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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 40th issue of Asian Journal of Extension Education for the year 2022. 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: 30 December, 2022

P. K. Wakle
Chief Editor

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RESEARCH ARTICLE

Socio- economic status of farmers practicing livestock-based subsidiary occupation and their constraints

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ABSTRACT

The study was conducted to know the socio- economic status of farmers practicing livestock-based subsidiary occupation and their constraints during 2020-21 in Gadag and Dharwad district of Karnataka. Forty farmers from three categories of livestock-based subsidiary occupations such as the rearing of milch animals, goat/sheep and mixed livestock were selected for the study by a simple random sampling procedure. The study revealed that about one-third (35.83%) of the livestock farmers had no education, more than half (55.00%) of the farmers were in medium size family, two fifth (40.00%) of the farmers belonged to low-income category. Majority of the farmers had low (Up to 5) livestock possession, two third (66.67%) of the farmers had high experience in subsidiary occupations and more than one-third (39.17%) of the farmers had high economic motivation. Major constraints faced by the farmers in practicing livestock-based subsidiary occupations includes high cost on feed and storage of feed and delay in veterinary service, that ranked first followed by non-availability of fodder round the year that ranked II.

Keywords: Livestock, subsidiary occupation and constraints

InTRODUCTION

Livestock plays a vital role in Indian economy. Around 20.50 million people rely on livestock for their livelihood and it contributes 16.00 per cent to the income of small rural households. The livelihood of two thirds of the agricultural community is provided by livestock. Additionally, it employs about 8.80 per cent of India's total population, 4.11 per cent of the GDP and the livestock industry contributes 25.60 per cent of the total agricultural GDP (Anonymous, 2020).

In contrast to their share of 24 per cent in land, marginal farm families (1 hectare of land), which made up 48.00 per cent of rural families, control more than half of the country's cattle and buffalo, as well as two-thirds of the small ruminants (goat & sheep), pigs, and poultry. As a result, all farmers raise animals, regardless of their financial situation (Anonymous, 2011).

Animals produce milk, meat, and eggs that are rich in protein, highly nutritive and more biologically active than plant-based proteins. Thus, the livestock industry aids in reducing the protein gap. In addition to helping the national economy in general and the agricultural economy in particular, the livestock sector also gives livestock owners a steady income.

In rainfed areas where crop production is erratic and the rearing of large ruminants is severely constrained by a lack of feed and fodder, sheep and goat play a significant role in the food and nutritional security of the rural poor. In unfavourable conditions, sheep and goats can easily

survive by eating available bushes and trees. In pastoral societies in India, sheep and goat are kept as a source of additional income and as insurance against income shocks of crop failure (Kumar,2007). However, farmers face many constraints in management of livestock. Hence the study was taken up during 2020-21.

MATERIAL AND METHODS

The Ex-post-facto research design was employed in the study to investigate socio- economic status of farmers practicing livestock based subsidiary occupation and their constraints. Study was conducted in Dharwad and Gadag districts and three category of livestock-based subsidiary occupations such as the rearing of milch animals, goat/sheep and mixed livestock were considered for the study. Forty farmers were selected from each category by a simple random sampling procedure and a personal interview method was used to collect the data. The total sample was composed of 120 farmers having livestock-based subsidiary occupations. Constraints were studied in six categories as general, feeds & feeding, breeding, veterinary/ health care service, care & management and marketing.

RESULT AND DISCUSSION

Education

The results in the Table 1 inferred that over one third (35.83 %) of the farmers had no education (Illiterate) followed by middle school (25.00 %), high school (16.67%), and primary school (15.83 %). Only 5.83 per cent of the farmers had studied up to degree college. This situation might have arised due to lack of school in their village and non-realization of importance of education. The similar results are in line with Sabapara *et al*. (2014) who reported that 37.00 per cent of farmers had no education.

Size of the family

The results showed that more than half (55.00 %) of the farmers belonged to medium (5 to 8 members) family size whereas, 34.17 per cent and 10.83 per cent of them belonged to large (> 8 members) and small (< 5 members) family size respectively. It was observed that many had nucleus families. As such family size is reduced even in rural areas. These findings are in conformity with the results of Mukesh *et al*. (2015) who reported that more than half (55.83 %) of the famers belonged to medium family size.

Annual income

It was observed that, most (40.00%) of the farmers belonged to low (less than Rs. 294697) annual income category followed by more than one third (36.67%) and 23.33 per cent of the farmers belonged to medium (< Rs. 294697 to Rs. 468883) and high (> Rs. 468883) income categories, respectively. In the present study, majority of the farmers had small and marginal landholding. Dairy, sheep/goat and mixed livestock were maintained as a subsidiary occupation. The farmers keep livestock to improve their income specially in small and marginal farmers. They have very less opportunities to improve their income. The findings are in conformity with results of Wadekar *et al*. (2016) who reported that less than half (43.33%) of farmers belonged to low level income category.

Livestock possession

The results revealed that more than half (53.33%) of the farmers belonged to low (Up to 5) category of livestock possession, followed by one fourth (25.00%) and about one fifth (21.67%) of the farmers were found in medium (6 to 14) and high (15 and above) livestock possession categories respectively. Availability of labour, non-availability of space to house, high cost of animals and feed

were the reasons to have fewer number of livestock. Among them feed availability and the ability to maintain them determine the size. The results were in line with Tajpara *et al*. (2020) who reported that more than half (54.67%) of famers possess low livestock possession.

Experience in subsidiary occupation

It was noticed that majority (66.67%) of the farmers belonged to high (> 20 years) farming experience followed by 25.00 per cent and 8.33 per cent of the farmers belonged to medium (10 to 20 years) and low (< 10 years) categories respectively. The sample consists of farmers with middle and high age group. Livestock as a subsidiary occupation is maintained traditionally and it is a part of their farming. Hence, they had high experience. The above finding are in line with Saravanan *et al*. (2020) who reported that more than half (54.00%) of the respondents possessed more than 20 years of experience.

Economic motivation

The results inferred that nearly forty per cent (39.17%) of the farmers belonged to high economic motivation category followed by medium (34.17%) and low (26.67%) economic motivation categories. Farmers do have urge to earn more, that is one of the reasons to take up livestock based subsidiary occupation. Improved dairy and sheep/goat management helps to get higher returns with their other income generating activities. Sharma *et al.* (2022) reported that more than one third (37.50%) of the farmers belonged to high category of economic motivation.

Institutional support

The results in table 2 inferred that majority (52.50%) of the farmers access credit from nationalized banks followed by farmer service societies (29.17%), private finance (10.00%) and Primary Agricultural Co-operative Societies /Cooperative societies (7.50%), Apart from these services 5.83 per cent had also availed from Agriculture/Veterinary Department (5.83%), from private money lender (5.00%) and (3.33%) friends and neighbours (3.33%).

The implication is that the major sources of credit among the farmers were nationalized bank which are institutional credit sources. Credit from institutional sources has less compared to other sources because farmers also get loan from cooperative societies The results are in line with findings of Silong and Gadanakis (2020) who reported 31.00 per cent and 21.00 per cent of farmers obtained credit from formal and non-formal credit providers respectively.

