revealed from Table 1 that, 45.00 per cent beneficiary farmers possess semi-medium land holding i.e.2.01-4.00 ha,and

the non-beneficiary farmers, 36.67 per cent of them possess semi-medium land holding i.e. 2.01- 4.00 ha, It could be concluded that, the majority of beneficiary and non-beneficiary farmers had semi-medium land holding and in case of annual income majority of the of beneficiary farmers 50 per cent of beneficiary farmers were found in medium level of annual income and in case of non-beneficiary farmers, 46.67 per cent from low level.

It could be seen from the Table 1 that, beneficiary farmers 51.67 per cent and non-beneficiary farmers, 50.00 per cent of them having medium level of farming experience i.e. 13 to 24 years and in case of area under cotton cultivation 53.33 per cent of the beneficiary farmers and 43.33 per cent non-beneficiary farmers has area under cotton cultivation up to 0.89 to 1.32 ha. Majority of beneficiary farmers 63.34 per cent and, 51.67 per cent of non-beneficiary farmers uses medium level of source of information.

In scientific orientation majority of 51.67 per cent of beneficiary farmers and 50.00 per cent of non beneficiary farmers having medium level of scientific orientation, and economic motivation and It could be seen that, more than half i.e. 51.67 per cent of beneficiary farmers and 43.34 per cent non-beneficiary farmers having medium level of economic motivation, It could be concluded that, majority of beneficiary and non beneficiary farmers of cotton had medium level of economic motivation.

Impact

Impact of farmers field school on cotton growers has been studied in terms of change in knowledge and change in adoption.

Change in knowledge

Distribution of the beneficiary and non-beneficiary farmers according to their knowledge about recommended IPM practices of cotton crop have been furnished in Table 17.

Table 2. Distribution of the beneficiary and non-beneficiary farmers according to their practice wise knowledge about recommended IPM practices of cotton crop

Sl. No.	Practices	Beneficiary		Non-beneficiary	
		Yes (%)	No (%)	Yes (%)	No (%)
A	**Cultural practices**				
1	Deep ploughing	48 (80.00)	12 (20.00)	45 (75.00)	15 (25.00)
2	Follow the removal and destruction of alternate host of pest like weed, grasses And other plant debris	57 (95.00)	3 (05.00)	42 (70.00)	18 (30.00)
3	Avoid mono-cropping of cotton crop	41 (68.33)	19 (31.67)	38 (63.33)	22 (36.67)
4	Follow crop rotation	57 (95.00)	3 (05.00)	51 (85.00)	9 (15.00)
5	Use only certified seed	42 (70.00)	18 (30.00)	30 (50.00)	30 (50.00)
6	Use of pest resistant and tolerant varieties of cotton	54 (90.00)	6 (10.00)	27 (45.00)	33 (55.00)

Sl. No.	Practices	Beneficiary		Non-beneficiary	
		Yes (%)	No (%)	Yes (%)	No (%)
A	**Cultural practices**				
7	Proper sowing time	24 (40.00)	36 (60.00)	12 (20.00)	48 (80.00)
8	Use of quantity of seed	48 (80.00)	12 (20.00)	45 (75.00)	15 (25.00)
9	Spacing	49 (81.67)	11 (18.33)	44 (73.33)	16 (26.67)
10	Trap crop	48 (80.00)	12 (20.00)	42 (70.00)	18 (30.00)
11	Intercropping	33 (55.00)	27 (45.00)	12 (20.00)	48 (80.00)
12	Irrigation management	15 (25.00)	45 (75.00)	6 (10.00)	54 (90.00)
13	Quantity of fertilizer	36 (60.00)	24 (40.00)	27 (45.00)	33 (55.00)
14	Bird perches in cotton crop	39 (65.00)	21 (35.00)	7 (11.67)	53 (88.33)
15	Follow the hoeing in cotton field	45 (75.00)	15 (25.00)	42 (70.00)	18 (30.00)
16	Grazing of animals after last picking in cotton field	44 (73.33)	16 (26.67)	38 (63.33)	22 (36.67)
17	Burning of cotton stalks, shaded	40	20	35	25
	leaves, bolls and other plant debris the end of season	(66.67)	(33.33)	(58.33)	(41.67)
18	Avoid the rationing of cotton crop	45 (75.00)	15 (25.00)	38 (63.33)	22 (36.67)
B	**Mechanical Practices**				
1	Removal and destruction of infested shuts	52 (86.67)	08 (13.33)	40 (66.67)	20 (33.33)
2	Removal and destruction of pest infested buds and larvae of bollworm	57 (95.00)	3 (05.00)	42 (70.00)	18 (30.00)
3	Use the pheromone straps in cotton field	37 (61.67)	23 (38.33)	34 (56.67)	26 (43.33)
4	Use the yellow sticky traps in cotton field	57 (95.00)	3 (05.00)	51 (85.00)	9 (15.00)
5	Practices of detopping	42 (70.00)	18 (30.00)	30 (50.00)	30 (50.00)

Sl. No.	Practices	Beneficiary		Non-beneficiary	
		Yes (%)	No (%)	Yes (%)	No (%)
C	Physical Practices				
1	Light traps for per ha.	48 (80.00)	12 (20.00)	41 (68.33)	19 (31.67)
D	**Biological Practices**				
1	Use the parasitoid for control of pest of cotton	48 (80.00)	12 (20.00)	48 (80.00)	12 (20.00)
2	Use the predators for control of pests	57 (95.00)	3 (05.00)	42 (70.00)	18 (30.00)
3	Use the HaNPV for control of cotton bollworms	37 (61.67)	23 (38.33)	33 (55.00)	27 (45.00)
4	Use the spraying of bacterial biological insecticide (Bt) for control of bollworm	57 (95.00)	3 (05.00)	51 (85.00)	9 (15.00)
5	Spraying Neem Seed Kernel Extract (NSKE)	42 (70.00)	18 (30.00)	30 (50.00)	30 (50.00)
6	Spraying of biological insecticide at evening time	54 (90.00)	6 (10.00)	28 (46.67)	32 (53.33)
7	Avoid the spraying of toxic chemical insecticide after application of bio agents	26 (43.33)	34 (56.67)	13 (21.67)	47 (78.33)
E	**Chemical Practices**				
1	Precautions you have take while spraying the chemical insecticide	48 (80.00)	12 (20.00)	48 (80.00)	12 (20.00)
2	Avoid excesses of toxic insecticide	57 (95.00)	3 (05.00)	42 (70.00)	18 (30.00)
3	Use of chemical insecticide for seed treatment	37 (61.67)	23 (38.33)	45 (75.00)	15 (25.00)
4	Use granular pesticide in soil	57 (95.00)	3 (05.00)	51 (85.00)	9 (15.00)
5	Spraying of proper pesticide for control of sucking pest of cotton	42 (70.00)	18 (30.00)	30 (50.00)	30 (50.00)
6	Spraying of proper pesticide for control of cotton bollworms	54 (90.00)	6 (10.00)	28 (46.67)	32 (53.33)
7	Use of synthetic pyrethroids	26 (43.33)	34 (56.67)	13 (21.67)	47 (78.33)

Sl. No.	Practices	Beneficiary		Non-beneficiary	
		Yes (%)	No (%)	Yes (%)	No (%)
8	Why to use of synthetic pyrethroids	48 (80.00)	12 (20.00)	45 (75.00)	15 (25.00)
9	Rate of application of chemical insecticide used	49 (81.67)	11 (18.33)	44 (73.33)	16 (26.67)

It is observed Table 2 that most of the cultural practices in cotton are known by the farmers. Practices like follow the removal and destruction of alternate host of pest like weed, grasses and other plant debris (95.00%), Follow crop rotation (95.00%),Use of pest resistant and tolerant varieties of cotton (90.00%), Spacing (81.67%), Deep ploughing (80.00%), Use of quantity of seed (80.00%), Trap crop (80.00%) were already known by the farmers of FFS respectively. Where the non beneficiary farmers have knowledge of this cultural practices Practices like follow the removal and destruction of alternate host of pest like weed, grasses And other plant debris (70.00%), Follow crop rotation (85.00%), Use of pest resistant and tolerant varieties of cotton (45.00%), Spacing (73.33%), Deep ploughing (75.00%), Use of quantity of seed (75.00%), Trap crop (70.00%).

In mechanical and physical practices, Removal and destruction of pest infested buds and larvae of bollworm is very important practice to control the pest population and its further damage to the plant but it was known to the 70.00 per cent of non beneficiary farmers while 95.00 per cent of beneficiary farmers. Similarly only 50.00 per cent of non beneficiary farmers were known to the Practices of detopping and 70.00 per cent of beneficiary farmer. And It is observed that most of the biological practices in cotton crop are known by the farmers. Practices like Use the predators for control of pests 95 percent of beneficiary and 70 percent of non beneficiary, spraying of bacterial insecticide 95 percent of beneficiary and 85 percent of non beneficiary.

It is observed from Table 2 that most of the chemical practices in cotton crop are known by the farmers. Practice like Avoid excesses of toxic insecticide 95 percent of beneficiary and 70 percent of non beneficiary, Use granular pesticide in soil 95 percent of beneficiary 85 percent of non beneficiary, Spraying of proper pesticide for control of cotton bollworms 90 percent of beneficiary and 46.67 percent of non beneficiary.

Table 3 : Distribution of beneficiary and non-beneficiary farmers according to the knowledge level about recommended IPM practices of cotton

Sl. No.	Knowledge	Beneficiary farmers (n=60)		Non-beneficiary farmers (n=60)	
		Frequency	Per cent	Frequency	Per cent
1.	Low	00	00.00	03	05.00
2.	Medium	14	23.33	51	85.00
3.	High	46	76.67	06	10.00
	Total	**60**	**100.00**	**60**	**100.00**

Data with regards to the level of knowledge possessed by the beneficiary and non-beneficiary cotton farmers have been furnished in Table 3. It indicated that, 76.67 per cent of beneficiary farmers found to have high knowledge level, followed by 23.33 per cent medium level knowledge about recommended IPM practices of cotton. No one beneficiary farmer was found in low knowledge level.

In case of non-beneficiary farmers, 85.00 per cent of them found to have medium level of knowledge about recommended IPM practices of cotton, followed by 10.00 per cent of them having high level of knowledge whereas only 5.00 per cent of them found in low level of knowledge.

It could be inferred from Table 18 that majority of beneficiary farmers were found in high level of knowledge whereas non-beneficiary farmers in medium level of knowledge.

Change in adoption

Distribution of the beneficiary and non-beneficiary farmers according to their practice wise adoption of recommended cultivation practices of cotton crop have been furnished in Table 19

Table 4. Distribution of the beneficiary and non-beneficiary farmers according to their practice wise adoption about recommended IPM practices of cotton crop

Sl. No.	Practices	Beneficiary		Non-beneficiary	
		Yes (%)	No (%)	Yes (%)	No (%)
A	Cultural practices				
1	Deep ploughing	48 (80.00)	12 (20.00)	39 (65.00)	21 (35.00)
2	Follow the removal and destruction of alternate host of pest like weed, grasses and other plant debris	54 (90.00)	06 (10.00)	42 (70.00)	18 (30.00)
3	Avoid mono-cropping of cotton crop	37 (61.67)	23 (38.33)	34 (56.67)	26 (43.33)
4	Follow crop rotation	50 (83.33)	10 (16.67)	45 (75.00)	15 (25.00)
5	Use only certified seed	48 (80.00)	12 (20.00)	30 (50.00)	30 (50.00)
6	Use of pest resistant and tolerant varieties of cotton	52 (86.67)	8 (13.33)	32 (53.33)	28 (46.67)
7	Proper sowing time	26 (43.33)	34 (56.67)	13 (21.67)	47 (78.33)
8	Use of quantity of seed	50 (83.33)	10 (16.67)	45 (75.00)	15 (25.00)
9	Spacing	50 (83.33)	10 (16.67)	42 (70.00)	18 (30.00)
10	Trap crop	46 (76.67)	14 (23.33)	37 (61.67)	23 (38.33)
11	Intercropping	35 (58.33)	25 (41.67)	24 (40.00)	36 (60.00)

12	Irrigation management	29 (48.33)	31 (51.67)	15 (25.00)	45 (75.00)
13	Quantity of fertilizer	39 (65.00)	21 (35.00)	28 (46.66)	32 (53.34)
14	Bird perches in cotton crop	41 (68.33)	19 (31.67)	32 (53.33)	28 (46.67)
15	Follow the hoeing in cotton field	49 (81.67)	11 (18.33)	46 (76.67)	14 (23.33)
16	Grazing of animals after last picking in cotton field	45 (75.00)	15 (25.00)	43 (71.67)	17 (28.33)
17	Burning of cotton stalks, shaded leaves, bolls and other plant debris the end of season	46 (76.67)	14 (23.33)	42 (70.00)	18 (30.00)
18	Avoid the rationing of cotton crop	48 (80.00)	12 (20.00)	45 (75.00)	15 (25.00)
B	**Mechanical Practices**				
1	Removal and destruction of infested shuts	52 (86.67)	8 (13.33)	48 (80.00)	12 (20.00)
2	Removal and destruction of pest infested buds and larvae of bollworm	57 (95.00)	3 (05.00)	42 (70.00)	18 (30.00)
3	Use the pheromones traps in cotton field	43 (71.67)	17 (28.33)	40 (66.67)	20 (33.33)
4	Use the yellow sticky traps in cotton field	56 (93.33)	4 (06.67)	51 (85.00)	9 (15.00)
5	Practices of de topping	42 (70.00)	18 (30.00)	28 (46.67)	32 (53.33)
C	**Physical Practices**				
1	Light traps for per ha.	50 (83.33)	10 (16.67)	46 (76.67)	14 (23.33)
D	**Biological Practices**				
1	Use the parasitoid for control of pest of cotton	44 (73.33)	16 (26.67)	29 (48.33)	31 (51.67)
2	Use the predators for control of pests	54 (90.00)	6 (10.00)	28 (46.67)	32 (53.33)
3	Use the HaNPV for control of cotton bollworms	39 (65.00)	21 (35.00)	24 (40.00)	36 (60.00)
4	Use the spraying of bacterial biological insecticide (Bt) for control of bollworm	50 (83.33)	10 (16.67)	46 (76.67)	14 (23.33)
5	Spraying Neem Seed Kernel Extract (NSKE)	45 (75.00)	15 (25.00)	43 (71.67)	17 (28.33)

6	Spraying of biological insecticide at evening time	52 (86.67)	8 (13.33)	42 (70.00)	18 (30.00)
7	Avoid the spraying of toxic chemical insecticide after application of bio agents	38 (63.33)	22 (36.67)	36 (60.00)	24 (40.00)
E	**Chemical Practices**				
1	Precautions you have take while spraying the chemical insecticide	49 (81.67)	11 (18.33)	42 (70.00)	18 (30.00)
2	Avoid excesses of toxic insecticide	55 (91.67)	5 (08.33)	32 (53.33)	28 (46.67)
3	Use of chemical insecticide for seed treatment	38 (63.33)	22 (36.67)	24 (40.00)	36 (60.00)
4	Use granular pesticide in soil	53 (88.33)	7 (11.67)	28 (46.67)	32 (53.33)
5	Spraying of proper pesticide for control of sucking pest of cotton	41 (68.33)	19 (31.67)	21 (35.00)	39 (65.00)
6	Spraying of proper pesticide for control of cotton bollworms	52 (86.67)	8 (13.33)	46 (76.67)	14 (23.33)
7	Use of synthetic pyrethroids	40 (66.67)	20 (33.33)	39 (65.00)	21 (35.00)
8	Why to use of synthetic pyrethroids	48 (80.00)	12 (20.00)	42 (70.00)	18 (30.00)
9	Rate of application of chemical insecticide used	49 (81.67)	11 (18.33)	45 (75.00)	15 (25.00)

It is revealed from Table 4 that most of the cultural practices in cotton are adopted by the farmer. Practices like Follow the removal and destruction of alternate host of pest like weed, grasses and other plant debris 90 percent of beneficiary and 70 percent of non beneficiary, crop rotation 83.33 percent of beneficiary and 75 percent of non beneficiary, rationing of cotton crop 80 percent of beneficiary and 75 percent of non beneficiary were already adopted. Adoptions of almost all the cultural practices were increased with the help of FFS.

Most of the mechanical and physical practices in cotton crop were adopted by the farmers. Practices like Removal and destruction of pest infested buds and larvae of bollworm 95 per cent of beneficiary and 70 percent of non beneficiary, yellow sticky traps 93.33 per cent of beneficiary and 85 per cent of non beneficiary, detopping 70 per cent of beneficiary and 46.67 percent of non beneficiary were already adopted

Most of the biological practices in cotton are adopted by the farmers. Practices like use of parasitoid 73.33 percent of beneficiary 48.33 percent of non beneficiary, use of predators 90.00 percent of beneficiary 46.67percent of non beneficiary, and in case of chemical practices like, avoid excess use of insecticide 91.67 percent of beneficiary and 53.33 percent of non beneficiary, chemical seed treatment 63.33 percent of beneficiary and 40.00 percent of non beneficiary, control of sucking pest using proper pesticide 68.33 percent of beneficiary and 35.00 percent of non beneficiary were followed .Adoption of almost all the chemical practices was increased due to the FFS.

Table 5. Distribution of beneficiary and non-beneficiary farmers according to the adoption level about recommended IPM practices of cotton

Sl. No.	Adoption	Beneficiary farmers (n=60)		Non-beneficiary farmers (n=60)	
		Frequency	Per cent	Frequency	Per cent
1.	Low	00	00.00	04	06.67
2.	Medium	07	11.67	49	81.66
3.	High	53	88.33	07	11.67
	Total	**60**	**100.00**	**60**	**100.00**

Data with regards to the level of adoption about recommended cultivation practices of cotton of beneficiary and non-beneficiary farmers have been furnished in Table 5. Indicated that, 88.33 per cent of beneficiary farmers found to have high adoption level, followed by 11.67 per cent in medium adoption level. No one beneficiary farmer was found in low adoption level.

In case of non-beneficiary farmers, 81.66 per cent of them found in medium level of adoption about recommended cultivation practices of cotton, followed by 06.67per cent of them having low level of adoption whereas 11.67 per cent of non-beneficiary farmers found in high level of adoption.

It could be inferred from Table 5 that majority of beneficiary farmers were found in high level of adoption whereas non-beneficiary farmers in medium level of adoption.

Impact of Farmers Field School of cotton on the beneficiary farmers over non-beneficiary farmers

Mean score of the dimensions of impact, their per cent change are furnished in table 6

A cursory look at Table 6 revealed that, mean score of knowledge (74.87), adoption (76.79), of the beneficiary famers were found to be higher than mean score of knowledge (64.25), adoption (53.29), of the non-beneficiary famers. It was also found that there was change in knowledge, adoption, and to the tune of 16.53 and 44.09 percent respectively of beneficiary farmers over non-beneficiary farmers as a result of impact of Farmers field school. Thus, it could be stated that farmer's field school had created positive impact on beneficiary farmers.

Table 6. Impact of farmers field school of cotton on the beneficiary farmers over non-beneficiary farmers

Sl. No.	Impact dimension	Mean score		Per cent Change
		Beneficiary farmers	Non-Beneficiary farmers	
1.	Knowledge	74.87	64.25	16.53
2.	Adoption	76.79	53.29	44.09
	Mean Impact			**30.31**

When the impact of farmers field school as whole was considered, it is evident from Table 6 that, there was total 30.31 per cent impact of FFS on the beneficiary famers when compared with non-beneficiary farmers. It could therefore, be stated that

there was definite impact of farmers field school on the beneficiary farmers in terms of change in knowledge, and change in adoption to the extent of 30.31 per cent .