Organization participation

The results presented in table 3 revealed that the majority of the farmers had participated regular in milk co-operative societies (72.50%) followed by youth club (54.17%) and farmer producer company (45.83%).

Majority of the farmers participated occasionally in co-operative societies (86.67%), Gram panchayat (84.17%), self-help groups (51.67%), Mahila mandal (49.17%), farmer producer groups (45.00%) and youth club (44.17%). However, 49.17 per cent and 46.67 per cent of the farmers never participated in Mahila mandal and self-help groups respectively.

Source consultancy pattern

A glance at the table 4 revealed that majority (83.33%) of the farmers had frequently contacted veterinary clinic for information. Farmers occasionally visited Krishi Vignyan Kendra / University of Agricultural Sciences scientist (96.66%), private company personnel (71.66%), Agriculture Officer (57.50%) and Assistant Horticulture Officer (42.50%). With respect to informal sources, more than one third

(36.17%) of the farmers had frequently contacted progressive farmers for information, neighbours (25.00%) and friends (21.67%) for information. Similarly, about three forth (79.16%) of the farmers occasionally visited relatives, friends (78.33%) and neighbours (72.50%). Nearly two third (63.3%) of the farmers occasionally visited progressive farmers. However, 56.67 per cent of the farmers never visited input dealers for seeking information. In case of mass media sources, majority (97.50%) of the farmers frequently sought information from television. Similarly, majority (88.33%) of the farmers had occasionally used social media, newspaper (82.50%). However, no one had sought information from radio.

Constraints faced by the farmers in practicing livestock-based subsidiary occupations

The results in table 5 indicated that high cost on feed & storage of feed (100%) was major problem followed by non-availability of fodder round the year (90.00%), non-availability of artificial insemination(AI) facility in time (100%) was a problem listed under breeding of animals. Other constraints reported were high cost of medicine (79.17%) and low price of milk (66.66%).

Further, it was observed that farmers experienced problem of high cost of feed & storage of feed and dealy in service which ranked first among all the constraints, followed by non-availability of fodder round the year (90.00%) that ranked II. Lack of grazing land (79.17%), high cost of medicine & non-availability of medicine at local level (79.17 %) and lack of animal sheds (79.17 %) which ranked III. Further, disease occurrence (76.67%) was ranked IV, low price of milk was ranked V, non-functional milk cooperative societies (65.00% was ranked VI, lack of timely veterinary services (44.17%) was ranked VII, poor adaptability of cross breed animals (38.33%) was ranked VIII, difficult in cleaning of animals (35.00%) was ranked IX, low market price was ranked X, low productivity (23.3%) was ranked XI, inadequate knowledge about feeding(15.83%) was ranked XII and difficulty in heat detection (8.33%) was ranked XII.

Majority of the farmers were small and marginal farmers and land holding was less between two to five acres. They were not having separate land for growing fodder. There is a need to establish fodder banks to sustain livestock-based enterprise. Farmers had also found the problem of medicine that are not available at rural area.

Bhutia *et al*. (2017) were observed similar results and reported that major constraint was non-availability of improved breeds, lack of green fodder and lack of knowledge of balanced feeding. Kavithaa *et al.* (2020) reported that major constraints were unavailability of green fodder round the year, high cost of cattle feed and mineral mixture and lack of community grazing land.

CONCLUSION

Subsidiary occupation plays important role in the income generation of small and marginal farmers. It was observed that the majority of the farmers had low education status and possessed low livestock (Up to 5). The participation of the family members was high in different livestock activities and also collective decision-making pattern was followed. The major constraints experienced by the farmers were high cost of feed and storage of feed, non-availability of the fodder around the year, lack of grazing land and disease occurrence etc.. The study recommended community-level fodder banks and insurance schemes for livestock.

Table 1. Personal and socio-economic characteristics of the farmers (n=120)

Sl. No.	Categories	Frequency	Percentage
1	**Education**		
	Illiterate	43	35.83
	Primary school (1st to 4th)	19	15.83
	Middle school (5th to 7th)	30	25.00
	High school (8th to 10th)	20	16.67
	Junior college (11th to 12th)	7	5.83
	Degree college	1	0.83
	Mean: 1.43	**SD: 1.33**	
2	**Size of the family**		
	Small family (<5 members)	13	10.83
	Medium family (5 to 8 members)	66	55.00
	Large family (>8 members)	41	34.17
	Mean: 7.75	**SD: 3.05**	
3	**Annual income**		
	Low (< Rs. 294697)	48	40.00
	Medium (Rs. 294697 to Rs. 468883)	44	36.67
	High (> Rs. 468883)	28	23.33
	Mean: 381790	**SD: 204925**	
4	**Livestock possession**		
	Low (Up to 5)	64	53.33
	Medium (6 to 14)	30	25.00
	High (15 and above)	26	21.67
	Mean: 16.87	**SD: 25.97**	
5	**Experience in subsidiary occupations**		
	Low (<10 years)	10	8.33
	Medium (10 to 20 years)	30	25.00
	High (>20 years)	80	66.67
	Mean: 27.10	**SD: 12.59**	
6	**Economic motivation**		
	Low (<21.95)	32	26.67
	Medium (21.95 to 23.58)	41	34.17
	High (> 23.58)	47	39.17
	Mean: 22.75	**SD: 1.87**	

Table 2 : Institutional support availed by farmers for finance assistance

n=120

SI. No	Source	Availed loan/ subsidy
		f (%)
1	Farmer societies	24 (20.00)
2	Nationalized banks	54 (45.00)
3	PACS/Cooperative societies	9 (7.50)
4	Private money lender	6 (5.00)
5	Friends and neighbours	4 (3.33)
6	Agri./Vet. department	7 (5.83)
7	Finance companies and schemes etc….	12 (10.00)

Note: Figures in parenthesis indicate percentages and outside parenthesis indicate frequencies

Table 3 : Organization participation of the farmers practicing livestock-based subsidiary occupations

n = 120

SI. No	Name of the organization	Extent of participation		
		Regular	Occasionally	Never
		f (%)	f (%)	f (%)
1	Gram Panchayat	19 (15.83)	101 (84.17)	0 (0.00)
2	Co-operative Societies	16 (13.33)	104 (86.67)	0 (0.00)
3	Farmer producer groups	55 (45.83)	54 (45.00)	11 (9.17)
4	Self-help groups	2 (1.67)	62 (51.67)	56 (46.67)
5	Youth club	65 (54.17)	63 (44.17)	2 (1.67)
6	Mahila mandal	3 (2.50)	68 (56.67)	49 (40.83)
7	Milk cooperative societies	87 (72.50)	19 (15.83)	14 (11.67)

Note: Figures in parenthesis indicate percentages and outside parenthesis indicate frequencies

Table 4 : Source consultancy pattern of the farmers practicing livestock-based subsidiary occupations

n = 120

Sl. No.	Particulars	Frequency of use		
		Frequently	Occasionally	Never
		f (%)	f (%)	f (%)
I.	**Formal source**			
1	Agriculture Officer	11 (9.17)	69 (57.50)	40 (33.33)
2	Assistant Horticulture Officer	30 (25.00)	51 (42.50)	39 (32.50)
3	Veterinary clinic	100 (83.33)	20 (16.67)	0 (0.00)
4	KVK/ UAS scientist	4 (3.33)	116 (96.67)	0 (0.00)
5	Private company extension personnel	0 (0.00)	86 (71.66)	34 (28.33)
II.	**Informal sources**			
1	Progressive farmers	44 (36.67)	76 (63.33)	0 (0.00)
2	Friends	26 (21.67)	94 (78.33)	0 (0.00)
3	Relatives	0 (0.00)	95 (79.16)	25 (20.83)
4	Neighbors	30 (25.00)	87 (72.50)	3 (2.50)
5	Input dealers	0 (0.00)	52 (43.33)	68 (56.67)
III.	**Mass media sources**			
1	Radio	0 (0.00)	0 (0.00)	120 (100.00)
2	Television	117 (97.50)	3 (2.50)	0 (0.00)
3	News paper	2 (1.67)	99 (82.50)	19 (15.83)
4	Social media	12 (10.00)	106 (88.33)	2 (1.67)

Note: Figures in parenthesis indicate percentages and outside parenthesis indicate frequencies

Table 5 : Constraints faced by the farmers in practicing livestock-based subsidiary occupations **n=120**

SI. No	Constraints	Frequency	Percentage	Rank
I.	**General**			
1	Low productivity	28	23.33	XI
2	Low fat level in milk	53	44.17	VII
3	Poor adaptability of cross breed animals	46	38.33	VIII
4	High cost of feed and storage of feed	120	100.00	I
II.	**Feeds and feeding:**			
5	Inadequate knowledge about feeding	19	15.83	XII
6	Non availability of fodder round the year	108	90.00	II
7	Lack of grazing land	95	79.17	III
III.	**Breeding**			
8	Difficulty in heat detection	10	8.33	XIII
9	Delay in A.I service	120	100.00	I
IV.	**Veterinary/ Health care service**			
10	Lack of timely veterinary services	53	44.17	VII
11	High cost of medicine and non-availability of medicine at local level	95	79.17	III
12	Disease occurrence	92	76.67	IV
V.	**Care and management**			
13	Lack of animal sheds (housing facilities)	95	79.17	III
14	Difficult in cleaning of animals	42	35.00	IX
15	Lack of services at local level	25	20.00	XII
VI.	**Marketing**			
16	Low price of milk	80	66.66	V
17	Non-functional milk cooperative societies	78	65.00	VI
18	Low market price	35	29.17	X

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REVIEW ARTICLE

Constraints faced by the dairy farmers in India : A mini review

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ABSTRACT

Dairy farming is one of the most important economic activities in the rural areas of India where dairy is closely intervened with parallel farming system. Dairy farming is considered as lifeline in rural areas of India where people have been performing it traditionally for their livelihood and food security. This activity is carried out in millions of households across the state and provides employment to the marginal and landless farmers in India. Constraints refer to the problems which are faced by farmers in successful operation and management of dairy activity. Dairy production in area had numerous problems hindering the smooth progress of dairy sector in India.

Key words: Dairy Farmers, Constraints, Milk Production

INTRODUCTION

India has largest livestock population in the world i.e., 535.78 million which constitute 192.49 million cattle, 109.85 million buffalos (Livestock Census, 2020). India ranks first in milk production with a production level of 187.70 million tones milk during the year 2018-19 (Anonymous, 2019). As an inevitable part of agriculture, animal husbandry has been an integral part of farming from the time of its evolution 10,000 years ago. Animals provide nutrient rich food products, draught power, dung as organic manure and domestic fuel, hides and skin, and are regular source of cash income for rural households (Chinnadurai *et al.,* 2018). Dairying is most important component of economic and social life of the rural masses in India. Among all the possible livestock enterprises dairy farming is most popular and successful enterprise in rural part of India for livelihood activities. The low productivity of animal was main circumstances with average of 987 kg / lactation in Indian cow which is lower than world average of 2038 Kg/ lactation (Patil *et al.,* 2009). To increase production level from dairy animal farmer needs to adopt scientific dairy husbandry practices (Srinivas and Ramesha, 2017). The development of livestock sector is often considered as 'pro-poor'. The livestock products' demand is more income elastic, as income rises in relation to the cost of living, consumers generally tend to spend more on protein products of animal origin than before. It has been estimated that by the year 2020 the demand of milk will rise to 131- 158 million tonnes (Paroda and Kumar, 2000). Manhas and Sharma (2008) made an attempt to study the constraints faced by 200 dairy farmers in Jammu district of Jammu and Kashmir. The study revealed that half of the dairy farmers had faced a medium level of constraints, while 32.5 and 17.5 per cent respondents had faced a high and low level of constraints, respectively. Gangasagare and

Karanjkar (2009) reported that improved breeding practices were most adopted, whereas improved health care practices were least adopted by the respondents. Hamdani (2008) found that constraints in dairy farming mostly related to economy of respondents were perceived as more serious.

1.0 Feeding Constraints:

Kumar (2001), who revealed that non-availability or poor availability of green fodder and poor resources for green fodder cultivation were the constraints perceived by respondents Devendra *et al.*, (2002) reported that feeding constraints were perceived most serious by the respondents. Sarker and Ghosh (2010) and Minhaj *et al*., (2019), who reported that high cost of feed and mineral mixture was perceived as most serious constraint followed by high cost of fodder and non-availability of pastures. Kaur *et al.,* (2011) was noted that more than 90 per cent dairy farmers in central zone of Punjab state**.** Believed high cost of feed and fodder. Rathod *et a.,* (2011) highlighted that majority of farmers (87%) faced non-availability of fodder round the year. Rajpoot *et al.,* (2018) reported feed and green fodder /roughages management (63%) as the constraints faced by dairy farmers while adopting animal management practices. Sharma *et al.,* (2018) who reported low availability and high cost of concentrates (66%) as constraints in dairy farm women in Nainital District. Rajadurai *et al,*. (2020) found that all the dairy farmers were facing constraints of high cost of concentrates and shortage in green fodder, followed by non- availability of grazing land (77.7 per cent) and 46.3 per cent of the dairy farmers reporting fluctuation in concentrate feed cost. Babita Adhikari *et al.,* (2020) who reported that there were eleven constraints in dairy farming of which, the major constraint was unavailability of green fodder round the year (100%) in hill region of Uttarakhan state.

2.0 Housing Management Constraints:

Bala subramanian (1995) who found in Chengalpattu district, Tamil Nadu that majority of farmers had problem of animal shed or housing facilities because of their poor economic status and their inability to maintain farm and dairy record. Sharma *et al.,* (2000) also reported that low knowledge level, high cost of construction and lack of sufficient space were main constraints in adoption of improved housing practices. High capital and high cost of construction are always an issue for farmers when they want to start a dairy as enterprise. Narmatha *et al.,* (2010) also found high capital demand as major constraint in adoption of modern housing practices. Tailor *et al.,* (2012) also found in Udaipur that inadequate knowledge about scientific housing as a major constraint.