5.3.1 Testing the significance difference of the means

In order to test the variability of means of knowledge and adoption of beneficiary farmer and non- beneficiary farmers. The data were subjected to 'Z' test and the results thus obtained have been presented in Table 7.

Table 7. Testing the significance difference of the means in knowledge, adoption, productivity, annual income of beneficiary farmers and non- beneficiary farmers

Sl. No.	Impact dimension	Mean score		'Z' value
		Beneficiary farmers	Non-Beneficiary farmers	
1.	Knowledge	74.87	64.25	10.52**
2.	Adoption	76.79	53.29	9.63**

The 'z' values of knowledge (10.52) and adoption (9.63) found significant at 0.01 level of probability.

It could therefore, be inferred that the beneficiary farmers differ significantly over non-beneficiary farmers in knowledge and adoption. It could therefore, be explicitly stated that there was definite change in knowledge and change in adoption among beneficiary farmers over non-beneficiary farmers as result of Farmers Field School, it could definitely be stated that the Farmers Field School had a positively significant impact on the beneficiary farmers.

CONCLUSION

Impact of farmer's field school on cotton grower it was studied in term of change in knowledge and change in adoption over non-beneficiary farmers.

Mean score of knowledge (74.87) and adoption (76.79), of the beneficiary famers were found to be higher than mean score of knowledge (64.25) and adoption (53.29), of the non-beneficiary famers. It was also found that there was change in knowledge and adoption to the tune of 16.53 and 44.09 per cent respectively of beneficiary farmers over non-beneficiary farmers as a result of impact of Farmers field school. The 'z' values of knowledge (10.52) and adoption (9.63) were found significant at 0.01 level of probability.

Thus, it could be stated that farmer's field school had created positive impact on beneficiary farmers.

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RESEARCH ARTICLE

Problems faced by the tribal farmers in their livelihood and suggestion given by them for better livelihood in Yavatmal district of vidarbha region

Simral Kilnake[1], Y. B. Shambharkar[2], R. T. Katole[3] and S. N. Gajghate[4]

1. M.Sc. (Agri.) student, 2. Assistant Professor, 3. Associate Professor Department of Extension Education, Dr. PDKV, Akola , 4. Principal, Agriculture Technical School, Mul Maroda, Dist.: Chandrapur

Corresponding Author's email : sagawande7@gmail.com

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ABSTRACT

The present study titled "Assessment of Livelihood Status of Tribal Farmers" was undertaken in Yavatmal district of Vidharbh region of Maharashtra state during the year 2020-21. The ex-post facto analytical research design was used for the study. A total sample comprising of 150 farmers as respondents were selected from 10 villages by using random sampling method. The data was collected with the help of pre-tested interview schedule by personally interviewing the respondents.

The findings of the study indicated that, among the natural resource related problems cent per cent (100.00%) of the farmers have expressed that 'erratic rainfall. Among technical problems, majority (90.67%) of the respondents were strongly expressed that poor accessibility of extension agencies for technical guidance. With regards to financial problems, most prominent financial problems identified by the farmers were procedural delays in obtaining farm loans' (39.33%). In case of market related problems elicited by farmers, are lack of remunerative prices for the farm produce (64.67%). Among policy related problems, lack of awareness about the value addition of the farm produce was the problem expressed by 71.33 per cent of the respondents.

With regards to suggestion given by tribal farmers for their better livelihood majority of the respondents 81.33 per cent of respondents expressed that Government should provide year round employment guarantee schemes in the agricultural slack seasons. Maximum number of the respondents (68.00%) has strongly suggested that awareness training programmes about the value addition of the farm produce should be organized by Agricultural Universities/Department of Agriculture. Maximum number of the respondents (66.00%)

INTRODUCTION

Tribal communities live in about 15.00 per cent of the country's area, in various ecological and geo- climatic conditions ranging from plains, forests, hills and educational development. At one end of the spectrum are a few tribal groups that have adopted a mainstream way of life, while at the other end, there are others, who are still primitive. There are over 500 scheduled tribes in India notified under article 342 of the constitution of the India, spread over different states and union territories of the country. It is an established fact that the tribal economy is mainly based on agriculture and minor forest produce. India has one of the largest concentrations of tribal population in the world. As per the 2011 census, the scheduled tribe population in India is 10.43 crores, constituting 8.6% of the total population. 89.97% of them lives in rural area and 10.03% in urban areas.

The main tribes in Maharashtra are the Bhils, the Gonds, the Mahadeo Kolis, the Pawras, the Thakurs and the Varlis. There are three tribes Viz., the kolams (Yavatmal district), the katkaris (mainly in thane and raigad districts) and the madia gonds (Gadchiroli district), which have been notified as primitive tribes by the government of India. There are 35 districts in state and the tribal population is largely concentrated in the western hilly districts of Dhule, Nandurbar, Jalgao, Nashik, and Thane (Sahyandri region). And the eastern forest districts of Chandrapur, Gadchiroli, Bhandara, Gondia, Nagpur, Amravati and Yavatmal (Gondwana region).

The Vidarbha region of Maharashtra state consists of 11 districts having a large, proportion of tribal population. Gadchiroli (38.75%), Chandrapur (19.70%), and Yavatmal (21.47%) districts have a larger percentage of tribal population as compared to other districts. In these districts Gonds, Pardhans and Kolam are major tribes followed by Korku and others. Gonds, who are numerically predominant, are a part of Gond tribes accounting for one of the major tribal groups in India followed by Mundas. Traditional knowledge of handcrafts among Gonds in general and among Gonds of Chandrapur and Gadchiroli districts in particular, attracts attention. An attempt has been made to present the traditional knowledge and skills, specially related to wood craft and bamboo craft of Bond tribes of Vidarbh region.

Livelihood is defined as the ways and means of living to meet the basic minimum necessities of the individual farmer as well as his family. The livelihoods idea was first introduced by the Brundtland Commission on Environment and Development as a way of linking socioeconomic and ecological considerations in a cohesive, policy relevant structure. Livelihood security is the ability of a household to meet its basic needs like food, health, shelter and minimal levels of income basic education and community participation. Livelihood can be made up of a range of on farm and off farm activities which together provide a variety of procurement strategies for food and cash. Thus, each household can have several possible sources of entitlement which constitute its livelihood. The idea of livelihood security as explained above embodies three fundamental attributes 1) possession of human capabilities 2) Access to other tangible and intangible assets 3) The existence of economic activities. The interaction among these attributes defines what livelihood strategy a household peruses. For tribal people land is important source of livelihoods. Their economy was primarily agro based. Land is the only tangible assets for them. Apart from land forest is the second source of their livelihood. Their economy was subsistence in nature. There are many tribal studies conducted by different anthropologists and other social scientists which focuses on tribal and their problems by using different phenomenon. But there are limited studies available on the tribal in Vidarbha region based on their livelihood supports systems. Hence, the present piece of investigation has been undertaken.

METHODOLOGY

Yavatmal district of Vidarbha region of Maharashtra State was purposively selected for the present study as a tribal and distress prone district. An ex-post facto research design was followed to carry out the study since the variables chosen for the study already occurred.

Selection of talukas

Yavatmal district having 16 talukas and all are having considerable tribal population, zari jamni, kelapur, pusad, talukas are having highest tribal population. Zari jamni and kelapur talukas were selected purposively.

Selection of villages

Amongst selected talukas consecutive five (5) villages were selected purposively based on more number of tribal farmers Thus, from two talukas ten (10) villages were selected.

Selection of respondents

From each of the selected village, 15 tribal farmers as respondents were selected randomly. Thus from ten villages, 150 respondents were selected as sample of study. The list of the selected villages and number of respondents is given in Table. 1.

Table 1. Name of villages with number of respondents selected from each village

Sr. No.	District	Taluka	Villages	Respondents
1	Yavatmal	Zari jamni	Bailampur	15
2			Mangali	15
3			Khapri	15
4			Khatera	15
5			Jamni	15
6		Kelapur	Ghanmod	15
7			Pahapal	15
8			Pimpari	15
9			Kegaon	15
10			Wedad	15
		Total		**150**

RESuLtS ANd DiSCussiON

Table No. 2. Problems of the tribal farmers in their livelihood

Sr. No	Problems	Frequency	Percentage
	Natural related problems		
1	Erratic rainfall and cumulative droughts over year	150	100.00
2	Lack of irrigation facilities	99	66.00
	Technical problems		
3	Untimely and good quality of inputs like seeds, fertilizers, pesticides and other chemicals.	102	68.00
4	Poor accessibility of extension agencies for technical guidance	136	90.67
	Financial problems		
5	Procedural delay in obtaining farm loans	59	39.33
	Market related problems		
6	Lack of remunerative prices for the farm produce and high price fluctuation	97	64.67

7	Poor market conditions and high interference of middle men at each and every stage in the regulated markets	64	42.67
8	Lack of market intelligence information	92	61.33
	Policy related problems		
9	Lack of awareness about the value addition of the farm produce.	107	71.33
10	Lack of year round employment guarantee schemes in the agricultural slack seasons	89	59.33
11	Lack of awareness about the subsidiary occupations/alternative enterprises	100	66.67

From Table 2 the problems were classified into natural resources related, technical, financial, market related and policy related problems.

Natural resource related problems.

Among the natural resource related problems cent per cent (100.00%) of the farmers have expressed that 'erratic rainfall and cumulative droughts over years' followed by lack of irrigation facilities (66.00%).

Technical problems

Among the technical problems, majority (90.67%) of the respondents were strongly expressed that poor accessibility of extension agencies for technical guidance followed by (68.00%) of the farmers expressed ' untimely and good quality of inputs like seeds, fertilizers, pesticides and other chemicals as a problem

Financial Problems

The most prominent financial problems identified by the farmers was procedural delays in obtaining farm loans' (39.33%).

Market related problems

The major market related problems elicited by farmers are lack of remunerative prices for the farm produce (64.67%) and high price fluctuation followed by lack of market intelligence information (61.33%) and poor market conditions and high interference of middle men at each and every stage in the regulated markets (42.67%).

Policy related problems

Lack of awareness about the value addition of the farm produce was the problem expressed by 71.33 per cent followed by lack of awareness about the subsidiary occupations/alternative enterprises" were problem expressed by 66.67 per cent respondents. The respondents 59.33 per cent were expressed lack of year round employment guarantee schemes in the agricultural slack seasons was found predominantly among the policy related problems (Table 2).

Table No. 3. Suggestions of the tribal farmers for their better livelihood

Sr. No	Suggestions	Frequency	Percentage
1	Supply of timely and good quality of inputs like seeds, fertilizers, pesticides and other chemicals availability.	120	80.00

2	Government should provide the irrigation facilities	100	66.67
3	Government should make available the institutional credit and procedural early in obtaining farm loans.	86	57.33
4	Government should provide remunerative prices for the farm produce and avoid high price fluctuation	99	66.00
5	High interference of middle men at each and every stage in the regulated markets should be avoided	79	52.67
6	Trainings should be provided about market intelligence	93	62.00
7	Awareness training programmes about the value addition of the farm produce should be organized by Agril. Universities/Department of Agriculture.	102	68.00
8	Government should provide year round employment guarantee schemes in the agricultural slack seasons	122	81.33
9	Trainings should be organized about the subsidiary occupations/alternative enterprises by the Agril. Universities/Department of Agriculture	91	60.67

It is evident from Table 3 that, majority of the respondents 81.33 per cent of respondents expressed that Government should provide year round employment guarantee schemes in the agricultural slack seasons followed by (80.00%) of respondents expressed that supply of timely and good quality of inputs like seeds, fertilizers, pesticides and other chemicals availability

Maximum number of the respondents (68.00%) has strongly suggested that awareness training programmes about the value addition of the farm produce should be organized by Agril. Universities/Department of Agriculture followed by (66.67%) respondents has expressed that Government should provide the irrigation facilities.

Maximum number of the respondents (66.00%) suggested that Government should provide remunerative prices for the farm produce and avoid high price fluctuation where, as 56.66 per cent respondents suggested that trainings should be provided about market intelligence.

Maximum proportion of the respondents (60.00%) equally suggested that trainings should be organized about the subsidiary occupations/alternative enterprises by the Agril. Universities / Department of Agriculture and (57.33%) respondents suggested that Government should make available the institutional credit and procedural early in obtaining farm loans.

More than fifty per cent of the respondents (52.67%) suggested that high interference of middle men at each and every stage in the regulated markets should be

avoided for the better livelihood of the farming community.

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RESEARCH ARTICLE

Personel and infrastructural expectations of enrolled students from college of agriculture, Muktainagar (MS)

Balasaheb Romade[1], Riyajakhtar Shaikh[2] and Umrao Bondar[3]

1. Assistant Professor, College of Agriculture, Muktainagar (M.S)

Correspondence AuthorEmail : drbdr2016@gmail.com

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ABSTRACT

College of Agriculture, Muktainagar District Jalgaon was the first Government educational institute related to agriculture in the Jalgaon district of North Maharashtra established on 02 September, 2015 with a vision to impart agricultural education and uplift the socio-economic status of farmer and agricultural based community. The college was affiliated to Mahatma Phule Krishi Vidyapeeth, Rahuri District Ahmednagar from 2015. It is one of the leading college in agriculture science and technology. Every year, there were 60 students got admission in the B.Sc. (Hons.) Agriculture. They had different personal and infrastructural expectations through which they got the admission in agriculture field. With this background, a research study entitled "Study on personal and infrastructural expectations of enrolled students of college of agriculture, Muktainagar, District Jalgaon" was formulated with the following specific objectives. To know the profile of the respondents and to know the personal and infrastructural expectations.

The results indicates that the majority of students were belonged to Western/paschim region of Maharashtra state, maximum students were belonged to percentage range between 70.01-80.They had marginal and small size land holding, majority students had nuclear family and small size family and farming was the major occupation of father/guardian of the respondents. Majority of the respondents had medium level of personal, infrastructural (college) and overall expectations.

Keywords : Enrolled student, Expectations, Muktainagar.

INTRODUCTION

The well-known politician of Maharashtra state, Jansevecha Manbindu Shri. Eknathrao Khadse, he was a former member of Legislative Assembly of Maharashtra from Muktainagar constituency for six consecutive terms till 2019. Minister of Revenue, Agriculture, State Excise of Maharashtra (October 2014 to June 2016). Hailing from influential Leva Patil community in North Maharashtra. He was generously donated 40 ha. land from Leva Patil samaz trust and release Rs. 21cr amount from Maharashtra Government for the construction of an agriculture college at Muktainagar, which is geographically located in North Maharashtra. The tahsil Muktainagar falls in Jalgaon district situated in Maharashtra state. The size of the area is about 784.64 square kilometre. Accordingly, a site was selected near Jalgaon – Burhanpur (MP) highway No. 53, which is in 3 km. from Muktainagar town. The area of 40 hectares was an under construction, better management and development of farm area. The construction of main college administrative building with laboratories, lecture halls and library building with reading halls, students hostel buildings, guest house, gym, residential quarters etc. buildings construction work is completed

around this period. Each building was provided with irrigation and drainage facilities and connecting roads.

For the better development of facilities and students interest and with this background a research study entitled "Study on personal and infrastructural expectations of enrolled students of college of agriculture, Muktainagar, District Jalgaon" was formulated with the following specific objectives.

Objectives

(1) To know the profile of the respondents

(2) To know the expectations of the respondents.

METHODOLOGY

The study was carried out in College of Agriculture, Muktainagar, District. Jalgaon. The data was collected through Google form. "Ex-post facto design" was employed in the present investigation as the events have already occurred and design was considered appropriate. For this, study all the enrolled students of B.Sc. (Hons.) Agriculture, were selected for the study. Total strength was 180 students. However, total numbers of respondents were 140.

The actual work of data collection was done during the period of November 2021; all the 140 respondents were present in study. The statistical parameters included were frequency, percentage, rank, mean and standard deviation.

REsUltS and DiScusSiON

Profile of the students

Table 1 : Distribution of respondents according to their profile **n=140**

A	Location of students	Frequency	Percent
1	Vidarbha Region	14	10.00
2	Marathwada Region	07	05.00
3	Konkan Region	01	00.71
4	Western/Paschim Maharashtra	114	81.43
5	Out of Maharashtra	04	02.86
B	**Percentage of 12th Standard**	**Frequency**	**Percent**
1	Below 51.00 %	02	01.43
2	51.01 to 60.00 %	21	15.00
3	60.01 to 70.00%	44	31.43
4	70.01 to 80.00 %	52	37.14
5	80.01 to 90.00 %	19	13.57
6	Above 90 %	02	01.43
C	**Size of the land holding Parent's/Guardian**	**Frequency**	**Percent**
1	Marginal land holding (Less than 1.00 ha.)	41	29.29
2	Small land holding (Between 1.01 to 2.00 ha.)	41	29.29
3	Medium land holding (Between 2.01 to 4.00 ha.)	35	25.00
4	Large land holding (More than 4.00 ha.)	19	13.57

5	Land less (No land)	04	02.85
D	**Type of family**	**Frequency**	**Percent**
1	Nuclear family	98	70.00
2	Joint family	42	30.00
E	**Size of family**	**Frequency**	**Percent**
1	Small family(Up to 4 members)	65	46.43
2	Medium family(5 to 7 members)	57	40.71
3	Big family (8 or more than 8 members)	18	12.86
F	**Father/ Guardian occupation**	**Frequency**	**Percent**
1	Farming	80	57.14
2	Farming + Animal Husbandry	10	07.14
3	Service	38	27.14
4	Business	07	05.00
5	Others	05	03.57

The table 1 shows that major segments of the respondents (81.43 percent) were belonged to Western/paschim Region of Maharashtra followed by 10.00 percent, 5.00 percent, 2.86 percent and 0.71 percent were belonged to Vidarbha Region, Marathwada Region of Maharashtra, Out of Maharashtra and Konkan region, respectively. It is apparent that major segments (37.14 per cent) of the students had belonged to 70.01 to 80% category followed by 31.43, 15.00, 13.57 percent students belonged to 60.01 to 70 %, 51.01 to 60 %, 80.01 to 90 % and below 51% and above 90% categories 1.43%, respectively and 29.29 percent of respondent's parent/guardian had marginal and small size of land holding followed by 25.00 percent and 13.57 percent of respondent's parent/guardian had medium and large size of land holding, respectively. Only 2.85 percent of respondent's parent/guardian had land less (no land). This may be due to land fragmentation among family members and also urbanization, too. This clearly indicates that the agricultural land availability is decreasing day by day that may cause a chronic food shortage in near future.

The data presented in table 1 indicated that majority (46.43 percent) of students belonged to small size family followed by 40.71 percent and 12.86 percent belonged to medium size family and big size family, respectively and majority (70.00 percent) of the students belonged to nuclear family system and remaining of them 30.00 percent belonged to joint family system. The data in table 1 is represented that majority (57.14 percent) of the father/guardian of students had faming as an occupation, while 27.14 percent, 7.14 percent, 5.00 percent and 3.57 percent had Service, Farming + animal husbandry, business and others type occupation, respectively. The results clearly indicate that the interest of the guardian is increasing towards service as compared with farming and stood second number in preference. The are supported with Vihariya *et al* (2017) and Harsh Parmar and N.M. Chauhan. (2018).

Expectations of the respondents

Table 2: Distribution of respondents according to their personal expectations n=140

Sr. No.	Personal expectations	Frequency	Percent	Rank
1	Government Service	91	65.00	I
2	Good salary	62	44.28	II
3	Civil Services	56	40.00	III
4	To go for PG	49	36.03	IV
5	Higher education	49	36.03	V
6	Own Entrepreneur / Business	48	34.28	VI
7	Own farming	35	25.74	VII
8	Become Scientist/Professor in Agriculture field	33	24.26	VIII
9	To join social service	24	17.14	IX
10	Private Sector Services	21	15.44	X
11	To own agro centre	18	13.24	XI
12	Higher studies in Abroad	14	10.30	XII
13	Establish nursery	10	07.35	XIII
14	To join Politics after degree	07	05.15	XIV

It is evident from table 2 that, government service was the major personal expectations among students hence, government service was ranked first followed by good salary, civil services, to go for PG, higher education, own entrepreneur / business, own farming, become scientist/professor in agriculture field, to join Social Service, private sector services, to own agro centre, higher studies in abroad, establish nursery, to join politics after degree and were ranked second, third, fourth, fifth, sixth, seventh, eighth, ninth, tenth, eleventh, twelfth, thirteen and fourteen respectively.

From this result it can be concluded that the first expectations is to get government service followed by getting higher salary. It is understandable that, the government service with higher salary to live better is the first preference of the student. Further looking to the increasing an importance and demand of agricultural knowledge in society they want to get higher study and complete post graduation for further upliftment. If it is not occurred they are ready to cultivate their hereditary land with scientific manner as well as they are enthusiastic to start their own Agri business. This all are good sign for better agricultural growth and better agricultural prospectus.

In the foregoing discussion showing the personal expectations of students, the researcher further analyzed the same data for level of personal expectations. These were categorized into three as (I) Low level of personal expectations (II) Medium level of personal expectations (III) High level of personal expectations.

Table 3: Distributions of respondents according to their level of personal Expectations n=140

Sr. No.	Personal Expectations	Frequency	Percent
1	Low Personal Expectations	36	25.68
2	Medium Personal Expectations	95	65.41
3	High Personal Expectations	09	08.91

The data in table 3 indicated that, majority (65.41 percent) of students had medium level of personal expectations while 25.68 percent had low level of personal expectations and 8.91 percent had high level of personal expectations. These results in the line of previous researchers, Chauhan and Sangada. J. (2016), Harsh Parmar and N.M. Chauhan. (2018) .

Expectations about infrastructural facilities of College Campus

Expectations about infrastructural facilities of college campus were divided in 18 different categories. According to frequency and percent, rank should be given to the college expectations. The data is presented in table 4.

Table 4 : Distribution of respondents according to their expectations about infrastructural facilities of college Campus n=140

Sr. No.	Expectations about infrastructural facilities of college campus	Frequency	Percent	Rank
1	Well-equipped library	115	82.14	I
2	Competitive Exam preparation facility	114	81.43	II
3	Sufficient infrastructural facilities at campus	113	80.71	III
4	Drinking Water/RO system facility in hostel	111	79.29	IV
5	Well-equipped laboratories	109	77.86	V
6	Well- Equipped hostel facility with hostel furniture	107	76.43	VI
7	Well-equipped kitchen/mess in hostel	104	74.28	VII
8	News -paper room at hostel	103	73.57	VIII
9	Well trained staff	100	71.43	IX
10	Solar water system at hostel	99	70.71	X
11	Hostel Premises sanitation	98	70.00	XI
12	Well-equipped Play –ground	98	70.00	XI
13	Indoor stadium and well-equipped gym	97	69.29	XII
14	Smart Class Rooms	92	65.71	XIII
15	24x7 Wi-Fi facilities at campus	90	64.29	XIV
16	Meeting hall at hostel	88	62.86	XV
17	Mini bus should be for degree students	75	53.57	XVI
18	TV room at hostel	49	35.00	XVII

It can be clear from table 4 that, well-equipped library and competitive exam preparation facility at campus was the major required facility hence, it was ranked first and second. While sufficient infrastructural facilities at campus ranked at third, drinking water/RO system facility in hostel ranked at fourth, well-equipped laboratories ranked at fifth, well- equipped hostel facility with hostel furniture ranked at sixth, well-equipped kitchen/mess in hostel ranked at seventh, news -paper room at hostel ranked at eighth, well trained staff ranked at ninth, solar water system at hostel ranked at tenth, hostel premises sanitation and well-equipped play-ground ranked at eleventh, indoor stadium and well-equipped gym ranked at twelfth, smart class rooms ranked at thirteen, 24x7 Wi-Fi facilities at campus ranked at fourteen, meeting hall at hostel ranked at fifth teen, mini bus should be for degree students ranked at sixteen and TV room at hostel ranked at seventeen. Physical facility is an essential for better and workable environment anywhere. Here is an educational institute so internet connection with Wi-Fi facility and play ground is the basic requirement hence, it stood first in infrastructural facility. Other expectations are related to potable water and newsroom along with good quality library facilities. All expectations must be solved by authority for further better growth of the educational institute and overall development of the student.

In the foregoing discussion showing the expectations about infrastructural facilities of college campus the researcher further analysed the same data for level of college expectations. These were categorized into three as (I) Low level of college infrastructural expectations (II) Medium level of college infrastructural expectations (III) High level of college infrastructural expectations.

Table 5: Distribution of respondents according to their expectations about infrastructural facilities of College Campus n=140

Sr. No.	Expectations about infrastructural facilities of College Campus	Frequency	Percent
1	Low college infrastructural expectations	15	10.87
2	Medium college infrastructural expectations	93	66.38
3	High college infrastructural expectations	32	22.75

It was seen from table 5 that, majority (66.38 per cent) of students had medium level of college infrastructural expectations while, 22.75 per cent had high level of college infrastructural expectations and 10.87 per cent had low level of college infrastructural expectations ,respectively.

Personal and college overall expectations

It is the total expectations of respondents (personal and college campus expectations). These were categorized into three as (I) Low level of over all expectations (II) Medium level of over all expectations (III) High level of over all expectations. The data are presented in table 6.

Table 6 : Distributions of respondents according to their level of overall expectations
n=140

Sr. No.	Overall Expectations	Frequency	Percent
1	Low overall Expectations	26	18.27
2	Medium overall Expectations	92	65.90
3	High overall Expectations	22	15.83

The data in table 6 indicated that majority (65.90 per cent) of students had medium level of overall expectations while, 18.27 per cent had low level of overall expectations and 15.83 per cent had high level of overall expectations, respectively. Similar results were also observed by Vanparia and Chatrola (2014), Harsh Parmar and N.M. Chauhan. (2018).

CONCLUSION

It can be concluded that majority of students were belonged to Western region of Maharashtra, maximum students were belonged to percentage range between 70.01-80.They had marginal and small size land holding, majority students had nuclear family and small size family and farming was the major occupation of father/guardian of the respondents.

Majority of the respondents had medium level of personal, college infrastructural and overall expectations and medium level of motivational sources.

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RESEARCH ARTICLE

Analysis of indicators of teaching proficiency of agriculture college faculty members

Swati Khandave [1] and Sachin Pawar[2]

Corresponding author's email :Swatim912@gmail.com

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INTRODUCTION

In present era of globalization role of teacher is changing, it's became more demanding and challenging to cope the needs young generation. A good teaching is the main criterion for any competent teacher. Teacher should be instrumental in discovering new methods, ideas, skills that suits to the students. The proficient teacher can apply teaching methods that are easier, quicker, better, safer, more rewarding, less labour intensive and more suitable. Thus, ,teachers are considered as one of the vital pivots of the society and society has many expectations from them which needs to fulfill by the teacher by discharging their duties efficiently.

Education in agriculture especially to undergraduate students is a complex and many-sided phenomenon demanding a variety of traits and abilities. These abilities may be grouped into two major categories namely those pertaining to teachers mental abilities and skills, his understanding of psychological and educational principles and his knowledge of the subject to be taught and those qualities of his personality, his interest, attitudes, beliefs and his behaviour in working relationships with pupils and others. These traits when put together comprise the teaching competency of the teachers.

Agricultural education is applied science emphasizing on practical work, fieldwork and laboratory work than theoretical lectures. In the present education system of agricultural education more concern is given on acquiring skills and hands on trainings to the students by implementing students READY programme. However, sound knowledge and competence of the agricultural graduates for meeting the new challenges is equally important.

A teacher cannot produce competent students unless possess competency to transmit the knowledge and possessed skill to the students. In the present era the role of teacher is very crucial, a competent teacher can produce competent agricultural graduates who can take self employment at their own through education with right knowledge and skill mix to fulfill the emerging challenges. Considering this background present study was undertaken with the objectives to study the extent of use of teaching methods/aids by the teacher and assess the teaching proficiency of teachers.

METHODOLOGY

Present study had been purposively conducted in the College of Agriculture, Pune, which is one of the historical constituent college of Mahatma Phule Krishi Vidyapeeth Rahuri. At pune college sub campus, under graduate B.Sc. (Agri.), B.Sc. (Hort.) and post graduate M.Sc. (Agri.) and M.B.A (Agri.) instructional programmes are being undertaken. To assess the teaching proficiency of faculty members students rating and teacher's self rating method was used. Total 90 students from last year of B.Sc. (Agri.) and the faculties being engaged in

under graduate as well as post graduate teaching were considered as sample for the study. A detailed list of the teaching staff along with their discipline was obtained from the office of the Associate Dean, from the list it is observed that total 51 faculty members are engaged in teaching. Exploratory and analytical research design was used for the present investigation. Data were collected personally with help of structured interview schedule from 90 students and out of 51 faculty members 45 members were responded within stipulated time, so their responses were considered. Data were tabulated and analysed for obtaining the results.In present study teaching competency can be operationalised as total outcome of eleven identified indicators by the experts.

RESULTS AND DISCUSSION

Teaching methods and aids use

Table 1: Distribution of the respondents according to their use of teaching methods and aids

Sr. no	Teaching methods and aids used	Self-rating (N=45)		Student's rating (N=90)	
		Number	Percentage	Number	Percentage
1.	Low	0	0	12	13.33
2.	Average	11	24.44	24	26.67
3.	Above average	18	40.00	46	51.11
4.	High	16	35.55	8	8.89
5.	Total	45	100	90	100
Mean index		71		56	
SD		16.63		17.55	
Mean index difference		15			
'Z' value		4.85**			

**Significant at 0.01 level of probability

It is revealed from Table-1 that 40.00 percent respondents expressed that their level of use of teaching methods and aids for teaching and allied activities was above average, also more than half of students rating (51.11%) indicate that it was above average. 35.55 percent respondents reported that their level of use of teaching methods and aids to be high, however students rating indicate that it was only 4.44 percent.

To know the significant difference between these two types of rating 'Z' test for testing of mean difference was applied and calculated 'Z' value is depicted at the bottom of the Table 1. It could be observed from the data that there is significant difference between respondents self-rating and their student's rating (Mean difference = 15), the cal. 'Z' value is4.85was observed to be highly significant at 0.01 level of probability). This indicates the disagreement between the respondents and their students about teaching methods and aids use and leads to reject the null hypothesis that there is no difference in the self-rating and students rating. In other words, it is stated that the ratings by self and by students for teaching methods and aids used by the teacher respondents were not rational.

Table 2: Distribution of respondents according to the extent of use of teaching methods and aids

Sr. No.	Particulars	Self-rating (N = 45)			Students rating (N = 90)		
		Often	Some Times	Never	Often	Some Times	Never
A	**Teaching methods**						
1.	Lecture	45 (100)	00	00	74 (83.00)	16 (17.77)	00
2.	Course plan, lesson plan and lecture notes.	42 (93.33)	2 (4.44)	01 (2.22)	77 (85.55)	10 (11.11)	3 (3.33)
3.	Role-play techniques.	21 (46.66)	19 (42.22)	5 (11.11)	39 (43.33)	31 (34.43)	20 (22.22)
4.	Hands on experiences.	19 (42.22)	23 (51.11)	03 (6.66)	24 (26.66)	51 (56.67)	15 (16.66)
5.	Field situations.	18 (40)	24 (53.33)	03 (6.66)	34 (37.77)	45 (50.00)	11 (12.22)
6.	Demonstrations	17 (37.77)	20 (44.44)	08 (17.77)	33 (36.66)	47 (52.22)	10 (11.11)
7.	Assignments.	25 (55.55)	16 (35.55)	06 (13.33)	48 (52.74)	21 (23.33)	21 (23.33)
8.	Question answer sessions/ Group Discussion.	09 (20.00)	16 (35.55)	20 (44.44)	19 (21.11)	28 (31.11)	43 (47.77)
B	**Teaching Aids**						
1.	Chalk and Black board.	23 (51.11)	15 (33.33)	07 (15.55)	44 (48.88)	27 (30.00)	19 (21.11)
2.	Charts/ Models.	19 (42.31)	13 (28.88)	13 (28.88)	16 (17.80)	55 (61.11)	19 (21.11)
3.	Overhead projector and transparencies.	10 (22.22)	24 (53.33)	11 (24.44)	20 (22.21)	45 (50.00)	25 (27.78)
4.	Video Clips/ Documentaries.	7 (15.55)	02 (4.44)	36 (80.00)	13 (14.44)	06 (6.66)	71 (78.88)
5.	Posters.	5	26	14	09	71	10
		(11.11)	(57.77)	(31.10)	(10.81)	(78.87)	(11.11)
6.	Computer aided lectures.	5 (11.12)	11 (24.43)	29 (64.44)	13 (14.44)	19 (21.11)	58 (64.44)
7.	LCD.	36 (80.00)	07 (15.55)	02 (04.43)	65 (72.22)	15 (16.66)	10 (11.11)
8.	Interactive classroom.	02 (04.44)	09 (20.00)	34 (75.54)	02 (22.00)	08 (08.89)	80 (88.90)

It is observed from Table-2 that often used teaching methods by the respondents were conventional teaching methods viz; lecture (100%) most of the students also reported the same (83.00%) followed by Course plan, lesson plan and lecture notes (93.33%) and by students rating (85.55%), Hands on experiences by self (42.22%) and by students rating (26.66%) .

The sometimes used teaching methods and aids by the respondents were posters (57.55%) and by students rating (78.87%), Field situations (53.33%) and by students rating (50.00%), Overhead projector and transparencies (53.33%) and by students rating (50.00%).

Whereas never used teaching aids were namely, Video Clips/ Documentaries as stated by teachers (80.00%) by students rating (78.88%), Interactive class (75.54%),by students rating (88.90%), computer-aided instructions (power points, CD's, Computer aided lectures.) by self (64.44%) by students rating (86.66%).

Teaching Proficiency

Table 3: Distribution of respondents according to their teaching Proficiency

Sr. No.	Teaching proficiency level	Self-rating (N=45)		Student's rating (N=90)	
		Number	Percentage	Number	Percentage
1.	Poor (Up to 25)	00	00	00	00
2.	Average (26 to 50)	03	6.66	22	24.44
3.	Above average (51 to 75)	11	24.44	64	71.11
4.	Good (Above 75)	31	68.48	10	11.11
	Total	45	100.00	90	100.00
		Self rating		Student's rating	
Mean index		81		56	
SD		16.60		09.90	
		Self – student's			
Mean index difference		25			
'Z' Value		9.31**			

** Significant at 0.01 level of probability

The data presented in Table 3 emphatically indicates that over half of the faculty members expressed themselves (68.45 %) to be good in teaching proficiency; however their student's ratings (11.11 %) expressed them to be good in teaching proficiency. The teachers having above average teaching proficiency were 24.44 percent by self, by 71.11 percent by student ratings. Similar findings were reported by

Lahariya (2007) . Further it is revealed that 00.00 percent of teachers by self, 00.00 percent by students were poor in teaching competency. Similar results were reported by Patel 2017.

The self-ratings however found to have differed significantly from students' ratings, the difference between mean of self-ratings and students' rating scores was found to be significant (Z = 9.31). It leads to the rejection of null hypothesis. This might be because of the reason that the teachers may not be exhibiting standardized forms of qualities and behavior with students. Teachers need to prepare for handling and operating of modern instructional tools, focus on developing certain soft skills, hard skills and qualities necessary for discharging various duties and responsibilities more effectively as a faculty member.

Table 4: Respondents ranking to mean indices on Teaching Proficiency Indicators

Sr. No	Indicators constituting teaching proficiency	Self-rating (N=45)		Student's rating (N=90)	
		Mean Index	Rank	Mean Index	Rank
1	Planning ability	65.38	I	58.00	II
2	Knowledge	64.87	II	58.04	I
3	Mental abilities	64.82	III	57.18	V
4	Professional Ethics	64.64	IV	58.67	IV
5	Guiding ability	63.88	V	59.99	III
6	Teaching ability	63.34	VI	54.92	VII
7	Communication competency	63.25	VII	56.99	VI
8	Self-development	62.23	VIII	54.75	VIII
9	Skill	61.93	IX	52.85	X
10	Evaluation ability	60.89	X	53.72	IX
11	Creativity	60.37	XI	50.77	XI

Although the overall teaching proficiency has been below good, the self-rating worked out for all teaching proficiency indicators, did not indicate much variation. Among the eleven identified teaching proficiency indicators, the first five positions have been occupied by planning ability, knowledge, mental abilities, professional ethics and guiding ability as per self-rating. As according to the student rating the first five positions occupied were knowledge, planning ability, guiding ability, professional ethics and mental abilities.Similar findings were in line with Ghonji *et al.*2014. With regards to other areas of teaching proficiency and their ranks from sixth to eleventh, it was observed that controversy exists between the self, student's ratings in ranking the indicators *viz.*Communication competency, Teaching ability, Self-development, Evaluation ability and Creativity this might be due to difference in their perspectives about these indicators. Similar findings were reported by Nair (2017). The magnitude of teaching proficiency mean indices revealed that actual teaching proficiency of faculty members as per self-rating ranged in between 65.38 and 60.37 percent and as per students rating ranged in between 58.04 and 50.77 per cent.

CONCLUSION

The study can be concluded that teachers should use modern teaching tools alongwith conventional methods viz. video clips, documentaries,interactive techniques as per time availability. Aslo they need to present standardized forms of qualities and behavior with students. It is also conclude that involvement of teachers devotedly in teaching is very important instead of other non teaching work. Updating knowledge, preparation for classes and effective communication has to be improved by self. The organization may organize need-based training followed by proper evaluation, regular guidance and providing various facilities to improve their proficiencies in future.

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RESEARCH ARTICLE

Technical efficiency of pesticide use in cotton cultivation in Yavatmal district

J. R. Bhusnar[1], N. V. Shende[2] and N. R. Koshti[3]

1. PG Student, Department of Agricultural Economics and Statistics,
2. Head, Department of Agricultural Economics and Statistics, 3. Associate Dean (LAE),
Dr. Panjabrao Deshmukh Krishi Vidhyapeeth, Akola (MS) -444104

Corresponding author's email : nvshende73@gmail.com

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ABSTRACT

The excesses use of the pesticide in the agriculture has not only increased production costs but also lead to ill effect of pesticide use. The present study attempted to analyze technical efficiency of pesticide use in cotton production, undertaken in Wani, Ghatanji, Ralegaon and Kalambtehsils of Yavatmal district for the year 2020-21 with the view to economic characteristics of cotton growers, examine input used, cost structure and return in production of cotton. The study is based on the primary data obtained from 100 randomly selected farmers growing cotton spread across four tehsils of Yavatmal district, multiple log linear regression was used to compute the plant protection chemicals expenditure elasticity. The study revealed that 62.00 per cent farmers were under small size of land holding, whereas 73.00 per cent farmers are under middle age group. Almost all farmers were literate except 2.00 per cent farmers were illiterate, whereas about 89.00 per cent farmers educated from primary to higher secondary. In the sample farmers 78.00 per cent families were nuclear. The cropping intensity of overall farmers was 116.03 per cent and highest in medium size group followed by large size group. The per hectare cost of cultivation for overall farmers was Rs. 46807.97 and Rs. 68278.29 at cost 'A_2' and 'C_2'respectively of which cost of pesticide account for 8.22 per cent. On an average the expenditure on pesticide in cotton cultivation was 5610.74 Rs/ha. The yield obtained from the sample was 18.68 qtls/ha. The farmers obtained net return at overall level of Rs. 50298.79 and Rs 28828.47 at cost 'A_2' and 'C_2'respectively. The input-output ratio at cost 'A_2' and 'C_2' were 1:2.07 and 1:1.42, respectively at overall level. The per hectare expenditure on Plant Protection Chemical (PPCs) was highest for large farmers (RS. 6869.67) followed by medium farmers (Rs. 5228.95) respectively. The rate of return obtained from pesticide use was high for small farmers (Rs. 2.26) compared to medium farmers (Rs. 2.14) and large farmers (Rs. 2.08). The rate of return on pesticide less than five for all groups of farmers indicates excessive use of pesticide. It should be based on inferred that the farmers spent more on PPCs. About 48.00 farmers applied pesticides four times during cotton production. The ratio of MVP to MFC was less than unity in all most all the resources which means they are over utilised. The ratio of MVP to MFC was negative in case of plant protection chemical, revealed that, every rupee of an additional income on PPCs will lead to reduction in gross income. The optimum quantity of pesticide required for cotton was estimated at 3.24 kg/ha. However sample farmers were used high quantity of pesticide i.e. 4.10 kg/ha.