3.0 Healthcare Constraints:

The incidence of prolapse of genitalia was 1.86 and 0.85, whereas dystocia was 14.58 and 6.26 per cent in buffaloes and cows, respectively. The incidence of dystocia has been reported to be 8.0 per cent of buffaloes in Ambala (Tomar and Tripathy, 1995) whereas 12.6 per cent in Karnal (Taraphder 2002).Noticeably, under Indian conditions, mastitis causes loss of about INR 5000 Crores. Singh *et al.,* (2003), Naidu and Rao (2004) and Prajapati *et al.,* (2005) reported that abnormal post partum uterine discharge was observed in 22.22 and 13.87 per cent of buffaloes and cows in Punjab state. Roy *et al.,* (2005) reported that due to poor sanitary conditions and under nutrition conditions, the animals become susceptible to infections and disease. Lack of veterinary services adds up more severe adverse effects from such diseases. Due to unhygienic management and inadequate nutrition the animals become susceptible to infections

and disease. Patil *et al.,* (2009) and Tailor *et al.,* (2012) who found in Nagpur that 43.11 per cent of the farmers revealed high cost of medicine as their constraint, About 68.0 per cent of the respondents, opined to have inadequate knowledge of diseases, their prevention and control as their constraints and 56.89 per cent stated their constraints as non-availability of nearby veterinary hospitals. Kaur *et al.,* (2011) reported that central zone of Punjab state dairy farmers dairy farming major reproductive problems like anestrus in buffaloes and cows was 3.82 and 1.20 per cent, respectively. Kaur *et a.,* (2011) reported that central zone of Punjab state dairy farmers faced the problem of repeat breeding in buffaloes and crossbred cows (91.00 %) as major constraints in dairy farming Adhikari *et al., (*2020) found that occurrence of diseases among animal (34.17%) in hill region of Uttarakhand .

4.0 Breeding Constraints:

Venkatasubramanian (1994) who reported that distant location of A.I. centers was perceived as constraints by least number of respondents. It is also evident from the same table that preference of natural service, lack of good bredable bulls and high cost involved in calling veterinary staff for treatment of breeding related problem were on first, second and third ranks. Pandey (1996) and Sahu (1999) who also reported that lack of knowledge about the right time of servicing the animals after calving and getting pregnancy diagnosis done were the constraints perceived by majority of the respondents. Ramkumar *et al.,* (2004), Tailor *et al.,* (2012) and Dhindsa *et al.,* (2014) who reported that inadequate knowledge about repeat breeding was the major constraint faced by the dairy farmers in Pondicherry, Tamil Nadu and Udaipur respectively. Rathod *et al.,* (2011) highlighted lack of timely Artificial Insemination (AI) facility (72%), low conception rate through artificial insemination (57%) as the constraints in dairy farming. Jeelani *et al.,* (2015) and Rupasi *et al.,* (2006) who reported that poor conception rate of artificial insemination, prolonged age at first calving (4-6 years) were the major constraints in animal husbandry sector. Inadequate knowledge to detect heat signs in dairy animals was perceived as least serious. Babita Adhikari *et al.,* (2020) found that poor conception rate in Artificial Insemination (15%) in hill region of Uttarakhand .

5.0 Economic, Marketing and Management aspect Constraints :

Jayalaxami *et al.,* (1997) and Maity and Sidhu (2001) also reported low price of milk as a major constraint. Manoharan *et al.,* (2003) who reported the low economic gain from dairy enterprise which might be due to high cost of animals, feed and fodder etc. may increase the production cost and hence there was low economic gain from dairying. Kaur *et al.,* (2011) reported that low price of crossbred cow milk (98.67 %) in central zone of Punjab state. Rao *et al.,* (2013) who also reported that non-remunerative price of milk and lack of preservation facilities for milk was main constraints in milking practices. Singh *et al.,* (2017) non-remunerative price of milk was indicated as constraints in dairy farming. Rajpoot *et al.,* (2018) reported respondents not having cross breed/superior animals (72.5%) as the constraints faced by dairy farmers while adopting animal management practices Rajpoot *et al.,* (2018) reported low price of milk and milk products (83%) as the constraints faced by dairy farmers while adopting animal management practices. Singh *et al.,* (2019). Hence it is suggested that there should be improved marketing system, so that milk producers will not face difficulty in marketing of milk and milk products. Babita Adhikari *et al.,* (2020) reported that low productivity of animal (70%) in hill region of Uttarakhand.

6.0 Financial Constarinst:

Shergill (2006) reported that only 3.51 per cent milch animals were covered by insurance in Punjab. Out of the 300 households, 4 households reported the death of one milch animal each during October to March, 2010 and the death of milch animals caused a capital loss of Rs. 93000.

Kaur *et al.,* (2011) reported that In Punjab, insurance of milch animals, though formally possible, is not much popular among the dairy farmers. The information about insurance cover and capital loss due to death of milch animals is households only 16 households got their animals insured. Out of the total 4088 milch animals, only 499 (12.21 %) were covered by insurance.

7.0 Veterinary Services:

Venkata subramanian and Ram Chand (1993) also reported distant location of veterinary institutions as the constraints perceived by majority of the respondents. Venkata subramanian (1994) who also found that inadequate knowledge of disease symptoms among the farmers as important constraints in adoption the improved health-care practices. Meena (2000) and Kumar (2001) also reported the lack of faith in modern medicines among the sizeable number of respondents. Presence of the above mentioned constraints could be the reasons available indigenous herbs. Patal *et al*., (2018) concluded that unavailability of on time veterinary services for treatment and lack of veterinary services for treatment were main constraints. These results were not supporting present finding. High cost of veterinary medicine is a worldwide phenomenon. Thus, there is a need of training in this sphere of management to bring down the incidences of diseases Sharma *et al.*, (2018) also reported Insufficient veterinary doctors or attendants (72%) as one of the major constraints among dairy farm women in Nainital District. Rajpoot *et al.,* (2018) reported lack of veterinary facility in village (70%) as the constraints faced by dairy farmers while adopting animal management practices. Babita Adhikari *et al.,* (2020) found that unavailability of resource person especially veterinary doctor in nearby area (50%) in hill region of Uttrakhand State.