Thus the farmers were found to use excess quantity of pesticide than optimal requirement. In other words farmers lost Rs. 1066.67per hectare. The application of plant

protection chemicals (PPCs) along the wind direction (85.00 per cent) reduces farmers exposure to chemicals. Whereas most of the pesticide applicators (48.00 per cent) observed protecting covering like facemasks. Thus is suggested that the farmers should be educated to identify the threshold level of pest infestation and take measure only after that instead of blindly following neighboring farmers while applying plant protection chemicals.

Keywords: Pesticide, Cotton, Income, Cost and Net return

INTRODUCTION

Cotton is one of the principle commercial crop of the country. Cotton production is crucial as the whole spectrum of textile sector depend on it. Further, the export performance of textile sector is also depends on the quality of cotton produced. To put it straight cotton plays an important role in terms of generating direct and indirect employment as well as earning foreign exchange. Over the year, the production of cotton has been reduced due to the pest attack. The main pest is cotton bollworm. To control the pest incidence, the farmers have applied more than the recommended levels of pesticides.

Indian average consumption of pesticide is although, far lower than many other developed economics, the problems of pesticide residue is very high in India. Pesticide residue in several crops has also affected the export of agricultural commodities in the last few years. In this context, pesticide use, proper application technologies and integrated pest management are some of the key strategies for minimizing human exposure to pesticide. Cotton is such a crops where there is continuous and discriminate use of synthetic pesticides on sucking pests, there is resistance and hence efficacy has become less reliable.

Keeping this in view, the present study has been undertaken to study the socio-economic characteristics of sample farmers, frequency and extent of pesticide use in cotton, estimate cost and return in cotton production with special reference to pesticide use, examine pesticide handling practices and safety measures followed by sample farmers.

METHODOLOGY

The present study was conducted during the year 2020-21 in Yavatmal district of Maharashtra. The four tehsil were selected on the basis of potential area under cotton cultivation and five villages were selected from each tehsil.From each selected villages five farmers were randomly selected.Thus, a total 100 cotton farmers were selected for collecting the required informaton for the study.

Table No. 1 Village wise distribution of selected cotton growers

Tehsil	Village	No of selected farmer
Wani	Borgaon	5
	Chikhali	5
	Chilai	5
	Tejapur	5
	Sonapur	5

Tehsil	Village	No of selected farmer
Ghatanji	Tadsawali	5
	Saifal	5
	Bhambhora	5
	Chincholi	5
	Sayatkharda	5
Ralegaon	Kinhi Jawade	5
	Sawangi	5
	Bori	5
	Khairi	5
	Savitri	5
Kalamb	Babhulgaon	5
	Gaurgaon	5
	Diksal	5
	Moha	5
	Khadki	5
Total		**100**

Method of analysis

For the purpose of achieving the objective of the study, the collected data were subjected to the statistical analysis. For this purposes tabular analysis and production function analysis were employed.

1) Tabular analysis

The data collected were presented in tabular form to facilitate easy comparison. This techniques of tabular presentation was employed the cost and return structure using standard cost concept. The data were summerized with aid of statistical tools like average, percentage etc. to obtain the meanigful results.

2) Cost concepts

Cost concept: These include cost A_1, A_2, B_1, B_2, C_1, C_2 and C_3.

Cost A_1 = All actual expenses in cash and kind incurred in production by the producer. The following items are included in cost A_1

Cost A_2 = Cost A_1 + Rent paid on leased in land.

Cost B_1 = Cost A_1 + Interest on value of owned capital assets.

Cost B_2 = Cost B_1 + Rental value of owned land + Rent paid for leased in land.

Cost C_1 = Cost B_1 + Imputed value of family labour.

Cost C_2 = Cost B_2 + Imputed value of family labour.

Cost C_3 = Cost C_1 + 10 percent of Cost C_2 on account of managerial functions performed by farmers.

3) Production function analysis

The Cobb-Douglas production function is the most widely used form of production function for filling agricultural production data, because of its mathematical properties like case of interpretation and computational simplicity. In the present study to analyse the technical efficiency of pesticide use the Cobb-Douglas production function in the log form used as follow.

$$\text{Log } Y = \log A + a_1 \log X_1 + a2 \log X_2 + a_3 \log X_3 + a_4 \log X_4 + a_4 \log X_5 + \log u$$

Where,

Y = Gross income from cotton (Rs/ha)

X_1 = Expenditure on seed (Rs/ha)

X_2 = Expenditure on fertilizer and manures (Rs/ha)

X_3 = Quantity of pesticides used (Kg/ha)

X_4 = Expenditure on labour (Rs/ha)

X_5 = Area under cotton cultivation (ha)

A = Constant

bi = Production elasticity's

u = Random error

One of the objective of the study was to study the frequency and extent of pesticide use in cotton to workout the optimum quantity of pesticide use. Hence, PPCs input was measured in physical quantity while other inputs measured in monetory value. The marginal value product for each input were calculated at the geometric mean levels of the respective resources and geometric mean level of output by using following formula,

$$\text{Marginal value product of Xi} = bi \frac{\overline{Y}}{\overline{X}}$$

Where,

$\bar{Y}$ = Geometric mean of gross income

Xi = Geometric mean of Xi^{th} resources

bi = Production elasticity of i^{th} resources

The marginal value product was equated the marginal factor cost to determine optimal use of resources. To determine the optimum quantity of pesticide use, under the assumption of profit maximization behaviour, the following relationship was estimated. The marginal Physical product (MPP) of pesticides was equated to the price ratio of the pesticide and cotton.

$$MPP = (dy / dx) = Pp/Py$$

$$\text{i.e. } b_3(\bar{Y}/X) = Pp/Py$$

$$X^* = (b_3 . Y . Py)/Pp$$

Where,

X* = Optimum quantity of pesticides

b_3 = Production elasticity of pesticides

MPP = Marginal physical product of pesticides

Pp = Unit price of pesticides (Rs/kg)

Py = Output price of the cotton (Rs/qtls)

The rate of returns from pesticide use in the cotton was computed by using formula as suggested by Nguyen and Tran Thi Than Dung, (2003). The rate of returns was estimated by following formula,

$$\text{Rate of return} = \frac{(\text{Return} - \text{Total cost other than pesticide})}{\text{Total pesticide cost}}$$

The rate of returns on pesticide less than five indicates excessive use of pesticide.

4) Plant protection chemical expenditure function

The following log linear regression function was used for estimating the plant protection chemical elasticity coefficient.

$$\text{Log } Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + \log u$$

Where,

Y = Expenditure on plant protection chemicals (Rs. /ha.)

X_1 = Total family income (Rs/ha)

X_2 = Expenditure on fertilizer and manures (Rs. /ha)

X_3 = Intensity of pesticide application (No./ha)

X_4 = Area under cotton (ha)

5) Income concept

1. Gross income

It was calculated as under,

Gross value of output = Value of main produce + Value of by-produce.

2. Farm business income

Gross value of output - Cost 'A'

3. Family labour income

Gross value of output -Cost 'C_1'

4. Net income

Gross value of output -Cost 'C_2'/'C_3'

5. Input – output ratio

It is a ratio between the value of gross output and the cost of cultivation at different cost concepts.

6.Cost of production per qtl.

Cost of production per qtl of cotton has been worked out by deducting the value of by product from per hectare cost 'C_2' and then dividing by main yield in quintals.

Results and Discussion

Keeping in view the objectives of the study, the data were analyzed using suitable techniques. The results obtained from this study have been presented and discuss critically.

Table No. 2: Classification of farmers according to size of land holding

Sr. No.	Size of holdings	No of Farmers. (No.)	Average size of holdings(ha)
1	Small (0.1 to 2 ha)	62 (62.00)	1.47
2	Medium (2.01 to 4.00 ha)	28 (28.00)	2.90
3	Large (4.01 ha &Above)	10 (10.00)	6.04
4	Total	100 (100)	3.47

(Figures in parentheses indicates percentage to the total)

It was revealed from table no. 2 that the average sizes of land holding for small medium and large farmers were 1.47, 2.90 and 6.04 ha respectively. The small size of land holding contribute 62.00 per cent farmers in the study.

Table 3 : Classification of Farmers according to age group

Sr. No.	Age Group	Size of land holding (n=100)			Overall
		Small	Medium	Large	
1	Young age (20-40 years)	18 (29.03)	6 (21.43)	1 (10.00	**25 (25.00)**
2	Middle age (41-64 years)	42 (67.74)	22 (78.57)	8 (80.00)	**73 (73.00)**
3	Old age (Above 65 year)	1 (1.61)	0 (00.00)	1 (10.00)	**2 (2.00)**
Total		**62 (100.00)**	**28 (100.00)**	**10 (100.00)**	**100 (100.00)**

(Figures in parentheses indicates percentage to the total)

Table no. 3 revealed that, there were 25.00 per cent farmers were under young age category. However, 73.00 per cent farmers were under middle age category and few farmers were under old age category i.e. 2.00 per cent farmers. It is evident from table no. 3 that, middle age group farmers were interested for cotton cultivation in study area.

Table No. 4: Education status of selected cotton growers

Sr. No	Particulars	Size of land holdings			
		Small	Medium	Large	Overall
1	Illiterate	2 (3.23)	0 (0.00)	0 (0.00)	2 (2.00)
2	Primary school (Standard 1- 4)	9 (14.52)	4 (14.29)	2 (20.00)	15 (15.00)
3	Middle school (Standard 5-7)	11 (17.74)	5 (17.86)	2 (20.00)	18 (18.00)
4	High school (Standard 8-10)	21 (33.87)	12 (42.86)	3 (30.00)	36 (36.00)
5	Higher secondary (Standard 11-12)	15 (24.19)	3 (10.71)	2 (20.00)	20 (20.00)
6	Graduate & Above (Standard Above 12)	4 (6.45)	4 (14.28)	1 (10.00)	9 (9.00)
	Total	62 (100.00)	28 (100.00)	10 (100.00)	100 (100.00)

(Figures in parentheses indicates percentage to the total)

The information regarding the educational status of selected cotton growers is presented in the table no. 4 It revealed that, at overall level 36.00per cent farmers were educated up to high school (8-10) followed by 20.00 per cent farmers were higher secondary (10-12) educated. A very few farmers i.e. 9.00 per cent were educated more than graduation on the other hand 2.00 per cent farmers were illiterate in the study area.

Table No. 5: Classification of farmers according to size of family

Sr. No	Size of family (No. of Members)	Size of land holding			Overall
		Small	Medium	Large	
1	Small (<5)	23 (37.10)	13 (46.43)	4 (40)	40 (40.00)
2	Medium (5-10)	38 (61.29)	11 (39.29)	3 (30)	52 (52.00)
3	Large (> 10)	1 (1.61)	4 (14.28)	3 (30)	8 (8.00)
Total		62 (100.00)	28 (28.00)	10 (10.00)	100 (100.00)

(Figures in parentheses indicates percentage to the total)

Table no. 5 revealed that, the 40.00 per cent farmer had small (up to 5 members) size of family. However, 52.00 per cent farmer having 5 to 10 members in the family. Very few farmers i.e. only 8.00 per cent farmer had more than 10 members in their respective families were observed in the sample.

Table No. 6: Classification of selected farmers on the basis of type of family

Sr. no.	Family Type	Size of land holding			Overall
		Small	Medium	Large	
1	Nuclear	51 (82.26)	20 (71.43)	7 (70.00)	**78 (78.00)**
2	Joint	11 (17.74)	8 (28.57)	3 (30.00)	**22 (22.00)**
Total		**62 (100.00)**	**28 (100.00)**	**10 (100.00)**	**100 (100.00)**

(Figures in parentheses indicates percentage to the total)

Table no. 6 revealed that, in small category farmers 82.26 per cent families were nuclear and 17.74 per cent families were joint out of total farmers under small category. In medium category 71.43 per cent families were nuclear and 28.57 per cent families were joint out of total 28 farmers family under medium group. Whereas, in large group 70.00 families were nuclear families and 30.00 per cent families were joint out of total 10 farmers family under large group. In overall 100 families, 78.00 per cent families were nuclear. However rest of the family i.e. 22.00 per cent was joint family.

Table No. 7: Land utilization pattern of selected cotton grower (Area: ha)

Sr. No.	Particulars	Size of holdings			
		Small	Medium	Large	Overall
1	Total land holding	1.48 (100.00)	2.90 (100.00)	6.04 (100.00)	3.47 (100.00)
2	Fallow land	0.02 (1.35)	0.02 (0.68)	0.08 (1.32)	0.04 (1.15)
3	Net cultivated area	1.46 (98.64)	2.87 (98.97)	5.96 (98.68)	3.43 (98.85)
4	Irrigated area	0.25 (16.89)	0.71 (24.48)	1.27 (21.07)	0.74 (21.36)
5	Area sown more than once	0.11 (7.43)	0.57 (19.65)	1.00 (16.65)	0.55 (15.85)
6	Gross cropped area (GCA)	1.58	3.46	6.96	3.98
7	Cropping intensity (%)	108.22	120.56	116.77	116.03

(Figures in parentheses indicates percentage to the total)

Table no. 7 revealed that, on and overall the gross crop areas were found 3.98 hectares while (98.85 per cent) area under net cultivable land, followed by (15.85 per cent) area sown more than once. The cropping intensity found under small, medium and large groups of farmers were 108.22, 120.56 and 116.77 per cent, respectively. At overall level the cropping intensity was 116.03 per cent. The cropping intensity is increase as the size of holdings increase.

Table No. 8: Cropping pattern of selected cotton growers

Sr. No.	Particulars	Size group (Area : ha)			
		Small	Medium	Large	Overall
A	**Kharif crops**				
1	Cotton	0.89 (56.33)	1.02 (29.48)	2.30 (33.05)	1.40 (35.17)
2	Soybean	0.32 (20.25)	1.19 (34.39)	2.18 (31.32)	1.23 (30.90)
3	Tur	0.23 (14.56)	0.33 (9.54)	0.90 (12.93)	0.48 (12.06)
4	Blackgram	0.03 (1.90)	0.31 (8.95)	0.54 (7.76)	0.29 (7.29)
5	Greengram	0.01 (0.63)	0.04 (1.16)	0.08 (1.15)	0.03 (0.75)
5	Total Kharif	1.47 (93.04)	2.89 (83.53)	6.00 (86.21)	3.45 (86.68)
B	**Rabi crops**				
1	Wheat	0.08 (5.06)	0.32 (9.25)	0.52 (7.47)	0.30 (7.54)
2	Gram	0.03 (1.90)	0.25 (7.23)	0.44 (6.32)	0.24 (6.03)
	Total Rabi	0.11 (6.96)	0.57 (16.47)	0.96 (13.79)	0.54 (13.57)
	Gross cropped area	1.58 (100.00)	3.46 (100.00)	6.96 (100.00)	3.98 (100.00)
	Cropping intensity (%)	108.22	120.56	116.77	116.03

(Figures in parentheses indicates percentage to the total)

Table no. 8 described the cropping pattern of selected farmers and it was found that, at overall size group highest area was sown under cotton crop (35.17 per cent) followed by soybean crop (30.90 per cent), tur crop (12.06 per cent), blackgram crop (7.29 per cent) and green gram crop (0.75 per cent) in kharif season. In Rabi season, the overall area allocated under wheat crop was highest (7.54 per cent) followed by gram crop (6.03 per cent). The gross cropped area on overall basis was found to be 3.98 hectares. It was revealed that, in kharif season average area under cotton crop is highest in large group of farmers as per gross cropped area and per cent share highest in small group of farmers (56.33 per cent) followed by large group (33.05 per cent) and medium group of farmers (29.48 per cent).

Table 9 : Per hectare cost of cultivation of cotton with special reference to pesticide use (Small farmers)

Sr. No.	Items		Units	Units required	Price per unit	Cost Rs.	Per cent
1	Hired Human labour	Male	Days	13.45	234.55	3154.80	4.78
		Female	Days	62.08	145.55	9036.22	13.69
		Total	Days	75.53	161.40	12191.02	18.46
2	Bullock labour	Hired	Days	2.08	748.69	1557.28	2.36
		Owned	Days	2.87	733.27	2104.49	3.19
		Total	Days	4.95	739.75	3661.77	5.55
3	Machine	Hired	Hrs.	9.02	508.45	4586.30	6.95
		Owned	Hrs.	0.00	0.00	0.00	0.00
		Total	Hrs.	9.02	508.45	3661.30	6.95
4	Seed		Kg.	2.39	1657.80	3962.15	6.00
5	Manure		Tonne	2.91	2019.83	5877.71	8.90
6	Fertilizer	N	Kg.	104.01	15.62	1625.25	2.46
		P	Kg.	42.07	40.02	1683.93	2.55
		K	Kg.	25.25	33.70	851.06	1.29
		Total	Kg.	171.33	24.28	4160.24	6.30
7	Irrigation		Rs.			301.54	0.46
8	Incidental Charges		Rs.			72.91	0.11
9	Plant Protection		Rs.			5228.95	7.91
10	Repairing charges		Rs.			69.96	0.11
11	Depreciation		Rs.			1309.30	1.99
12	Land Revenue		Rs.			67.66	0.10
13	Int. On Work. Cap. @ 6%		Rs.			1799.84	2.72
14	**Cost ‘A_1’**		Rs.			43173.27	65.39
15	Rent paid For leased land		Rs.			0.00	0.00
16	**Cost ‘A_2’**		Rs.			43173.27	65.39
17	Int. On Fixed Capital @ 10%		Rs.			1083.20	1.64
18	**Cost ‘B_1’**		Rs.			44256.48	67.03
19	Rental Value Of Land (1/6 of GP- Land revenue)		Rs.			16005.22	24.24
20	**Cost ‘B_2’**		Rs.			60261.70	91.27
21	Family	Male	Days	17.36	208.83	3625.39	5.49

	labour charges	Female	Days	14.27	150.02	2140.87	3.24
		Total	Days	31.63	182.30	5766.26	8.73
22	**Cost 'C$_1$'**		Rs.			50022.73	75.76
23	**Cost 'C$_2$'**		Rs.			66027.97	100
24	**Cost 'C$_3$'**		Rs.			72630.75	
25	Main yield		Qtl.	18.57	5193.17	96437.30	
26	**Cost of production Rs/qtl. At 'C$_2$'**		Rs.			3555.63	
27	**Rate of return obtained from pesticide**		Rs			2.26	

It is revealed from the table no. 9 that, the per hectare cost of cultivation at cost 'A$_2$'was Rs 43173.27, cost 'B$_1$'was Rs. 44256.48 Whereas cost 'B$_2$' was Rs. 60261.70 and cost 'C$_1$' was Rs. 50022.73, cost 'C$_2$' was Rs. 66027.97 whereas cost 'C$_3$'was Rs 72630.75 which indicate the 10 per cent as a managerial cost. The major share of cost of cultivation goes towards cost 'A$_2$' (65.39 per cent). In cost 'A' share of plant protection chemical was 7.91 per cent. Per hectare yield obtained by small farmers was 18.57 quintal with gross returns of Rs. 96437.30. In case of small size group, per quintal cost of production was Rs.3555.63.

The cost incurred and returns realized from pesticide use was calculated and presented the table no. 9. It revealed from the table that, the expenditure on pesticides worked out to Rs 5228.95/ha. The rate of returns from pesticide use was computed by using formula as suggested by the Nguyen and Tran Thi (2003). The result also indicated that, the rate of returns obtained from pesticide use was Rs. 2.26.The rate of returns on pesticide less than five indicates excessive use of pesticide.

Table 10: Per hectare cost of cultivation of cotton with special reference to pesticide use (Medium farmers)

Sr. No.	Items		Units	Units required	Price per unit	Cost Rs.	Per cent
1	Hired Human labour	Male	Days	14.54	236.62	3440.54	5.21
		Female	Days	65.36	149.39	9804.88	14.84
		Total	Days	79.90	165.77	13245.42	20.04
2	Bullock labour	Hired	Days	2.19	743.41	1628.06	2.46
		Owned	Days	2.93	727.34	2131.10	3.22
		Total	Days	5.12	744.76	3813.16	5.77
3	Machine	Hired	Hrs.	9.22	516.97	4766.77	7.21
		Owned	Hrs.	0.00	0.00	0.00	0.00
		Total	Hrs.	9.22	516.97	4766.77	7.21
4	Seed		Kg.	2.12	1654.80	3508.17	5.30

5	Manure		Tonne	3.20	2027.44	6487.80	9.81
6	Fertilizer	N	Kg.	106.04	15.96	1692.68	2.56
		P	Kg.	48.87	40.39	1973.90	2.99
		K	Kg.	22.83	32.16	734.24	1.11
		Total	Kg.	177.74	24.76	4400.82	6.66
7	Irrigation		Rs.			445.12	0.67
8	Incidental		Rs.			68.29	0.10
9	Plant Protection		Rs.			5786.97	8.76
10	Repairing charges		Rs.			63.12	0.09
11	Depreciation		Rs.			1418.30	2.15
12	Land Revenue		Rs.			68.30	0.10
13	Int. On Work. Cap. @ 6%		Rs.			1907.78	2.89
14	**Cost 'A$_1$'**		Rs.			45789.42	69.29
15	Rent paid For leased land		Rs.			0.00	0.00
16	**Cost 'A$_2$'**		Rs.			45789.42	69.29
17	Int. On Fixed Capital @ 10%		Rs.			1104.42	1.67
18	**Cost 'B$_1$'**		Rs.			46893.84	70.96
19	Rental Value Of Land (1/6 of GP- Land revenue)		Rs.			16325.00	24.70
20	**Cost 'B$_2$'**		Rs.			63218.84	95.66
21	Family	Male	Days	9.79	205.53	2012.20	3.04
	labour charges	Female	Days	5.70	150.03	855.18	1.29
		Total	Days	15.49	185.11	2867.38	4.34
22	**Cost 'C$_1$'**		Rs.			49761.22	75.30
23	**Cost 'C$_2$'**		Rs.			66086.22	100
24	**Cost 'C$_3$'**		Rs.			72694.84	
25	Main yield		Qtl.	18.90	5204.22	98359.76	
26	**Cost of production Rs/qtl. At 'C$_2$'**		Rs.			3496.63	
27	**Rate of return obtained from pesticide**		Rs			2.14	

It is revealed from the table no. 10 that, the per hectare cost of cultivation at cost 'A_2'was Rs 45789.42, cost 'B_1'was Rs. 46893.84 Whereas cost 'B_2' was Rs. 63218.84 and cost 'C_1' was Rs. 49761.22, cost 'C_2' was Rs. 66086.22 whereas cost 'C_3'was Rs. 72694.84 which indicate the 10 per cent as a managerial cost. The major share of cost of

cultivation goes towards cost 'A_2' (69.29 per cent). Share of plant protection chemical was 8.76 per cent. Per hectare yield obtained by medium farmers was 18.90 quintal with gross returns of Rs. 98359.76. In case of medium size group, per quintal cost of production was Rs.3496.63.

The cost incurred and returns realized from pesticide use was calculated and presented in the Table no. 10. It revealed from the table that, the expenditure on pesticides worked out to Rs. 5786.97/ha.The result also indicated that, the rate of returns obtained from pesticide use was Rs. 2.14.The rate of returns on pesticide less than five indicates excessive use of pesticide.

Table 11 : Per hectare cost of cultivation of cotton (large farmers)

Sr. No.	Items		Units	Units required	Price per unit	Cost Rs.	Per cent
1	Hired Human labour	Male	Days	16.33	243.11	3970.00	5.37
		Female	Days	69.73	150.01	10460.00	14.15
		Total	Days	86.06	167.67	14430.00	19.53
2	Bullock labour	Hired	Days	2.06	752.42	1550.00	2.10
		Owned	Days	3.06	710.23	2173.33	2.94
		Total	Days	4.12	903.72	3723.33	5.04
3	Machine	Hired	Hrs.	9.66	538.99	5206.67	7.04
		Owned	Hrs.	0.00	0.00	0.00	0.00
		Total	Hrs.	9.66	538.99	5206.67	7.04
4	Seed		Kg.	2.36	1669.20	3939.33	5.33
5	Manure		Tonne	5.00	2072.00	10360.00	14.02
6	Fertilizer	N	Kg.	115.06	15.57	1792.45	2.45
		P	Kg.	52.33	40.02	2094.69	2.83
		K	Kg.	18.40	33.74	620.86	0.84
			Kg.	185.79	24.26	4508.00	6.10
7	Irrigation		Rs.			806.66	1.09
8	Incidental		Rs.			51.33	0.07
9	Plant Protection		Rs.			6869.67	9.30
10	Repairing charges		Rs.			50.66	0.07
11	Depreciation		Rs.			1653.90	2.24
12	Land Revenue		Rs.			62.66	0.08
13	Int. On Work. Cap. @ 6%		Rs.			2247.55	3.04
14	**Cost 'A_1'**		Rs.			53909.79	72.95
15	Rent paid For leased land		Rs.			0.00	0.00
16	**Cost 'A_2'**		Rs.			53909.79	72.95
17	Int. On Fixed Capital @ 10%		Rs.			2470.00	3.34

18	**Cost 'B$_1$'**		Rs.			56379.79	76.29
19	Rental Value Of Land (1/6 of GP- Land revenue)		Rs.			16145.66	21.85
20	**Cost 'B$_2$'**		Rs.			72525.46	98.14
21	Family labour	Male	Days	5.40	204.32	1103.33	1.49
		Female	Days	1.8	150.00	270.00	0.36
	charges	Total	Days	7.2		1373.33	1.86
22	**Cost 'C$_1$'**		Rs.			57753.12	78.15
23	**Cost 'C$_2$'**		Rs.			73898.79	100
24	**Cost 'C$_3$'**		Rs.			81288.67	
25	Main yield		Qtl.	18.66	5211.68	97250.00	
26	**Cost of production Rs/qtl. At 'C$_2$'**		Rs.			3960.28	
27	**Rate of return obtained from pesticide**		Rs			2.08	

It is revealed from the table no. 11 that, the per hectare cost of cultivation at cost 'A$_2$'was Rs 53909.79, cost 'B$_1$' was Rs. 56379.79, Whereas cost 'B$_2$' was Rs. 72525.46 and cost 'C$_1$' was Rs. 57753.12, cost 'C$_2$' was Rs. 73898.79 whereas cost 'C$_3$'was Rs. 81288.67 which indicate the 10 per cent as a managerial cost. The major share of cost of cultivation goes towards cost 'A$_2$' (72.95 per cent). Share of plant protection chemicals was 9.30 per cent. Per hectare yield obtained by large farmers was 18.66 quintal with gross returns of Rs. 97250.00. In case of large size group, per quintal cost of production was Rs. 3960.28.

The cost incurred and returns realized from pesticide use was calculated and presented in the table no. 11. It revealed from the table that, the expenditure on pesticides worked out to Rs 6869.67/ha. The rate of returns from pesticide use was computed by using formula as suggested by the Nguyen and Tran Thi (2003). The result also indicated that, the rate of returns obtained from pesticide use was Rs. 2.08.The rate of returns on pesticide less than five indicates excessive use of pesticide.

Table 12 : Per hectare cost of cultivation of cotton with special reference to pesticide use for overall farmers (n=100)

Sr. No.	Items		Units	Units required	Price per unit	Cost Rs.	Per cent
1	Hired Human labour	Male	Days	14.15	236.53	3346.98	4.90
		Female	Days	64.01	147.51	9442.13	13.83
		Total	Days	78.16	163.63	12789.11	18.73

2	Bullock labour	Hired	Days	2.11	747.37	1576.96	2.31
		Owned	Days	2.91	728.37	2119.56	3.10
		Total	Days	5.02	736.36	3696.52	5.41
3	Machine	Hired	Hrs.	7.38	514.81	3799.33	5.56
		Owned	Hrs.	0.00	0.00	0.00	0.00
		Total	Hrs.	7.30	514.81	3799.33	5.56
4	Seed		Kg.	2.30	1662.27	3823.23	5.60
5	Manure		Tonne	3.27	2749.03	8989.32	13.16
6	Fertilizer	N	Kg.	105.98	15.73	1667.24	2.44
		P	Kg.	45.42	40.10	1821.75	2.69
		K	Kg.	23.60	33.31	786.25	1.15
		Total	Kg.	175.00	24.43	4275.24	6.26
7	Irrigation		Rs.			410.85	0.60
8	Incidental		Rs.			77.20	0.11
9	Plant Protection		Rs.			5610.74	8.22
10	Repairing charges		Rs.			73.70	0.10
11	Depreciation		Rs.			1385.86	2.03
12	Land Revenue		Rs.			67.12	0.09
13	Int. On Work. Cap. @ 6%		Rs.			1953.08	2.86
14	**Cost 'A$_1$'**		Rs.			46807.97	68.55
15	Rent paid For leased land		Rs.			0.00	0.00
16	**Cost 'A$_2$'**		Rs.			46807.97	68.55
17	Int. On Fixed Capital @ 10%		Rs.			1273.33	1.86
18	**Cost 'B$_1$'**		Rs.			48124.08	70.48
19	Rental Value Of Land (1/6 of GP- Land revenue)		Rs.			16102.95	23.58
20	**Cost 'B$_2$'**		Rs.			64241.37	94.09
21	Family	Male	Days	12.69	208.22	2642.35	3.87

It is revealed from the table no. 12that, the per hectare cost of cultivation at cost 'A_2'was Rs 46807.97, cost 'B_1'was Rs. 48124.08Whereas cost 'B_2' was Rs. 64241.37 and cost 'C_1' was Rs. 52114.64, cost 'C_2' was Rs. 68278.29 whereas cost 'C_3'was Rs. 75039.35 which indicate the 10 per cent as a managerial cost. The major share of cost of cultivation goes towards cost 'A_2' (68.55 per cent). Share of plant protection chemicals was 8.22 per cent. Per hectare yield obtained by overall farmers was 18.68 quintal with gross returns of Rs.97106.76. In case of overall farmers per quintal cost of production was Rs.3655.15.

The cost incurred and returns realized

from pesticide use was calculated and presented the table no. 12. It revealed from the table that, the expenditure on pesticides worked out to Rs 6869.67/ha. The rate of returns from pesticide use was computed by using formula as suggested by the Nguyen and Tran Thi (2003). The result also indicated that, the rate of returns obtained from pesticide use was Rs. 2.21.The rate of returns on pesticide less than five indicates excessive use of pesticide. It should be based on inferred that, the farmer spent more on PPCs.

Table No. 13: Per hectare cost and return from cotton cultivation (Rs/ha)

Sr. No.	Particulars	Size group			
		Small	Medium	Large	Overall
1	Yield (Quintal)	18.57	18.90	18.66	18.68
2	Price / Quintal	5193.17	5204.22	5211.68	5198.43
3	Value of main produce	96437.30	98359.76	97250.00	97106.76
4	Value of by produce	0.00	0.00	0.00	0.00
5	Gross produce	96437.30	98359.76	97250.00	97106.76
	Total cost				
a)	Cost 'A2'	43173.27	45789.42	53909.79	46807.97
b)	Cost 'B2'	60261.70	63218.84	72525.46	64241.37
c)	Cost 'C2'	66027.97	66086.22	73898.79	68278.29
d)	Cost'C3'	72630.75	72694.84	81288.67	75039.35
4	**Net returns over**				
a)	Cost 'A2'	53264.03	53264.03	43340.21	50298.79
b)	Cost 'B2'	36175.60	35140.92	24724.54	32865.39
c)	Cost 'C2'	30409.33	32273.54	23351.21	28828.47
d)	Cost' C3'	23806.55	25664.92	15961.33	22067.41
5	**Input-output ratio at**				
a)	Cost 'A2'	2.23	2.15	1.80	2.07
b)	Cost 'B2'	1.60	1.56	1.34	1.51
c)	Cost 'C2'	1.46	1.49	1.32	1.42
d)	Cost'C3'	1.33	1.35	1.20	1.29

It is revealed that, from the table no. 13 at overall level average gross returns worked out to Rs. 97106.76. The net returns obtain at various costs were Rs. 50298.79at cost 'A_2', Rs. 32865.39at cost 'B_2', Rs. 28828.47 at cost 'C_2'. This means cotton crop appeared to be better form monitory benefits. Cost 'A_2'was known as variable cost which was spent by the farmer itself. Which revealed that, highest input-output ratio at 'A_2' was estimated for small group of farmers followed by medium and large group i.e. 1:2.23, 1:2.15, and 1:1.80 respectively. However overall input output ratio was1:2.07at 'A_2'.The highest input-output ratio at cost 'C_2' was recorded in medium size group i.e. 1:1.49 and input-output ratio at cost 'C_2' was recorded small size group 1:1.46 and large size group was 1:1.32. At overall level, the input-output ratio at cost 'C_2' was 1:1.42.

Table 14 : Quantity of pesticide used by cotton farmers

Sr. No	Particulars	Formulations (Kg. or Lit./ha)	Total amount (Rs)	Cost Rs/(Lit/Kg)
A	**Insecticides**			
1	Imidacloprid 200 SL	0.26	731.14	2800
2	Imidacloprid 350 SC	0.14	666.19	4800
3	Monocrotophos 36% SL	0.59	354.98	600
4	Acetamipride 20% SP	0.55	399.24	750
5	Acephate 75% SP	0.43	368.66	850
6	Bifenthrin 10% EC	0.10	150.13	1500
7	Difenthiuron 50% WP	0.16	519.57	3200
8	Flonicamide 50%	0.09	633.01	10600
9	Thiamethoxam 12.6% + Lambdacyhalothrin 9.5	0.30	822.73	2700
10	Thiamethoxam 25% WG	0.03	33.26	1150
11	Acephate 50% + Imidaclopride 1.8% SP	0.06	51.60	800
B	**Fungicides**			
1	Carbendazim 12% + Moncozeb 63% WP	0.66	360.88	550
2	Hexaconazole 5% SC	0.49	292.26	600
3	Thiophanate methyl 70% EC	0.03	37.37	1050
4	Propiconazol 25% EC	0.05	14.68	300
C	**Growth regulators**			
1	Boom flower	0.21	125.44	600
2	Humic acid	0.03	19.57	450
3	Isabian	0.05	36.69	950

Different types of pesticides were used to control pests at various stages of crop growth in cotton. Form table no. 14 it is revealed that Imidacloprid was the most preferred insecticide and among fungicides Carbandazim + Moncozeb was the most preferred fungicide.

Table No. 15: Frequency of pesticide application by sample farmers (n=100)

Sr. No.	No. of Application	Frequency	Percentage
1	3	25	25.00
2	4	48	48.00
3	5	16	16.00
4	6	09	9.00
5	7	02	2.00
Average application per farm	5		

Table no. 15 showed that he number of spraying range from 3 to 7 with an average of 5 per farm. About 48.00 per cent of farmers applied on an average of 4 spraying followed by 25.00, 16.00, 9.00 and 2.00 per cent of farmer apply 3, 5, 6 and 7 sprays, respectively.

Table No. 16: Estimated Cobb-Douglas production function in cotton production

Sr. No.	Explanatory Variable	Coefficient	Standard Error
1	Intercept	2.106	0.433
2	Expenditure on seed (Rs/ha)	0.185*	0.093
3	Expenditure on Fertilizers and Manure (Rs/ha)	0.017	0.018
4	Quantity of Pesticide (Kg/ha)	-0.050	0.056
5	Expenditure on labour (Rs/ha)	0.498**	0.130
6	Area under cotton cultivation (ha)	0.149**	0.042
7	Coefficient of multiple determination (R^2)	0.423	
8	Returns to scale Σbi	0.799	
9	Calculated F value	13.80	

Note: (* significant at 5 %,* * significance at 1%)

The estimated production functions are presented in table no. 16. The inputs included in model explained 42.30 per cent of variation in cotton output as revealed by the coefficient of multiple determination (R^2). The summation of production elasticities indicated decreasing return to scale i.e. for each per cent incremental use of all inputs simultaneously would get less than one per cent of output. The estimated parameter of expenditure on seed is positively significant at five per cent level of significance and expenditure on labour and area under cotton positively significant at one per cent level of significance indicating that one every one per cent increase in labour and area it would result in increase of gross return by 0.498 and 0.149 per cent respectively. The coefficient of fertilizer and manure is positive but shows non significant. The elasticity coefficient for PPCs is negative indicating negative effect on gross income, where one percent increase in PPCs application would result in decrease of gross income by 0.050 per cent.

Table 17 : Allocative efficiency in cotton cultivation

Sr. No.	Resources	MFC	MVP	MVP/MFC
1	Seed	1	0.26	0.26
2	Fertilizer and Manure	1	0.22	0.22
3	Pesticides	1	-0.43	-0.43
4	Labour	1	0.57	0.57

The allocative efficiency of resources used in cotton was revealed in table no. 17.The ratio of MVP to MFC was less than unity in all most all the resources which means they are over utilised. The ratio of MVP to MFC was negative in case of plant protection chemical (-0.43), revealed that, every rupee of an additional income on PPCs will lead to reduction in gross income. It clearly shows that, PPCs are extensively and indiscriminately used resulting negative externalities i.e. decreased in the use of these inputs would enhance the returns.

Table No.18: Expenditure elasticity of pesticide use in cotton cultivation

Sr. No	Variables	Co-efficient
1	Intercept	1.180
2	Total family income (Rs/ha)	0.486**
3	Fertilizer and manure (Rs/ha)	-0.030
4	Intensity of pesticide application (No)	0.470**
5	Area under cotton (ha)	-0.393
6	Coefficient of multiple determination (R^2)	0.378

Note: (* significant at 5 %, * * significant at 1%)

A log linear model was estimated considering the cost of pesticide as dependent variable. Total family income (Rs), expenditure of fertilizer and manure (Rs), number of pesticide application and area under cotton (ha) were taken as independent variable. The independent variables included in model explained per cent total variation in expenditure on PPCs. Table no. 18 revealed that the estimated parameter of total family income and intensity of pesticide application were positively significant at one per cent level of significance indicating that, one per cent in total family income and intensity of pesticide application would result in increase expenditure on plant protection chemicals by 0.486 and 0.470 per cent respectively. The regression coefficients were negative for manures and fertilizers and area under cotton. However coefficient of multiple determinants was 0.378.