8.0 Organisational Constraints:

Nachimuthu (2002) said that lack of training institute in the research locale, lack of knowledge about schemes of A.H department and absence of milk testing facilities in study area were highlighted a major constraint. Arunkumar (2004) in his study on profile of SHGs and their contribution for livestock development in Karnataka reported the problems faced by the members were lack of timely support from banks/other organization was the major problem, inadequate number of organizations linked up, unequal distribution of work among members, non introduction of agriculture based income generating activities (IGA), non availability of information about IGA, and difficulty in getting external loans. Dabas *et al*., (2004) and Patil *et al.,* (2009) who found that majority of the dairy farmers experienced delay in payment from dairy co-operative societies, followed. Seth *et al.,* (2004) and Jeenger (2010) who reported that majority of the respondents had not taken training in dairy farming. It may be due to fact that lack of training organizations in the study area or located in urban area and semi urban area. Rathod *et al.,* (2009) and Prasad *et al.,* (2019) who reported that majority of the respondents were not aware of schemes of A.H. department and lack of storage facility for milk and milk by products. Ashraf *et al*., (2013) and Rupasi *et al.,* (2006) who reported that financial shortage and high input prices were faced by farmers to adopt improved animal husbandry practices. On the other hand, lack of proper knowledge of milk production economics was perceived

as least serious Rao *et al.,* (2013) and Rao *et al.,* (2013) told that lack of own capital and lack of credit facility were main constraints in dairy farmers this result are opposite to present finding it might be due to the present finding was conducted on urban and peri urban region whereas that study was in rural area. High capital and high cost of construction are always an issue for farmers when they want to start a dairy as enterprise. Long term loans and subsidies through bank and government can solve the constraints of shelter for dairy animals. Rani *et al,*. (2013) studied the constraints perceived by dairy farmers in adoption and repayment of dairy loans in Amritsar District of Mejha region of Punjab. Rao *et al.,* (2013) told that lack of own capital and lack of credit facility were main constraints in dairy farmers this result are opposite to present finding it might be due to the present finding was conducted on urban and peri urban region whereas that study was in rural area. High capital and high cost of construction are always an issue for farmers when they want to start a dairy as enterprise. Long term loans and subsidies through bank and government can solve the constraints of shelter for dairy animals. Babita Adhikari *et al.,* (2020) reported that lack information about government schemes (45%) in hill region of Uttrakhand State.

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RESEARCH ARTICLE

Constraints faced by dairy farm women while adopting animal management practices in Navsari district of Gujarat India

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ABSTRACT

The most significant role played by livestock sector particularly dairying is to improve the economic lot of million of rural families, as it provides insurance against crop failure, besides generating a regular source of income and employment .The present study was carried out to analyse the constraints faced by the rural dairy youth farm women in Navsari district. This study was conducted in six villages from three talukas of Navsari district by personally interviewing three hundred sixty dairy women farmers last three years .The ex-post facto design was followed . Study revealed that the major constraints were high cost of concentrate feed, lack of technical know-how about feed, fodder and health management aspects, non-availability of roughages and non-availability of remunerative prices of milk and milk products.Dairy farm women have to be motivated to acquire more advanced scientific knowledge for increasing the livestock production through various extension programmes at grassroot level.

Key words: Animal Husbandry, Dairy Farm Women, Milk Production

INTRODUCTION

Milk production has been increased gradually from 112.2 million tones in the year 2008-09 to 191 million tones in the year 2019-20 with 5.24 % growth rate to assert India as the largest producer in the world. About 40% of the milk sold is handled by the organised sector and the remaining 60% by the unorganised sector. It is estimated that the demand for milk would be in the range of 200 -210 million tons by financial year 2021-22.Milk production has witnessed a steady growth in the country registering CAGR of about 5.5% between financial year 2010 and financial year 2019 (Anon.,2019). Moreover, the major constraints encountered by the dairy farmers in Surat district were high feed cost, high construction cost and non-remunerative prices for milk (Sabapara, 2014). The rapid growth of milk production in India has been mainly because of the increase in the number of animals rather than that of improved productivity. The low productivity of dairy animals is of great concern and average productivity of Indian cow is only 987 Kg/ lactation.

METHODOLOGY

The study was conducted in purposively selected Navsari district of Gujarat, during the year 2016-19 .Navsari district consist of six talukas from which three talukas namely Navsari, Gandevi and Vansda taluka were selected for the study. From each taluka six villages were selected with simple random sampling methods, and from each village, twenty young farm women (i.e. below 35 years age) were selected with purposive random sampling

method. Thus, total 360 young farm women were selected for the study. The ex-post facto research design was followed. An interview schedule was developed in accordance with objectives of the study and it was pre tested and translated in to guajarati language. The parameter with maximum frequency or percent was ranked first, while the parameter with minimum frequency or percent ranked last.

RESULTS AND DISCUSSION

Table 1 . Profile of Dairy farm women **(n=360)**

Sr. No.	Categories	Frequency	Percent
A	**Age**		
	Younger (16-25 years)	107	29.80
	Middle (25-30 years)	104	28.90
	Old **(**>30 years)	149	41.30
B	**Education**		
	Primary Education (I-VIII)	00	00
	Secondary Education (IX-X)	149	41.30
	Higher Secondary Education (XI-XII)	123	34.20
	Graduation and above	88	24.50
C	**Type of Family**		
	Nuclear	279	77.50
	Joint	81	22.50
D	**Occupation**		
	Agril + A.H	360	100.00
	Labour	107	29.72
	Home makers	360	100.00
	Govt.Jobs/ Business	107	29.72
E	**Marital Status**		
	Married	300	83.40
	Unmarried	44	12.20
	Widow	00	00.00
	Single/Divorce	16	04.40
F	**Annual Income**		
	Low (up to 50000)	14	03.90
	Medium (50001 to 100000)	228	63.30
	High (>100000)	118	32.80

G	**Land Holding**		
	Landless	10	02.80
	Marginal (up to 2.5 acres)	255	70.80
	Small (2.5 to 5.0 acres)	95	26.40
	Large (above 5.0 acres)	00	00.00
H	**herd Size**		
	Small herd size (up to 2)	251	69.80
	Medium herd size (3to 4)	89	24.70
	Large herd size (>4)	20	05.50
I	**Types of Ruminant kept**		
	Small Ruminants (Goat & Sheep)	38	10.55
	Large Ruminants (Cow & Buffalo)	360	100
J	**Experience in Animal Husbandry**		
	Low (3 to 5 years)	80	22.20
	Medium (6 to 10 years)	198	55.00
	High (> 10 years)	82	22.80

The data presented in table -1 majority of farm women (41.30 per cent) belonged to >30 years age group followed by 29.80 per cent in 16-25 years age group and 28.90 per cent in 25-30 years age group. Majority (41.30 per cent) of the respondents had secondary level education, 34.20 per cent had higher secondary level education, followed by 24.50 per cent had "graduation and above level" of education. Majority of the respondents (77.50 per cent) had nuclear type of family; only 22.50 per cent had joint family. All respondents were engaged with main occupation i.e. agriculture with animal husbandry with house hold activities. Nearby one third (29.72) have labour and Govt. job with their main occupation.In the majority (63.30 per cent) of the respondents belonged to medium (50001 to 100000) income group followed by higher income (>100000) group and low income group (up to 50000) with 32.80 and 03.90 per cent respectively.

The table 1 also shows that majority (70.80 per cent) of the respondents belonged to marginal land holding followed by small land holding group (26.40 per cent) and 2.80 per cent were found landless. In the majority (69.80 per cent) of the respondents had small herd size, followed by medium herd size (24.70 per cent) and 5.50 per cent of respondents have large herd size. The data depicted in table 1 said that all the respondents were keeping large ruminants where as 10.55 per cent were also keeping small ruminants and inferred that more than half of the respondents (55.00 per cent) have medium level of experience, followed by 22.80 and 22.20 per cent have higher and lower level of experience in animal husbandry sector.