Table 19 : Optimum quantity of pesticide use in cotton production

Particulars	Kg/ ha	Cost (Rs/ha)
Optimal use	3.24	4544.07
Actual use	4.10	5610.74
Save/Loss	0.86	1066.67

The optimum quantity of pesticide requirement for cotton production was presented in table no. 19 The optimum quantity of pesticide required for cotton was 3.24 Kg/ha. The requirement of pesticide as estimated through production function. The actual quantity of pesticide use (4.10 Kg/ha) was high in the sample farmers.Thus the farmers were found to use excess quantity of pesticide than optimal requirement. In other

words farmers lost Rs. 1066.67per hectare, because of an uneconomical investment on pesticides in cotton farming. Profit maximization is attained at the optimal level therefore any increase in pesticide use higher than the optimal level is really not rational investment.

Table No. 20: Sources of information of pesticide used by farmers (n=100)

Sr. No.	Sources	Frequency	Percentage
1	Input seller	51	51.00
2	Own experience	22	22.00
3	Other farmers	36	36.00
4	Agriculture extension	21	21.00
5	Agriculture university	08	08.00
5	Television	24	24.00
6	Radio	00	00.00
7	Newspaper	08	08.00

The sources of information about pesticides use for the farmers were presented in the table no. 20. About 51.00 per cent of farmers get the information from pesticide dealers and 22.00 per cent have their own experience. About 36.00 per cent and 21.00 per cent of farmers get information from other farmers and extension workers respectively. Medias like extension literature and television, radio and newspaper accounted for about 32.00 per cent. Hardly 8.00 per cent farmers got the information from the agricultural universities.

Table No. 21: Pesticide handling practices followed by sample farmers (n=100)

Sr. No.	Particulars	No of farmers	Percentage
1	Direction of PPCs application		
a)	Along the wind	85	85.00
b)	Across the wind	00	00.00
c)	Do not consider	15	15.00
2	Protective covering covers		
a)	No protective covers	39	39.00
b)	Use of shoes	13	13.00
c)	Use of hand gloves	00	00.00
d)	Use of face masks /cover the face	48	48.00
e)	Use as plastic polythene as shoes	00	00.00
3	Hand washing practices		
a)	With soap	89	89.00
b)	With soil/ mud	11	11.00
c)	Other	00	00.00

4	Take the bath after spraying	53	53.00
5	Pesticide and water mixing practices		
a)	Use of wooden sticks	98	98.00
b)	Use bar hands	00	00.00
c)	Pouring the water by mug/jar	02	2.00
6	Measurement of pesticide		
a)	Measuring jar	88	88.00
b)	Pesticide bottle/cap	12	12.00
c)	Weighing balance	00	00.00

The application of PPCs along the wind direction reduces farmers exposure to chemical. This is correct method of applying PPCs and reduces the probability of poisonous effect, through inhalation of chemicalstable no. 21 revealed that, most of the farmers (85.00 per cent) apply the pesticide along with wind direction and remaining farmers not considering wind direction. Particles of PPCs, which adhered body and hands of the application, were washed with soap 89.00 per cent and 53.00 per cent farmers take bath after spraying. Regarding mixing of pesticides with water, 98.00 per cent used wooden stick and pouring water by jar/mug (2.00 per cent). For the measurement of pesticides, most of the farmers used measuring jar (88.00 per cent).

Table No. 22: Sprayer use and maintenance by sample farmers (n=100)

Sr. No	Particulars	No. of farmers	Percentage
1	Type of pesticide used		
	a) Knapsack sprayer	87	87.00
	b) Foot pump	00	0.00
	c) Power sprayer	13	13.00
2	Wash sprayer after use		
	a) Yes	72	72.00
	b) No	28	28.00
3	Disposal of washed water		
	a) Field	66	66.00
	b) Irrigation Chanel	06	6.00
4	Disposal of pesticide bottle		
	a) In field	64	64.00
	b) Sell	16	16.00
	c) Use for other purpose	20	20.00

Table no. 22 indicates that, two different type of sprayer were used by farmer in the study area. Majority of the respondents used knapsack sprayers (87.00 per cent). 72.00 per cent farmers washing their sprayer after use and about 66 per cent farmers disposed the washed water in to the crop field itself.The contamination of soil with PPCs would lead to a negative effect on soil health. Since it might affect some of the beneficial micro flora of the soil. The respondent were unaware of negative consequences of PPCs on soil health. About, 64.00 per cent farmers were found to thrown pesticide bottle in fields, 16.00 per cent farmers sold pesticide bottle after use, whereas 20.00 per cent farmers used empty bottles for other purpose.

Table No. 23: Farmers awareness towards pesticide use **(n=100)**

Sr. No.	Particular	No. of farmers	Percentage
1	Adequacy of pesticide use	43	43.00
2	Aware of recommended dose	07	7.00
3	Read the label	14	14.00
4	Aware of importance of colour symbol on PPC container	05	5.00
5	Aware of prices of all pesticide	12	12.00

The data recorded in Table no. 23, about 43.00 per cent farmers felt the use of PPCs was adequate i.e. sufficient to control the pest. It means that, 57.00 farmers surprisingly opined that the pesticide use in cotton was inadequate in the view of inefficient control of pest with exiting dose usage .Among the sample farmers only 7.00 per cent farmers were aware of the recommended dose of pesticides. This is the reason for farmers are using pesticides indiscriminately. About 14.00 of the sample farmers observed to read the labels on the pesticide container. Only 5.00 per cent farmers were aware about the importance of colour symbols on PPCs container and toxicity level and 12.00 per cent aware of the prices of all pesticides.

Table No. 24:Attitudinal response of PPCs applicators **(n=100)**

Sr. No.	Activities	No of farmers	Percentage
1	Drinking water	62	62.00
2	Smoking	00	00.00
3	Eating food	07	7.00
4	Work in field after spraying	17	17.00

Table no. 24 revealed that, about majority of (62.00 per cent) of the PPCs applicators were drinking water and 7.00 per cent were eating food during PPCs application. The other reason was to get the energy for spray. About 17.00 farmers reported working in the field after spraying activity. However, majority of (83.00 per cent) them work rest after spraying.

CONCLUSIONS

The resource use efficiency analysis clearly indicated that MVP/MFC ratio was negative for plant protection chemicals i.e. PPCs were not properly used as guided by economic principles. Thus the withdrawal of these resources would maximize the returns from cotton production. The farmers need to be educated and advised about the proper use of resource particularly plant protection chemicals.

The farmers in the study area were using more amount of pesticide. This is not only uneconomical but also leads to other ill effects of pesticide use. Therefore there is need for proper education to the farmers about the balance use of pesticides. They also need to be advised about the method of applying and identifying the spurious chemicals.

Awareness needs to be created and use of personal protective measures among

farmers whole handling pesticides. Farmers need to be encouraged to reduce, if not eliminated the use of pesticides, with the introduction of incentives to the farmers to help them shift from synthetic pesticide to bio-pesticides, organic farming and adoption of integrated pest management (IPM) practices.

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RESEARCH ARTICLE

Assessment of quality of life, social isolation and spirituality of farmers in distress prone area of vidarbha

Y. B. Shambharkar[1], N. R. Koshti[2], P. K. Wakle[3] and S. N. Gajghate[4]

1. Assistant Professor, Department of Extension Education, 2.Associate Dean, Instruction,

3. Head, Department of Extension Education, Dr. PDKV, Akola

4.Principal, Agriculture Technical School, Mul Maroda

Corresponding author's email : shambharkar_yash@yahoo.com

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ABSTRACT

The research study entitled "Stress Management of Farmers in Distress Prone Area of Vidarbha' was an attempt to aware the farmers about causes of stress at personal level, family level and occupational (farming) level and its management in holistic approach. This was an outcome of bottom-up approach of hearing the voices from the field and sincere efforts of researcher for taking their concerns to the people who matter the most. The study was conducted in six distress districts of namely, Akola, Buldhana, Washim, Amravati, Wardha and Yavatmal. The data were collected from 360 farmers' spread over 24 villages across the 6 *tahsils* of suicide concentrated six districts by conducting field survey, by applying exploratory and analytical design of social research. Apart from in-depth interviews with the randomly sampled 360 farmers', 05 group discussions were also carried out in the study area. The data regarding causes of stress in farmers' life and stress management by them was obtained on parameter/indicators identified from relevancy ratings from experts, finalized during the construction and standardization of scale. The standardized scales were administered to the respondents to measure the causes of stress and stress management during the course of investigation. The study findings have brought out dreadful picture of the socio-economic situations, causes of stress and its management.

The findings of the study indicated that, with regards to quality of life, it was revealed that little more than half of the respondents (52.78%) found in poor quality of life followed by 38.89 per cent of the respondents who were in the category of medium level of quality of life. Only 8.33 per cent of the respondents were observed in the category of high quality control level. Whereas, in case of social isolation, it was found that more than half (56.38%) of the respondents were found in medium level of social isolation followed by more than one fifth (23.06%) were in category of low social isolation. The respondents slightly more than one fifth (20.56%) were having high level of social isolation and in case of spirituality of the respondents, higher proportion of the respondents (56.38%) were found in medium level of spirituality followed by little more than one fourth of them (25.84%) were in high level of spirituality whereas only 17.78 per cent of the respondents were in low spirituality levels. Relatively higher proportion of the respondents were found in medium to high spirituality level. Subconsciously spiritual persons have the strong faith on God and do the things accordingly which may help to success them in each activity. On the basis of previous research higher the spirituality level, helps to manage the stress effectively.

INTRODUCTION

Modern living has brought with it, not only innumerable means of comfort, but also a plethora of demands that tax human body and mind. Now-a-days everyone talks about stress. It is cutting across all socio economic groups of population and becoming the great leveler.

Not only just high pressure farmers are its key victims but it also includes labourers, slum dwellers, working women, businessmen, professionals, and even children. Stress is an inevitable and unavoidable component of life due to increasing complexities and competitiveness in living standards and working condition. The speed at which change is taking place in the world today is certainly overwhelming and breathe taking. In the fast changing world of today, no individual is free from stress and no profession is stress free. Everyone experiences stress, whether it is within the family, business, organization, study, work, farming or any other social or economical activity. Stress has become the core concern in the life of everyone, but everybody wants stress-free life. Stress is a subject which is hard to avoid. Stress is a part of day-to-day living. Every individual is subjected to stress either knowingly or unknowingly. Stress, long considered alien to Indian lifestyle, is now a major health problem / hazard.

In the present study stress was defined as the occurrence of harmful/ unpleasant external situation/conditions in the life of individual farmer, related to individual level, family level and at farming level that produce stress reaction and secondly to the internal thought, judgment, emotional state and physiological process that are evoked by stressful stimuli.

The farmers have to be worked in the following situation.

Isolation

Isolation and lone working can be a source of concern in the agriculture sector. Although there are some studies that show farmers do not feel socially isolated other studies have shown that this is a key issue of concern. However, available evidence demonstrates an association between poor social support and increased stress symptoms, depression and suicide rates amongst farmers.

Due, in part, to the rural location of most farms means farmers and agricultural workers might not receive adequate or lower level of work-related social support Factors prevalent in remote areas (e.g., poor local transport, slower pace of life, and limited access to public services) can increase the feelings of isolation a farmer feels , and can make help seeking behavior more difficult Furthermore, the long hours that agriculture workers face can also have a detrimental impact on their –work-life balance

In addition, to social isolation, there are a number of agriculture tasks (e.g., land cultivation, sowing, plant protection operations, harvesting, fence mending) that are characterized by lone working . Such work tasks can place the worker in a vulnerable position should an accident or injury occur, as the worker might not be in a position to handle the situation independently and colleagues might not be aware of or available should an incident occur . Not only can the actual incident be detrimental to the health of an agriculture worker, but the concern with having to deal with a potentially difficult situation on their own (e.g., machine blockages and repairs, bull handling) can also be distressing and a potential source of stress to an agriculture worker.

Financial uncertainty

Agriculture outputs, be it crop or animal products, are vulnerable to market risks and competition, which can be a significant source of stress for farmers. In fact, some research studies have found that the main contributing factor for depression and suicide in farmers was financial difficulty. The role of financial uncertainty as a contributor towards work-related stress is seen in the findings of two research surveys that identify finances as the biggest source of

stress amongst farmers.

Planning difficulties

The reality of the agriculture sector is that, it is vulnerable to a number of external factors that workers have little control over. These include the seasonal nature of agriculture and stock problems. Plans made by farmers might become redundant or difficult to implement due to changes in the weather or stock problems. Therefore, rainfall, falling crop price and disease outbreak are some examples of external factors that make planning ahead in the agriculture sector a real challenge for many farmers to control and predict; which, in turn, can be a source of stress for farmers.

Seasonality

Weather conditions can differ considerably, with research demonstrating weather to be a significant concern for farmers, with a potential detrimental impact on the mental health of farmers. Destructive weather conditions have the ability to affect individual farms, such as when a field gets destroyed by hail or frost. Poor weather conditions can affect a group of farms or community when their crops are destroyed by excessive rainfall, or entire regions of crops and livestock can be affected by weather conditions that include droughts or floods . Farms that are involved in crop plantation are particularly vulnerable, as they may sustain heavy losses or may need additional planning and effort to save their crops . The inability to influence the season/weather, disrupted plans and crop losses, extra financial and labour input present possible challenges that can contribute towards work-related stress symptoms.

Stock problems

Stock crises generally apply to livestock farming and farm produce. The stock crises may occur at a farm, community and/or regional level. The economic effects of such situations are shared by entire rural communities, but farmers are particularly affected Overcoming each stock crisis requires significant work on the farmers' part. For crop farmers, along with the challenge of dealing with crop disease and pests, the possibility of damaged crops is another source of stress for farmers as well.

Administrative duties and understanding policy developments

The administrative burden for farmers has grown significantly in recent years. These duties may include: preparing large numbers of documents when claiming for subsidies, accounting stock or crop, selling their produce, filling in tax documentation, and complying with occupational safety and health requirements or other inspections. While larger farms may be able to outsource administrative roles, farmers from smaller farms often have to integrate these additional demands into their existing workload. Changes in legislation can also be a source of concern for farmers as they may be forced to change existing forms of practice. In a series of interviews with Danish farmers, Leskinen observed that farmers had negative perceptions on new regulations and they felt that insufficient support was provided to cope with additional administrative duties due to these regulations. A survey by Booth and Lloyd of farmers from the South West of England found that 43.00 per cent of respondents reported the amount of paper work as 'a little' stressful, and 54.00 per cent reported this work demand to be extremely stressful 'a lot'. The same survey also identified new legislation and paperwork to be the two biggest concerns for farmers. A similar observation was made in a different study by Simkin and colleagues, where farmers found the implementation of new legislation stressful However, Simkin and colleagues

also found that some farmers benefited from this change in legislation and, therefore, appreciated the implementation of these new policies. This perhaps suggest that whether or not a farmer perceives a benefit from the policy changes, may be associated with whether it is viewed as potential source of stress or not.

Stress management refers to the wide spectrum of techniques and psychotherapies aimed at controlling a person's levels of stress, especially chronic stress, usually for the purpose of improving everyday functioning.

Edelman and Mandle (1998) stated that stress management is a critical component of a healthy lifestyle. They stated that healthy behaviors, such as good nutrition and exercise, might help strengthen individuals' resistance to stress.

Peiffer (2001) indicated that dealing with stress in a positive way is another way for managing stress. From all of the viewpoints, coping strategies are focused on reactions to stressed outcomes. In contrast, stress management is focused on not only dealing with stress as it occurs but also building resilience and preventing stress.

Farming is one of the top high stress occupations. Working in the agriculture sector is known to be a very physically and mentally demanding job. Within the European agriculture sector, 42.00 per cent of workers reported that work had a negative impact on their health. In Finland, a postal survey of 555 farms found that 55.00 per cent of respondents experienced stress in farm work. The detrimental impact that work can have on workers´ health is partly due to the different psychosocial hazards faced by farmers and workers in this sector, such as: long working hours, isolation, financial uncertainty, planning difficulties, administrative demands, and the interaction between stress and exposure to multiple physical risks.

Stress disturbs the equilibrium of the body. It affects physically, emotionally and mentally and physical and mental health is equally important. In India, farmer suicides had been reported from various states, *viz.*, Maharashtra, Andhra Pradesh, Punjab, Karnataka and Orissa.

Maharashtra, one of India's most prosperous states is currently facing an epidemic of farmer suicides especially in the Vidarbha region.

In the distress region of Maharashtra State the farmers are committing suicides. There may be several reasons for committing the suicides. It is fact that the reasons or aspects which compelled to do the suicides of the farmers are stress. It has been inferred that the high suicide rates associated with farming are indicative of the stress currently faced within the occupation. But if the farmers have the coping/management ability of the adverse conditions or skill of management of stress, the suicides would not have occurred. Numbers of studies have been conducted on suicides of farmers and Central as well as Sate Government has providing the financial package to prevent the suicides even though farmers suicides are continued and no concrete reasons have emerged to prevent suicides of the farmers.

The process of stress management is named as one of the keys to a happy and successful life in modern society and ultimately for farmers.

It is, therefore, to know the extent of stress management behaviour of the farmers in distress prone area of Vidarbha, the present research has been undertaken which will help to sort out the problems of suicide and management strategies of stress.

METHODOLOGY

Locale of Study

Out of 11 districts of Vidarbha, the present study was undertaken in purposively selected, Akola, Buldana, Washim,

Amravati, Wardha and Yavatmal districts of Vidarbha region of Maharashtra State as distress prone districts. The above six districts are considered as distressed districts in the report of fact finding team on Vidarbha - of Planning Commission, GOI (2006) and also been endorsed in the address speech of HE Governor of Maharashtra state before the first Joint Session of State Assembly in 2010.

The researcher made the use of exploratory and analytical design of social research, since the emphasis of the study was to find causes of stress of farmers' and stress management which in turn was conceptualized as behavioural components.

Selection of Taluka's

The taluka-wise, village-wise and farmers-wise list of farmers suicides was obtained from respective collectorate office of the district. On the basis of suicidal talukas in the six respective districts, one taluka from each selected district was selected by lottery method. Thus, from six districts, six talukas were selected based on the suicides of the farmers which may be because of stress.

Selection of Villages

From the list obtained from collector office of the respective district, the list of villages, where the farmers committed suicides was considered and proportionate numbers of villages were randomly selected from each taluka by lottery method of random sampling and from each taluka four (04) villages were selected. Thus, from six selected talukas total, 24 villages were selected.

Selection of respondents:

From each selected village, the list of farmers was obtained from talathi/ Sarpanch, bank officials and key informants of the village based on the selection criteria. Amongst the selected list, 15 farmers were selected randomly from each selected village and from four selected villages and from each selected taluka 60 farmers were selected. Thus, 360 farmers were selected from 24 villages of six talukas of distress prone districts of the Vidarbha region. To know the stressful situation of the individual farmer, he/she was interviewed by considering the actual situation and cross checked by key informants of the village, with their neigbours and local leaders and assess the causes of stress and its management.

RESULTS AND DISCUSSION

Quality of life

It is expected that good quality of life leads to good satisfaction of every one's life hence good quality of farmers life might be less stressful than the poor quality life farmers.

Table 1 : Distribution of the respondents according to their quality of life

Sl. No.	Statements	Respondents (n=360)					
		Agree		Can not say		Disagree	
		Frq.	%	Frq.	%	Frq.	%
A.	**Material**						
1	My income is sufficient to fulfill my needs	3	0.83	00	00	357	99.17
2	I have required implements to my field operation	72	20.00	00	00	288	80.00
3	I am satisfied with my house	43	11.94	00	00	317	88.06

B	**Health**						
4	I am satisfied with my health	115	31.94	90	25.00	155	43.06
5	I am visiting doctor frequently	181	50.28	00	00	179	49.72
C	**Productivity**						
6	I have good potential to work in the farm for earning money	129	35.83	00	00	231	64.17
7	I spend my time to achieve more yield/money	149	41.39	107	29.72	104	28.89
8	I am satisfied with the education of my children	48	13.33	00	00	312	86.67
D	**Intimacy**						
9	I talk to my friends whenever in stress	119	33.05	00	00	241	66.95
10	I join the religious functions happened in the village	302	83.89	00	00	58	16.11
11	In stressful situation my family members care me	199	55.27	00	00	161	44.23
E	**Safety**						
12	I easily fall asleep	43	11.94	00	00	317	88.06
13	I am anxious person to get the things	102	28.33	00	00	258	71.67
14	I am worried person	261	72.50	00	00	99	27.50
15	I feel safe at my home	41	11.39	00	00	319	88.61
F	**Place in Community**						
16	I am satisfied with the position in my community	161	44.72	00	00	199	55.28
17	Peoples valued me	213	59.17	00	00	147	40.83
18	Peoples ask my advise	141	39.17	00	00	219	60.83

It is evident from Table 1, that in case of material possession, near about cent per cent of the respondents (99.17 %) were not in opinion that their income is sufficient to fulfill their needs followed by very meager percentage of them (0.83%) were having sufficient incomes to fulfill their needs. Majority of the respondents (80.00%) were not having required implements for the field operation which means that they do their field operation by hiring the implements while only one fifth of them (20.00%) were having required implements for the field operation. Large majority of the respondents (88.06%) were in opinion that they are not satisfied with their constructed house while little more than one tenth (11.94%) were satisfied with the same. With regards to health issue 43.06 per cent of the selected respondents were not satisfied with their health followed by 31.94 per cent of them were satisfied with their health while one fourth (25.00%) were not given any opinion may be because of health problem may occur according to situation. Slightly more than half (50.28%) of the respondents were visiting Doctors for their

own health and family health while little less than half (49.72%) of them not visiting Doctors for their own health. In case of productivity maximum number of the respondents were not agree that they have good potential to work in the farm for earning money whereas 35.83 per cent of them were agree to this statement. Relatively higher proportion of the respondents (41.39%) were in opinion that they spend their time to achieve more money or yield followed by 29.72 per cent of them were not given any opinion may be because of availability of work cannot assumed while 28.89 per cent of the respondents disagree to the same. Large majority of the respondents (86.67%) were not satisfied with the education of their children which may be because of money problem to take higher education followed by 13.33 per cent of them were satisfied with the education of their children. In case of intimacy, more than half of the respondents (66.95%) were not sharing their feelings whenever in stress followed by 33.05 per cent of the them were sharing their feelings whenever in stress. Large majority of the respondents (83.89%) were in opinion that they were joining the religious functions happened in the village while 16.11 per cent were disagree to the same. Higher proportion of the respondents (55.27%) were in opinion that their family members care them when they were in stress which is indicative of good relationship followed by 44.23 per cent of the respondents were disagree which may be because of not good relationship. Large majority of the respondents (88.06%) were not sleep easily might be because of different problems followed by little more than one tenth (11.94%) of them were in opinion that they sleep easily. Relatively higher proportion of the respondents (71.67%) were in opinion that they were not anxious persons to get the things which may be because of different tensions followed by 28.33 per cent of them were found anxious to get the things. Higher proportions of the respondents (72.50%) were found worried followed by 27.50 per cent of the respondents were not having worry which disturbs the daily life. Large majority of the respondents(88.61%) were expressed that they are not feeling safe at heir home may be because of different worries followed by 13.61 per cent of them were found in feelings of safe at their home. With regards to place in community indicators more than half (55.28%) of the respondents were not having satisfied position in their community while 44.72 per cent of them were found satisfied with the position in the community. Higher proportion of the respondents (59.17%) were in opinion that other peoples valued them followed by 40.83 per cent of the respondents were dissatisfied with the values received from others. Maximum numbers of the respondents (60.83%) were in opinion that other peoples not ask their advise while 39.17 per cent of the respondents agree that other peoples takes their advise.

Table 2 : Distribution of the respondents according to their levels of quality of life

Sl. No.	Quality of life	Frequency	Percentage
1	Poor (Up to 67)	190	52.78
2	Medium (67.01 to 80.40)	140	38.89
3	High (Above 80.40)	30	8.33
	Total	**360**	**100.00**

The data depicted in Table 2 revealed that little more than half of the respondents (52.78%) found in poor quality of life followed by 38.89 per cent of the respondents who were in the category of medium level of quality of life. Only 8.33 per cent of the respondents were observed in the category of high quality control level.

From the above table it is inferred that most of the respondents are from poor quality of life which may be the cause stress.

Social Isolation

Social isolation is the inadequate quality and quantity of social relations with other people at the different levels where human interaction takes place. Social isolation affects on the strategies of the stress management. Adequacy of the social isolation may help to manage the stress.

Table 3 : Distribution of the respondents according to their social isolation

Sl. No.	Statements	Respondents (n=360)					
		Agree		Can not say		Disagree	
		Frq.	%	Frq.	%	Frq.	%
	External social isolation						
1	I have regular contact with my neighbours / friends/ relatives	162	45.00	00	0.00	198	55.00
2	I seek social support from neighbours/ friends/ relatives	107	29.72	89	24.72	164	45.56
3	I discuss the things with neighbours/ friends/ relatives when I am in stress	104	28.89	35	9.72	221	61.39
4	I have reciprocity with neighbours/ friends/ relatives	115	31.94	00	0.00	245	68.06
	Internal social Isolation						
5	I am satisfied with social relationship	161	44.72	00	0.00	199	55.28
6	I am in feeling of loneliness	190	52.78	00	0.00	170	47.22
7	I trusted on peoples who are important to me	332	92.22	00	0.00	28	7.78

The data presented in Table 3 seen that in case of external social isolation, higher proportion of the respondents (55.00%) were not having regular contact with their neighbours/ friends and relatives followed by little less than one fourth (45.00%) of them were having regular contact with their neighbours/ friends and relatives. The 45.56 per cent of the respondents were not expected instrumental as well as emotional support from neighbours, friends and relatives which may be because of ego problem or shamefulness. This was followed by 29.72 per cent of the respondents who need social support from their neighbors, friends and relatives whereas little less than one fourth (24.72%) of them were not given any opinion which may be

because of situation based. About discussing the things with neighbours, friends and relatives in stressful situation, relatively higher proportion of the respondents (61.39%) were not agree which means that they are not sharing the stressful happenings with their neighbours, friends and relatives followed by 28.89 per cent of them were sharing their problems with neighbours, friends and relatives in stressful situation and only little less than one tenth (9.72%) were not given any opinion which may be based on arising situation. Maximum number of the respondents (68.06%) does not have reciprocity with neighbor, friends and relatives while only 31.94 per cent of the respondents were having the same which may helps to manage the stress. With regards to the internal social isolation, the indicator such as the respondents were satisfied with social relationship more than half (55.28%) of the respondents were not satisfied whereas only 44.72 per cent of them were satisfied with their social relationship. More than half of the respondents(52.78%) were in feelings of loneliness which may be due to low income level, social status or not proper relationship management. Loneliness is one of the factors which inclined to commit suicide. This was followed by 47.22 per cent of the respondents who were not having loneliness which means that they were having social contacts. The 92.22 per cent of the respondents trusted on peoples who are important to them followed by only 7.78 per cent of them were having no trust which may be because of their negative feelings or inferior complex.

Table 4 : Distribution of the respondents according to their levels of social isolation

Sl. No.	Social Isolation levels	Frequency	Percentage
1	Low (Up to 66.58)	83	23.06
2	Medium (66.59 to 80)	203	56.38
3	High (Above 80)	74	20.56
	Total	**360**	**100.00**

The bird eye view of the Table 4 revealed that more than half (56.38%) of the respondents were found in medium level of social isolation followed by more than one fifth (23.06%) were in category of low social isolation. The respondents slightly more than one fifth (20.56%) were having high level of social isolation.

From the above findings it is inferred that most of the respondents were in medium level of social isolation which may be because of low income, ultimately low status in the society or may be any other psychological problems.

Spirituality

Depression is the most common mental health problem in general and has been the focus of much of the research exploring the relationship between spirituality and mental health. The evidence shows a positive association between church attendance and lower levels of depression amongst adults, children and young people in UK. It also shows that belief in a transcendent being is associated with reduced depressive symptoms.

Similar research has examined the relationship between spirituality and anxiety or stress. Quantitative research demonstrates reduced levels of anxiety in a number of populations, including medical patients in later life, women with breast cancer, middle aged people with cardiac problems and those recovering from spinal surgery. Therefore researcher selected this variable for the present investigation.

Table 5 : Distribution of the respondents according to their spirituality

Sl. No.	Statements	Respondents (n=360)			
		Yes		No	
		Frq.	%	Frq.	%
1	I feel God's presence	342	95.00	18	5.00
2	I experience a connection to all of life	268	74.44	92	25.56
3	During worship or other times when connecting with God, I feel joy which lifts me out of my daily concerns.	258	71.67	102	28.33
4	I find strength in my religion or spirituality	250	69.44	110	30.56
5	I find comfort in my religion or spirituality	227	63.06	133	36.94
6	I feel deep inner peace or harmony	220	61.11	140	38.89
7	I ask for God's help in the midst of daily activities	245	68.06	115	31.94
8	I feel guided by God in the midst of daily activities	250	69.44	110	30.56
9	I feel God's love for me directly	272	75.56	88	24.44
10	I feel God's love for me through others	210	58.33	150	41.67
11	I spiritually touched by the beauty of creation	280	77.78	80	22.22
12	I feel thankful for my blessings	145	40.28	215	59.72
13	I feel selfless caring for others	172	47.78	188	52.22
14	I accept others even when they do things I think are wrong	103	28.61	257	71.39
15	I desire to be closer to God or in union with the divine	265	73.61	95	26.39

The bird eye of the Table 5 shows that large majority of the respondents (95.00%) were feelings of God's presence followed by meager per cent (5.00%) of them were not in opinion about feelings of God's presence which may be because of adverse situation in their life. With regards to experience a connection to all their life, majority of the respondents (74.44 %) were in that feelings and little more than one fourth (25.56%) were not having feelings about the same. Majority of the respondents (7167%) were in a feeling that during worship or any other time when connecting with God they feel joy which lifts them out of their concern while 28.33 of them were not having the feelings about the same.

Maximum number of the respondents (69.44%) were in opinion that they found strength in their religion or spirituality while 30.56 of them were not having the same feelings. Relatively higher proportions of the respondents (63.06%) were found comfort in their religion or spirituality whereas 36.94

per cent of the respondents were not found comfort in their religion which may be due to feelings of superstitism or no progress in their religion. Maximum number of the respondents (61.11%) were in feelings of deep inner peace or harmony while 38.89 per cent of them were not in opinion about the same. About asking for God's help in the midst of daily activities 68.06 per cent of the respondents were agree to this statement while 31.94 per cent of the respondents were not positive about the same. Higher proportion of the respondents (69.44%) were in feelings about guidance by God in the midst of daily activities followed by 30.56 per cent of them were not agree about the same. Majority of the respondents (75.56:%) were in feeling of direct love of God while little less than one fourth (24.44%) were not agree to this feelings which may be because of problems in their life. In case of feelings of love through others, higher proportions of the respondents (58.33%) were in the same feelings and 41.67 per cent of them were not in feelings about the same. Majority of the respondents (77.78%) were in opinion that they spirituality touched by the beauty of creation followed by more than one fifth (22.22%) were not agree about the same. Relatively higher proportion of the respondents (59.72%) were not thankful about the blessings of God which may be because of frequent problems in their daily life followed by 40.28 per cent of them were observed in the thankfulness of blessings of God. More than half of the respondents (52.22%) were not in feelings of selfless caring of others while 47.78 per cent of the respondents were agree to the same. Maximum numbers of the respondents (71.39%) were not in opinion that they accept others even when others do the things which are wrong while 28.61 per cent of the respondents were accepted the same. Majority of the respondents (73.61%) were in desire to be closer to God or union with the divine while little more than one fourth (26.39%) of them were not agree to the same statement.

Table 6 : Distribution of the respondents according to their levels of spirituality

Sl. No.	Spirituality level	Frequency	Percentage
1	Low	64	17.78
2	Medium	203	56.38
3	High	93	25.84
	Total	**360**	**100.00**

The data presented in Table 6 evident that higher proportion of the respondents (56.38%) were found in medium level of spirituality followed by little more than one fourth of them (25.84%) were in high level of spirituality whereas only 17.78 per cent of the respondents were in low spirituality level.

From the above table it is concluded that, relatively higher proportion of the respondents were found in medium to high spirituality level. Subconsciously spiritual persons have the strong faith on God and do the things accordingly which may help to success them in each activity. On the basis of previous research higher the spirituality level, helps to manage the stress effectively.

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RESEARCH ARTICLE

Perception of agriculture students towards rural entrepreneurship awareness development yojna in Rajasthan

D. K. Meena[1], V. S. Meena[2], R. K. Meena[3], N. K. Barod[4], J. K. Gupta[5] and Sweta Singh[6]

Assistant Professor, College of Agriculture, Bharatpur, SKNAU, Jobner, Jaipur

Corresponding author's email : devendrababli@gmail.com

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ABSTRACT

Student READY is part of the B.Sc. (Ag.) degree programme, which orient agricultural graduates in various rural developmental programmes. This has a strong potential to prepare a better agricultural technocrats with high level of skill in combination with the modern outlook and management capacity. This study was conducted to know the students perception on Students READY Programme at AU Jodhpur to seek suggestions from students for effective implementation. The data was online data collected from 80 students of two Colleges of Agriculture, Jobner and Bharatpur by using pre structured interview schedule. The findings revealed that majority of the students belonged to rural background. The Perception of the students regarding Student READY was satisfactory and it's helped in the overall development of the students.

Keywords: Student READY, Perception, suggestion

INTRODUCTION

The practical knowledge and experience is being realized the backbone for development process. The process of learning in the field situation is superimposed on knowledge acquired in the classroom situation. In this context, Agriculture education is undergoing change in rapid manner to meet the needs and challenges of the present era. Learning through experience in real life situation is recent concept introduced in the curriculum at undergraduate level of Agriculture students.

Agriculture science has been conceived as a programme for training youth and rural women to become good entrepreneurs. Therefore, it is very important to explain each component in details by a scheme through constituent bodies of ICAR. This is redefined as student ready programme the scheme was launched by Hon'bl PM on 25th July, 2015 to conceptualize and reorient graduate of agriculture and allied subjects. This scheme ensure employability among the students and develop entrepreneur by improve knowledge, effective skills and compatible ability through gain experience. In order to know the effectiveness of this programme among students the present study was undertaken to measure the perception of students towards Student READY programme.

The main objectives of READY programme are to provide an opportunity to B.Sc. Agriculture students to develop the right perspective of rural life and develop positive attitude towards community. It provides firsthand experience to the students to impart knowledge of Agriculture Science and transfer of scientific and simple household technologies related to all disciplines of Agriculture. The students

under the supervision of teachers, stay in an adopted village for a period of nearly fifty six days and work in rural families. The students understand the available resources and the constraints in the transfer of technology for the development of rural families.

The programme will help in building confidence, skill and to acquire Indigenous Technical Knowledge (ITK) of the locality and thereby, preparing the pass-out for self-employment. It also aims to provide opportunities to acquire hands-on-experience and entrepreneurial skills through experiential learning modules. This is a step towards "Earn while Learn".

The major components proposed by Fifth Dean's committee for carrying out READY programme are Rural Agricultural Work Experience, plant clinic training/Agro Industrial attachment, Experiential Learning Programme (ELP) in Agriculture and student Projects. Under the Agricultural Extension module of READY, different aspects of agricultural extension, especially field extension, were studied by the students during their attachments to different villages, which included agro-ecosystem analysis through participatory rural appraisal (PRA) techniques, study of communication/ information sources use pattern, role and importance of village level institutions, documentation during rural agricultural fair through photo features and news writing, etc. Agro-ecosystem analysis was done by the students during their village attachment, which included analyses of space i.e. transact walk, mapping, time i.e. time line, time trend, seasonality diagram, etc., flow (mobility map, venn diagram, etc) and decision (wealth ranking, constraints analysis). Different methods followed were transect/ biodiversity walk, resource profile of the village, time line, seasonality diagram of crops, farming activity scheduling of crops, mobility diagram, venn diagram, etc. This exercise has helped the students to formulate suitable extension approach for improving the farming.

METHODOLOGY

The study was conducted through online survey. SKNAU, Jobner has constituent colleges where students had been passed out at least two batches of READY programme. The survey questionnaire had been sent to 145 pass out students of two randomly selected Colleges of Agriculture namely, Jobner and Bharatpur of batch 2019-20, who have undergone through READY programme. Among them 80 students replied. The questionnaire was of multiple choice question based on their course to know their perception and they were asked to score in a five-point continuum ranging Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree as they perceived. The structured schedule was of 12 items towards READY programme. The perception was categorized into low, medium and high by using mean and standard deviation.

RESULTS AND DISCUSSION

Distribution of respondents according to their perception

The findings presented in Table-1 revealed that perception of students towards READY programme, majority of the respondents (85.00%) had the medium perception towards READY programme as compared to 8.75 and 6.25 per cent of them possessed high and low perception towards READY programme; respectively. It was observed that most of the students come from farming community and they can easily understand the local situation/problem of the rural area therefore medium category having more perception towards READY programme.

Table: 1 Distribution of Respondents towards READY programme (N=80)

S. No.	Categories	Frequency	Percentage
1.	Low	05	06.25
2.	Medium	68	85.00
3.	High	07	08.75
Total		**80**	**100.00**

This shows that the emphasis given on all the components of the READY programme curriculum is facilitating the learning of the students and designed READY programme had met almost all the needs of the students and improve the skills and knowledge of the students. These findings have been supported by the findings of Kapri et.al.(2016) and Kotte (2014).

Table: 2 Perception of respondents towards READY programme (N=80)

S. No.	Statements	FA	SWA	NA
1	READY has helped me to get familiar with rural life	70(87.50)	10(12.50)	0(0.00)
2	To understand village situations	75(93.75)	05(6.25)	0(0.00)
3	To understand rural institutions	68(85.00)	12(15.00)	0(0.00)
4	READY has helped me to understand the socio economic conditions of farmers	77(96.25)	03(03.75)	0(0.00)
5	To understand cropping pattern of community	74(92.50)	16(20.00)	0(0.00)
6	READY has helped me to understand adoption patterns and adoption gaps	36(45.00)	40(50.00)	04(05.00)
7	READYimproves communication skill	76(95.00)	4(05.00)	0(0.00)
8	READY has helped me to understand farmers' problems	77(96.25)	03(03.75)	0(0.00)
9	READY has improved my leadership qualities	69(86.25)	11(13.75)	0(0.00)
10	To get acquainted with ongoing TOT programme of agriculture	40(50.00)	35(43.75)	05(06.25)
11	READY developed confidence and professional competence in me to solve field problems	73(91.25)	07(08.75)	0(0.00)
12	READY provided me practical training in crop production	71(88.75)	09(11.25)	0(0.00)

FA= Fully Agree, SWA=Some What Agree, NA=Not Agree

The perusal of table -2 revealed that 87.50 per cent of the students were fully agreed that READY programme had helped to get familiar with rural people followed by READY had helped to understand village situations 93.75 per cent. Total 96.25 per cent students were fully agree village attachment, READY has helped me to understand the socio economic conditions of farmers, READY has helped me to understand farmers' problems respectively, followed by RAWE To understand cropping pattern of community(92.50%). Total 95.00 per cent students were fully agrees that RAWE It improves communication skill. Followed by READY developed confidence and professional competence in me to solve field problems (91.25 per cent). Whereas, 45.00 per cent of the students had fully agreed that READY has helped me to understand adoption patterns and adoption gaps. READY had helped to get acquainted with ongoing Transfer of Technology programmes in agriculture/homestead. A great majority fully agreed that has READY provided me practical training in crop production (88.75 per cent). Almost all of the students fully agreed that READY has improved my leadership qualities 86.25%.