2.0 Constraints faced by dairy farm women while adopting animal management practices in Navsari district

Constraints imply the problems or

difficulties faced by dairy farmers while adopting day-to-day animal husbandry practices in their dairy enterprise. Here, constraints are studied under five major categories i.e economical constraints, technological constraints input-supply constraints marketing constraints and administrative constraints.

Economic constraints

The data in table 2 indicated that the respondents were confronted with economical constraints , majority of dairy farm women (90.60 %) reported higher expenses over concentrate feed respectively followed by (79.16%), (49.72%), (26.94%) and (14.72 %) of the respondents reported that high cost of milch animals , high cost of construction of cattle shed, high rate of interest on loans and lack of loan facilities as a major constraints faced by respondents of South Gujarat . These findings are in line with those of Patel *et al*., (2013) observed that non-availability of green fodder (73.75%), lack of knowledge on balanced scientific feeding (72.5%) were major problems associated with feeding practices in Narmada district of south Gujarat.

Table 2. Economical constraints

Economical Constraints	Frequency	Percent	Rank
High cost of concentrate feed	326	90.60	I
High cost of milch animals	285	79.16	II
High cost of construction of cattle shed	179	49.72	III
High rates of interest on loans	97	26.94	IV
Lack of loan facilities	53	14.72	V

TECHNICAL CONSTRAINTS

Regarding the technical constraints (table 3) the majority of the respondents perceived lack of technical know-how about feed, fodder and health management aspects as the most important technological constraint in adoption of improved dairy management practices , followed lack of knowledge about recommended practices of animal husbandry (70.00%), lack of knowledge about latest technology related to milk and milk processing (52.77 %) and inadequate knowledge of vaccination schedule (49.16%) were assigned 2nd , 3rd and 4th dose knowledge respectively**.** These findings was similar to those Sarita *et al*. (2017) opined that (72.00 %) buffalo owners in murrah breeding tract of Haryana were unaware about preventive vaccination program and about 63.33 and 62 % farmers, respectively faced emergency veterinary services and infrequent visit of veterinarian to the village.

Table 3. Technical constraints

Technical constraints	Frequency	Percent	Rank
Lack of technical know-how about feed, fodder and health management aspects	295	81.9	4I
Lack of knowledge about recommended practices of animal husbandry	252	70.00	II
Lack of knowledge about latest technology related to milk and milk processing	190	52.77	III
Inadequate knowledge of vaccination schedule	177	49.16	IV

Input supply constraints

In table 4 majorities of the respondents were confronted with the constraint of non-availability of roughages (66.11 %) and as such it was rated as the most important constraint in adoption of improved dairy management practices followed by lack of supply of crossbred cows (48.61%) and non-availability of medical aids for animal treatments (30.81%).

Table 4. Input supply constraints

Input supply constraints	Frequency	Percent	Rank
Non-availability of roughages	238	66.11	I
Lack of supply of crossbred cows	175	48.61	II
Non-availability of medical aids for animal treatments	111	30.81	III

MARKETING CONSTRAINTS

Problems related to marketing of milk in the study area were depicted in table 5, which revealed that non-availability of remunerative prices of milk and milk products (71.66 %) was the major constraint and ranked first rank. The other least concerned constraints were high cost of preparation of milk products (38.05 %) and irregular collection of milk (20.67%). These findings was similar to those Patel *et al.*, (2013) found that majority of the farmers (87.5%) in south Gujarat faced non-remunerative price for milk, while less number (31.25%) cited lack of preservation facilities for milk.

Table 5 . Marketing constraints

Marketing constraints	Frequency	Percent	Rank
Non-availability of remunerative prices of milk and milk products	258	71.66	I
High cost of preparation of milk products	137	38.05	II
Irregular collection of milk	37	10.30	III

Administrative constraints

Constraints associated with administrative work associated of rural dairy farm women in the study area were perceived by less number of farmers (Table 6). Here, about 63.33, 33.33 and 08.33 % owners reported lack of proper training on animal husbandry, lack of artificial insemination facility in villages and lack of veterinary services in time. In a similar line, Tomar and Thakur (2002) and Singh *et al.* (2004) reported inadequate veterinary care and services in time as the principal limitation faced by the dairy farmers.

Table 6. Administrative constraints

Administrative constraints	Frequency	Percent	Rank
Lack of proper training on animal husbandry	228	63.33	I
Lack of artificial insemination facility in villages	120	33.33	II
Lack of veterinary services in time	30	08.33	III

CoNCLUSION

It can be concluded high cost of concentrate feed , lack of technical know-how about feed, fodder and health management aspects , non-availability of roughages, non-availability of remunerative prices of milk and milk products and lack of proper training on animal husbandry in the field of animal husbandry were the first ranking constraints of the area. The findings lead to conclude that a number of constraints were found to be hindering the adoption of dairy management practices by dairy farm women. Dairy farm women have to be motivated to acquire more advanced scientific knowledge for increasing the livestock production through various extension programmes at grassroot level.

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RESEARCH ARTICLE

Impact of farm pond on agricultural development of farm pond owner farmer

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ABSTRACT

The present study was conducted mainly with the specific objective 'to Study impact of farm pond on agricultural development of farm pond owner farmers. For the study solapur district was selected. Total 160 respondents are selected. Ex-post-facto research design was used for the research study All crops showed a positive change in average productivity, indicating an increase in crop productivity. The majority of kharif and rabi crops had higher average productivity. Kharif crops Soybean and Green Gram shown the maximum increase in average productivity, 27.90 per cent and 22.21 per cent respectively. Gross cropped area increased by 16.60 per cent) after construction of farm ponds over before construction of farm ponds. Before construction of farm ponds, the cropping intensity was (113.88 per cent) whereas after construction of farm ponds it was 132.18 per cent. After the construction of the farm pond, the area of vegetable crops increased by 40.95 per cent, while the area of fruit crops increased by 84.37 per cent. Relatively higher proportion (33.12 per cent), of the beneficiary farmers in the before construction of farm pond category had annual income ranging from Rs. 150001 to 225000/-, followed by 19.37 per cent of farm pond owner farmers having annual income ranging from 75001-150000/- According to the study, changes in agricultural development dimensions such as productivity of major crops such as Soybean 27.90 per cent and Rabi Sorghum 29.50 per cent were observed after the construction of farm ponds. Chick pea 17.94 per cent, cropping intensity 16.06 per cent and annual income 14.28 per cent. The total impact of farm ponds on beneficiary farmers was found to be 22.94 per cent. It means that farm ponds have a distinct impact on agricultural development. As a result, it is implied that the implementation of the farm pond programme should be continued and expanded to other areas, as well as motivating farmers to raise fish, which may help farmers earn additional income. Second, farmers must be educated to priorities high-value, demand-driven crops over low-value crops in their production plans as the irrigation is available.

Key Words: Impact, Farm Pond, Agricultural Development.