It can be clearly noted from the above findings that READY has helped me to understand farmers' problems was rated as the most achieved objective followed by Practically understand the familiar with rural life.

The possible reason is that extension faculty both on the campus and off the campus shoulders major part of the READY work. There will be continuous guidance by the extension teachers particularly at the village level, but it needs based as far as other disciplines are concerned. Since the major share of activities in READY is of extension only, it is natural to find high rating by students for gain in communication skills. In student READY programme extension teacher play a very important role as a bridge. They help students in every level of the programme because they understand the language both of the student and of farmers and solve their problems by understanding them. Since the major share of activities in READY Program is of extension only, it is natural to find high rating by students for gain in communication skills.

CONCLUSION

Student READY Programme is an exposure to the principles of “learning by doing” and “seeing is believing”, which provides a direction to the students to think and act on their own. It offers a direction to the students to develop their knowledge, attitude and skill to graduate out as an expert and contribute in holistic development of agriculture. By this interview schedule, we find that mostly students were coming from rural background because of low education level they don't have much to do except agriculture so the primary occupation of respondent's parent's is agriculture and they have less than two lac annual income by farming. Use of cell phone in this generation is increasing day by day. In this era of internet, we can expect that internet is the first choice of every student when it comes to use of mass media. In conclusion we found that student ready programme increase communication skill and develop personality. Moreover, in this programme student develop their confidence level and professional competence to solve field as we as their own problems. By collection data from student's suggestion for this programme is to increase the stipend because they come from such background where their parents can't afford such expenses and student also want time of programme should be such that it will cover all the operations and cover one entire cropping season rather than for one semester.

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RESEARCH ARTICLE

Impediment in social economical growth in the mining area –A case study

Amit Kumar Singh[1] & Y. K. Singh[2]

1. CSIR-Central Institute of Mining and Fuel Research Barwa Road, Dhanbad-826001, Jharkhand (INDIA),
2. MGCVV, Chitrakoot, Satna, Madhya Pradesh

Corresponding author's email: amitcmri@yahoo.co.in

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ABSTRACT

Mining is beneficial for the local population in terms of economic expansion and decreasing poverty, however, it also affects the social life of the local population. Therefore, the aim of the study is to know the main impediments in Social Economical Growth in the Mining Area of the Dhanbad district (Jharkhand) which is the maximum responsible for social, economical growth. For this purpose select 240 respondents from 10 villages of coal mining area the respondents were categorised into four parts namely social, economical, administrative as well as environmental and health. Respondent's opinion (both categories beneficiaries and non-beneficiaries) related hurdles about various optimum growths of the village communities were observed. The data were analysed with the help of a two-point scale. Villagers felt illiteracy was the main impediment to rural social growth. The other impediments like the effect of traditional culture, fatalistic feelings and incompetent village leadership also checked the rural development of the study area. Poverty in the economic, complicated procedure of advancement of loans by local agencies/banks in administrative impediments and pollution as well as health is a major impediment in society. Thus, the present study provides baseline information about Impediment in Social Economical Growth in the Mining Area that could be helpful to the mining, local and nation administration to decide to improve and protect the socioeconomic and environmental status of the area.

Keywords: Coal mining, Dhanbad, Impediment, Development, Environmental issues

INTRODUCTION

In the development of social-economical growth in the mining area mining always plays an important role in the economical growth of our country. After agriculture, mining may well have been the occupation that took the highest human activities. These two industries together have been classified as the paramount industries of the early civilization. The importance of these industries has been changed very little since the beginning of civilization. Mining and agriculture still provide all the primary resources which are used by modern man. Cropping, fishing, and lumbering are a part of agriculture while mineral, oil, and gas production are a part of mining. Worldwide consumption of mined commodities has increased steadily in recent years, a trend that is expected to continue, as a result of strong demand in fast-growing developing countries. Mining is a major economic activity in many developing countries (Tauli-Corpuz, 1997; UNEP. 1997). Mining is viewed as one of the significant economic activities which have the prospect of contributing to the development of economies and contributes nearly 2.4 per of Indian Gross Domestic Product (GDP). However, the contribution of the mining sector to the GDP of India is on the decline. The mining sector contributed 3.4% of

India's GDP in 1992-93. This declined to 3.0% in 1999-2000 and further to 2.3% in 2009-10. And with the sector contracting in absolute terms in the last couple of years, the contribution of the mining sector to India's GDP has come down to 2% in 2012-13 (FICCI, 2013). The present contribution of the mining industry in GDP varies from 2.2% to 2.5% only.

Many countries across the globe are reliant on coal as they are not blessed with adequate energy resources to shelter their energy needs (Das, 2015). Countries like Japan, Chinese Taipei and Korea, ingress substantial measures of steam coal which is meant for electricity generation and coking coal, needed for steel production (Das, 2015). Even the alumina refineries, paper manufacturers, chemical and pharmaceutical industries, etc. are regular consumers of coal. The evaluation on the growing demand for energy resources shows that between 2000 and 2010, coal encountered nearly half of global energy demand. Though, there occurred hurried exhaustion in the case of renewable energy technologies, predominantly in the perspective of climate change, coal stand as the prominent unit of sustenance to fulfill the worldwide energy demand. This became possible because of the constant, extensively scattered and reasonable nature of coal (WCA, 2015).

Mining and power generation are among the most important developmental activities after agriculture. This rapid expansion of the mining industry has significant social and economic impacts on local communities in the region where mining is conducted. Mining has many common stages or activities, each of which has potentially adverse impacts on the natural environment, society and cultural heritage, the health and safety of mineworkers, and communities based close to operations (Moody and Panos, 1997, Akabzaa, 2000).

All sources of energy including coal also have numerous negative impacts. On the march of development, the resource-rich earth is being destroyed and the dependence on natural resources is becoming the victims (Sahoo, 2005). Whatever may be its form, it may be an opencast mine or underground mine, involves itself with widespread social, environmental and ecological complications such as pollution of air, water, noise and soil, deterioration of agricultural production, degradation of both physical and mental health, involuntary displacement, breakdown of community ties and social networks, etc. Usually, opencast mines require a larger amount of land and owing to its nature of extraction, it nurtures several socio-economic and environmental hazards (Singh, 2015). The process of mineral extraction (mining activity) has a noteworthy impact on the local communities, landscape and environment on the earth (Down & Stocks, 1997 and bell et. all, 2001) which is causing the disturbance of the ecosystem. Mining in a wider sense can also include extraction of petroleum, natural gas, and even water (Wikipedia, 2016) and petroleum product is the next important source of environmental pollution and generation of greenhouse gases.

Precarious substances and waste in the air, soil and water generated by mining may have far-reaching negative impacts on public health. When mining activities are not managed properly the activities of mining can abruptly and instantaneously affect the quality of life of the local communities i.e. their physical, mental and social well-being. Impromptu mining towns many times threaten food availability and safety increasing the risk of malnourishment. Indirect effects of mining on public health can include increased cases of tuberculosis, gastrointestinal diseases and chronic bronchitis.

Prosperous mining secure the

services of the local and provides them jobs, promoting the living standards of the community. Revenues generated from activities of mining help in developing schools, hospitals and other social amenities. These activities promote business enterprises in the mining regions. For instance, they promote growth in rental houses to provide accommodation for miners. Growth in businesses, such as hotels, is expected to cater to worker needs.

For the study in the social, economical growth of the study area it is required to know the main limitations of the area which is maximum responsible for social, economical growth. To know the main obstacle from the respondents the hindrances were categorised into four parts namely social, economical, administrative well as environmental and health. Respondent's opinion (both categories beneficiaries and non-beneficiaries) related hurdles about various optimum growths of the village communities were observed. Respondent's opinion in respect of various impediments in the social and economical growth of the study area is given in Table1: & Figure2.

Study Area

The Dhanbad district is situated in the state of Jharkhand and lies between 23˚37'3" N to 24˚4' N latitude and 86˚6'30" E to 86˚50'E longitude. The district expands in the area of 2886 sq. km in between Damodar, and Barakar, Rivers, forming its natural southern and south-eastern boundary. The climate of Dhanbad is a sub-tropical, sub-humid masonic type. The average annual rainfall of the district is around 1280 mm.

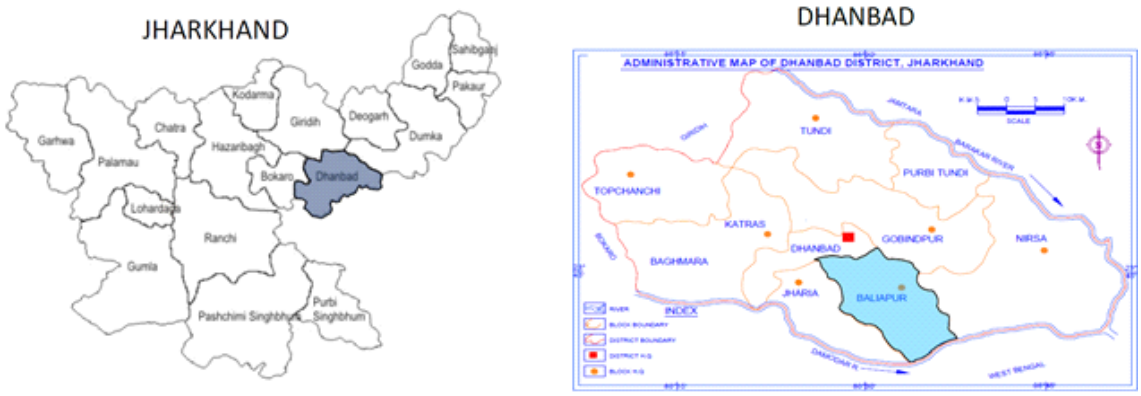

Fig.1: Location of the studied area in Dhanbad district, Jharkhand

Data Collection

The investigation work was done in Bharat Coking Coal Limited (BCCL) of Dhanbad, Jharkhand.

To justify the main impediment in Social Economical Growth in the Mining Area, study an attempt is made to compare two areas, one is affected by mining called **Beneficiaries** (inside the 3-kilometer range, of the mines) were chosen and another is non-affected by mining as **Non-Beneficiaries** (present in the same district and more than 8-18 kilometers from the mining set-up). Based on this reality, five influenced villages were chosen from the Beneficiaries group. As a role of non-beneficiaries (control group), five different villages were chosen for comparison in the study. It is worth referring to here that, non-recipient villages are not influenced by any type of industrial intercession and they are as yet exercising their indigenous methods for help. Data was taken by the investigator who personally interviewed respondents with the help of a

structured schedule. Again with the method of random sampling group of 24 respondents from each of ten comprehensive lists of villages were drawn. Thus, a total of 240 respondents were finally chosen to collect information with the help of a structured schedule. For the study, the main limitation is the social, economical growth of the study area which is the maximum responsible for social, economical growth. To know the main impediment from the respondents the impediments were categorised into four parts namely social, economical, administrative as well as environmental and health. Respondent's opinion (both categories beneficiaries and non-beneficiaries) related hurdles about various optimum growths of the village communities were observed.

Statistical analysis methods

Two-point scales along with percentages associated with 'Yes' response, and Percentage were used to test the statistical difference in different beneficiaries and non-beneficiaries groups and ranking was done according to them.

RESULTS AND DISCUSSION

The data were analysed with the help of a two-point scale. The data in the Table showed that 75 percent of respondents of beneficiary categories and 90 percent of respondents of non-beneficiary categories of villagers felt illiteracy as the main impediments of rural social growth. The other impediments like the effect of traditional culture, fatalistic feelings and incompetent village leadership also checked the rural development to the extent of 45.83, 40.00, and 31.66 respectively in beneficiary villages followed by 62.50, 56.66 and 40.00 percent respectively in non-beneficiary categories of villages. In case of economic impediments poverty and uneconomic holding, nonavailability of credit timely was taken for seeds and fertilizers, with the respondents belonging to beneficiaries and non-beneficiaries categories of villages non-availability of loan 48.33 percent was felt as a major impediment by the respondents of beneficiaries categories of village people while poverty 71.66 percent was a serious problem in rural social growth in non-beneficiaries categories of villages. Uneconomic holding 65.00 percent felt by respondents and next major impediments by the respondents belonging non-beneficiary categories of villages and its corresponding value in beneficiary categories of villages was worked out to be 33.33percenent was at second place in order.

In case of administrative impediments complicated procedure of advancement of loans by govt. banks/private banks/local agencies were observed as a major impediment to rural social growth. A respective percentage was 59.16 in beneficiary categories of villages and 65.00 percent in non-beneficiaries categories of villages. The second rank problem is the complicated procedure of input supply faced by 56.66 percent in beneficiary categories of villagers and 62.50 percent in non-beneficiaries categories of villages. Different attitudes of rural development personal were also a hurdle. The respective percentages were 27.50 beneficiary categories of villagers and 35.83 non-beneficiaries of villagers.

In the case of environmental and health impediments, noise pollution and water pollution was observed as major impediment in the rural social growth of the beneficiary area. A respective percentage was 85.00 and 80.00 in beneficiary categories of villages. And health and air pollution were third and fourth rank problems in the beneficiary area. The respective percentage was 68.33 and 65.83. While in the non-beneficiary category health was 1st rank (62.50%) problem. Water, air and noise pollution were very less compared to beneficiary category rank were II, III and IV and the respective percentage was 35.00, 26.66 and 20.83

Table-1: Respondent's opinion in respect of various impediments in the social and economical growth of the study area.

Sl. No.	Impediments in social and economical growth	No. of beneficiaries (N=120)	Rank	No. of non-beneficiaries (N=120)	Rank
1	2	3	4	5	6
1.	**Social**				
	• Effect of traditional culture	55 (45.83)	II	75 (62.50)	II
	• Illiteracy	90 (75.00)	I	108 (90.00)	I
	• Incompetent leadership	38 (31.66)	IV	48 (40.00)	IV
	• Fatalistic feelings of villages	48 (40.00)	III	68 (56.66)	III
2.	**Economical**				
	• Poverty	50 (41.66)	II	86 (71.66)	I
	• Uneconomic holding	40 (33.33)	III	78 (65.00)	II
	• Nonavailability of credit timely	58 (48.33)	I	70 (58.33)	III
3.	**Administrative**				
	• The complicated procedure of input supply	68 (56.66)	II	75 (62.50)	II
	• The complicated procedure of advancement of loans by local co-operatives/Banks	71 (59.16)	I	78 (65.00)	I
	• In different attitudes of rural development personal	33 (27.50)	III	43 (35.83)	III
4.	**Environmental & Health**				
	• Health	82 (68.35)	III	75 (62.50)	I
	• Noise Pollution	102 (85.0)	I	25 (20.83)	IV
	• Water Pollution	96 (80.00)	II	42 (35.00)	II
	• Air Pollution	79 (65.83)	IV	32(26.66)	III

Note: Figures in bracket are in percentage

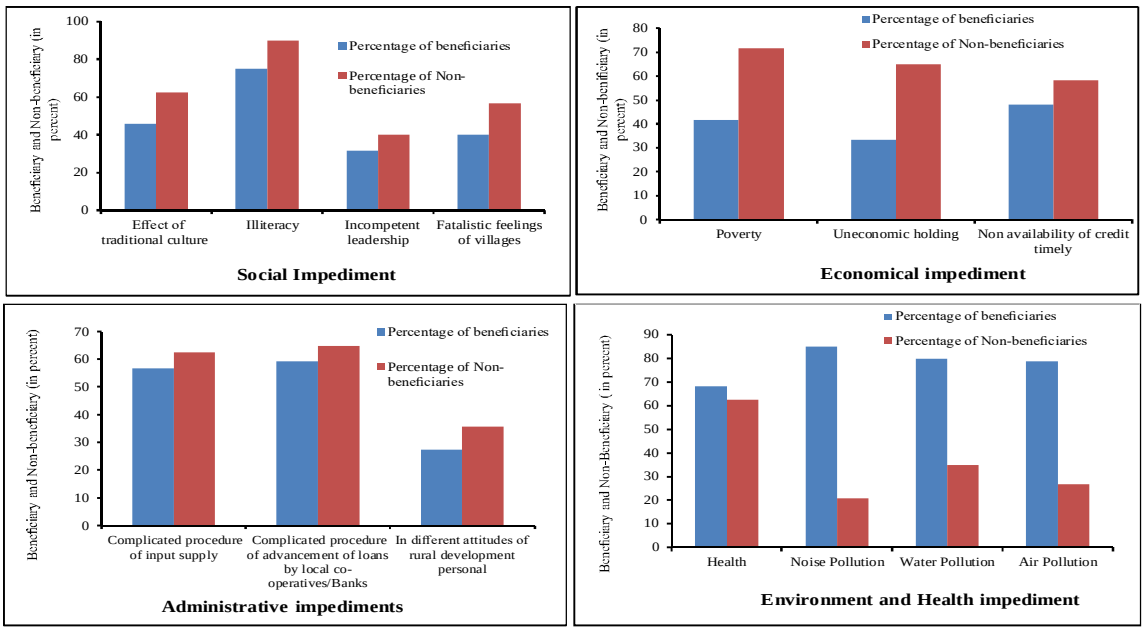

Figure 2: Respondent's opinion in respect of impediments in the social, economical growth of the study area.

CONCLUSION

In the mining area, overall quality of life is improved and there is a significant impact of the common facility for improvement in life quality except for health and environmental problem.

- Illiteracy and poverty were vital impediments in socio-economical growth in both categories (beneficiaries and non-beneficiaries) of villages. Another problem was noticed as complicated procedure of getting a loan from various agencies, which hamper significantly in development. Health and pollution are also found to be a big hurdle in development, Pollution is very much responsible for varied health issues. In the mining area (the mining beneficiary group) spend his money on health.
- The government development scheme procedure is completed.
- Thus, in the process of beneficiation, the role of education may be further enhanced by educating millions of people residing in thousands of under non-beneficiaries groups of villages.

Suggestions

Following suggestions are given to infallible strategy for overcoming the hurdles for the development of socio-economic status based on findings of this study:

- In emerging economics literacy should be increased by the government for the growth of socio-economic status. The adult education centers should be prepared in such a way that maximum villagers join them.
- Steps were taken to produce self-employment potentials for economically weaker people. For the removal of poverty, small-scale industries should be established. People generate more/extra employment opportunities for enhancing their income through small-scale industries.
- The coal-loaded vehicles should be properly covered at the time of transportation.
- Sufficient loans at subsidized interest rates should be provided to farmers in the study area.
- The government development scheme procedure should be simple and cooperative to poor people.
- Villager's attitude should change for the abolition of traditional culture and prepare them to adopt new ideas/schemes/ technology.

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Dr. PDKV, Akola - 444 104 (M.S.), India

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