METHODOLOGY

The list of farm pond issued in villages of Barshi and Mohol tehsil were obtained from the respective Taluka Agricultural Officer. There are 131 villages Barshi tehsil out of which 4 villages were selected according to maximum no. of farm pond in those villages. There are 102 villages in Mohol tehsil out of which 4 villages were selected according to maximum numbers farm pond in that villages. Total 8 villages were selected purposively from Barshi and Mohol tehsil of Solapur district for the study as both tehsils having dryland condition. Thus from 8 villages of both tehsils 160 respondents

were selected for the present study.

RESULTS AND DISCUSSION

Impact of Farm Pond on Beneficiary farmers

Table 1. Overall impact of farm pond on beneficiary farmers.

Sr. No.	Dimensions of Agricultural development	Respondents N = 160		
		Before (mean)	After (Mean)	Per cent Change
1.	Cropping intensity	113.88	132.18	16.06
2.	Productivity			
I	Soybean	17.45	22.32	27.90
ii.	Sorghum	18.30	23.70	17.94
iii	Annual (sugarcane)	850	947	11.41
iv.	Chilli	8.64	12.76	47.68
v.	Grape	227.20	247.9	9.11
3.	Annual income	210000	240000	14.28
Total impact 20.62 %				

When the overall impact is considered, Table 16. indicate that there was a total impact of (20.62 per cent) of farm ponds on the farm pond owner farmers. It could therefore be stated that farm ponds had a definite positive impact on the beneficiaries in terms of cropping intensity, productivity of major crops, and annual income. The findings of the present study are similar with to the findings of Bhange and *et al*(.2000).

Table 2 : Distribution of different major crops in study area according to the productivity before and after construction of farm ponds.

Respondents N=160

Sr No	Name of the crop	Before farm pond (QT/ha)	After farm pond (QT/ha)	Percentage change
A	***kharif***			
1.	Soybean	17.45	22.32	27.90
2.	Black gram	12.11	14.8	22.21
			***Kharif* total**	25.05
B	***Rabi***			
1.	Chick pea	13.21	15.58	17.94
2.	*Rabi* sorghum	18.30	23.7	29.50
			***Rabi* total**	23.72
C	**Annual**			
	Sugarcane	850	947	11.41

D	**Vegetables**			
1.	Onion	126	143.7	14.04
2.	Tomato	217	238.9	10.09
3.	Chilli	8.64	12.76	47.68
4.	Brinjal	213	234.41	10.05
			Total vegetables	20.46
E	**Fruits**			
1.	Grape	227.20	247.9	9.11
4	Banana	334.40	357.22	6.82
			Total Fruits	7.96

It is concluded grom table2. that, all the crops showedchange in average productivity in positive direction that is increasein productivity. The majority of *kharif* and *Rabi*crops had higher average productivity. The average productivity of kharif crops Soybean and Black Gram increased by 27.90 per centand 22.51 percent, respectively, over the earlier year. With related to *rabi* crops, there was a change in average productivity in chick pea and *rabi* sorghum, with percentage changes of 17.94 per cent and 29.50 per cent, respectively. In the case of vegetables, it was found to be 20.46 per cent, and in the case of fruit crops, it was found to be 7.96 per cent. In the case of the annual crop, sugarcane, the productivity change was 11.41 per cent.According to the given findings, it could be inferred that farm ponds had a significant impact on the productivity of various *kharif* and *rabi* crops, owing to the availability of protective irrigation from the farm pond.The above results show that after the construction and use of a farm pond, crop yield was increased. It was also discovered that crop production increased just after the construction of the farm pond. This could be due to an increase in irrigation area and the adoption of various improved technologies made available to farmers following the construction of a farm pond.These findings were partially in line with to the findings of Bhandarkar (2010).

Table 3. Cropping intensity before and after construction offarm pond

Respondents N=160

Sr No	Name of the crop	Before Construction farm pond	After Construction farm pond	Percentage change
A	***kharif***			
1.	Soybean	190.80	252.80	32.49
2.	Black gram	53	23.38	-55.89
	***Kharif* total**	**243.82**	**76.18**	**13.28**
B	***Rabi***			
1.	Chick pea	127	99.20	-21.89
2.	Sorghum	181	227.80	20.54
	***Rabi* total**	**308**	**327**	**6.16**
C	**Annual**			
	Sugarcane	**33.80**	**44.40**	**31.36**

D	**Vegetables**			
1.	Onion	28.60	37	29.37
2.	Tomato	10.30	16.03	55.63
3.	Chilli	11.40	17.17	50.61
4.	Brinjal	8.50	12.68	49.17
	Total vegetables	**58.80**	**82.88**	**40.96**
E	**Fruits**			
1.	Grape	16.54	30.10	81.98
2.	Banana	8.88	17.10	92.57
	Total Fruits	**25.60**	**47.20**	**84.38**
	GCA Total A+B+C+D+E	**670**	**777.66**	**16.06**
	Net cultivated Area	**588.30**		
	Cropping intensity	**113.88**	**132.18**	**16.06**

A critical observation of change in cropping intensity Table 3. revealed that the gross cropped area increased by 16.60 per cent after construction of farm ponds over before construction of farm ponds. Before construction of farm ponds, the cropping intensity was 113.88 per cent whereas after construction of farm ponds it was 132.18 per cent. The percent change in cropping intensity after the construction of farm ponds was 16.06 percent compared to the last year. The percentage change in the total *kharif* area was approximately 13.28per cent. However, the percent change in total *rabi* area after the construction of farm ponds was 6.16 percent. After the construction of the farm pond, the area of vegetable crops increased by 40.95 per cent, while the area of fruit crops increased by 84.37 per cent. The area under Chick pea and Black gram was reduced. This is because of the transformation of these areas to vegetable and fruit crops. The gross cropped area was increased, which may allow farmers to plant more *rabi* crops.

Besides that, the availability of water in farm ponds had resulted in cropping pattern diversification through crop substitution with more profitable crops. As a result, farmers must have been encouraged to be using farm pond technology in order to cultivate fallow land and increase cropping intensity. From the above findings it can be inferred that there was significant impact of farm ponds in changing cropping intensity which may help the beneficiary for the socio-economic upliftment. Similar types of findings were observed by Desai2005.

Table 4. Distribution of respondents according to their annual income.

	Annual	**Respondents**			
Sr. No	**income (Rs)**	**Before farm pond**		**After farm pond**	
		Frequency	**Percentage**	**Frequency**	**Percentage**
1	Up to 75000	26	16.25	0	0
2	75001 to 150000	31	19.37	44	27.50
3	150001 to 225000	53	33.12	38	23.75
4.	225001 to 300000	22	13.75	42	26.25
5.	Above 300000	28	17.50	36	22.50
	Total		**210000**	**240000**	**14.28**
	Mean				

it was revealed from table 4 that a relatively higher proportion (33.12 per cent) of the beneficiary farmers in the before construction of farm pond category had annual income ranging from Rs. 150001 to 225000/-, followed by 19.37 per cent of farm pond owner farmers having annual income ranging from 75001-150000/-, whereas 17.50 per cent had annual income above Rs. 300000 /-and only 16.25 per cent and 13.75 per cent of farm pond owner farmers having annual income up to Rs 75000/- and Rs. 225001 to 300000/- respectively. After the construction of farm ponds, the most of beneficiary farmers, that is 27.50 per cent were having annual incomes ranging from Rs. 75001 to 150000/-, followed by 26.25 per cent beneficiaries with annual incomes ranging from Rs.225001-300000/-,Also 23.75 per cent with annual incomes ranging from Rs. 150001 to 225000/- and 22.50 percent with annual incomes exceeding Rs. 300000/- .The annual income change after the construction of the farm pond was 14.28 per cent. According to the findings above, the annual income of farm pond owner farmers increased after the construction of farm ponds. These findings are supported by the findings of Desai R. (2005).

CONCLUSION

According to the study, changes in agricultural development dimensions such as productivity of major crops such as Soybean 27.90 per cent and *Rabi* Sorghum 29.50 per cent were observed after the construction of farm ponds. Chick pea 17.94 per cent, cropping intensity 16.06 per cent, and annual income 14.28 per cent. The total impact of farm ponds on beneficiary farmers was found to be 22.94 per centIt means that farm ponds have a distinct impact on agricultural development. As a result, it is implied that the implementation of the farm pond programme should be continued and expanded to other areas, as well as motivating farmers to raise fish, which may help farmers earn additional income. Second, farmers must be educated to priorities high-value, demand-driven crops over low-value crops in their production plans as the irrigation is available.

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RESEARCH ARTICLE

Attitude of student towards experiential learning programme

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ABSTRACT

The present investigation was conducted in the two constituent's colleges of agriculture under Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. i.e., College of Agriculture, Akola and Shri. Shivaji Agriculture College Amravati, with a view to know the attitude of student towards Experiential Learning Programme (ELP). Students who were registered for the final year (2019-20) were considered and total120 respondents were selected by random sampling method. Exploratory research design was used for the study. The majority (72.50%) of the students had favourable attitude towards ELP, followed by 15 per cent of the students had least favourable attitude towards ELP and 12.50 per cent students had highly favourable attitude towards ELP.

Key word - Attitude, Experiential Learning Programme

INTRODUCTION

Agriculture is pivotal to India's social security and overall economic welfare. The growth and development of any society and the development of human resource occurs mainly through education (Singh 2012). Agriculture graduate of the country are expected to render a great service to the community by motivating and providing a stimulus to their students so that they would show keen interest in the business of agriculture or service as change agents. Katyal and Bisht (2005) opined that present-day agricultural education produces degree holders and not hard-core professionals who can anticipate and analyze real life work and field problems and provide solutions on their management. Neither are they confident enough to pursue self-employment. For cultivating professionalism, it is necessary to build practical skills and entrepreneur spirit by making appropriate shifts in course curricula and emphasizing hands on training in life size situation. There was need for agricultural education to respond to the requirements of employment, food security, poverty, economic growth and sustenance of the natural resource quality Singh (2012).

In an effort to reorient agricultural education for employability, Indian Council of Agricultural Research (ICAR) developed and launched in 2006 a programme named Experiential Learning Programme to facilitate learning by experience for professional development. The programme is mandatory to undergraduate students in Agricultural Universities and offered for one semester during the final year. Experiential learning is a philosophy and

methodology in which educators purposefully engage with learners in direct experience and focused reflection in order to increase knowledge, develop skills, entrepreneurship, and inculcate values. Experiential Learning Programme is a business curriculum-related endeavour, which is interactive. It is for building skills in project development and execution, decision-making, individual and team coordination, approach to problem solving, accounting, quality control, marketing and resolving conflicts, etc.The programme has provided a very good platform for students with an approach of "Learning by Doing" and "Seeing is Believing" and gives a new direction to the undergraduate programme which will develop thinking, skilful, expert, manager, human resource in the area of agriculture, veterinary, horticulture, forestry and other allied disciplines.

Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola was implemented Experiential Learning Programme into the curriculum of the under- graduation with a load of 0+20 credits in the VIII semester of B.Sc. (agriculture) in all the constituent colleges of the University, with following objectives of Experiential Learning Programme ELP:

- To promote professional skills and knowledge through hands on experience.
- To build confidence and ability to work in project mode.
- To acquire enterprise management capabilities.

Keeping in view the present study has been conducted with following objectives

1. To study the profile of students under Experiential Learning Programme
2. To study the attitude of student towards Experiential Learning Programme

METHODOLOGY

The present study was based on the exploratory research design and carried out in College of Agriculture, Akola and Shri. Shivaji Agriculture College, Amravati. These two colleges were, purposively selected from four governments and two government aided agriculture colleges in the jurisdiction of Dr. PDKV, Akola .A sample of 120 students who pass out and registered in academic year 2019-2020 from these College were selected randomly for study. The questionnaire (Google form) was prepared based on objectives of the study and data were collected through online survey from selected respondents. The collected data were classified, tabulated, analyzed and interpreted in order to make the findings meaningful. The statistical measures such as frequency and percentage, arithmetic mean and standard deviation. To measure the attitude of student towards Experiential Learning Programme (ELP), a teacher made attitude test was developed in consultation with extension experts and available literature. It consists of 24 statements and responses were measured on five point continuum as strongly agree, agree, undecided, disagree and strongly disagree and score 5, 4, 3, 2 and 1, was given for positive statements whereas, reverse score was given to negative statements. Then, the obtained attitude score were converted in to attitude index with the help of following formula.

$$\text{Attitude Index} = \frac{\text{Sum of attitude score obtained by a respondent}}{\text{Sum of obtainable attitude score}} \times 100$$

RESULTS AND DISCUSSION

Profile of students under Experiential Learning Programme (ELP)

Table 1 : Profile characteristics of students under Experiential Learning Programme (ELP)

Sr. No.	Categories	Respondents (N=120)	
		Frequency	Percentage
1	**Gender**		
I	Male	60	50
ii	Female	60	50
2	**Family background**		
I	Rural	86	71.67
ii	Urban	34	28.33
3	**Academic performance of the students (CGPA)**		
i	First Division with Distinction (Above 8.50)	14	11.67
ii	First class (7.50 to 8.49)	79	65.83
iii	Second class (6.00 to 7.49)	26	21.67
iv	Pass (5.50 to 5.99)	01	00.83
4	**Parental occupation**		
i	Only Agriculture	54	45.00
ii	Agriculture + Labour	07	05.83
iii	Agriculture + Allied occupation (Goat farming/Poultry/Fishery)	14	11.67
iv	Agriculture + Business (Professional/Non-professional)	12	10.00
v	Agriculture + Service (Job with monthly salary/Pension)	26	21.67
vi	Other	07	05.83
5	**Annual income**		
I	Up to Rs. 1,00,000/-	62	51.67
ii	Rs. 1,00,001- 2,00,000/-	13	10.83
iii	Rs. 2,00,001- 3,00,000/-	13	10.83
iv	Rs. 3,00,001- 5,00,000/-	11	09.17
v	Above Rs. 5,00,001/-	21	17.50
6	**Participation in co-curricular and extra-curricular activities**		
I	Low (Up to 01)	49	40.83
ii	Medium (02 to 03)	58	48.33
iii	High (Above 03)	13	10.84
7	**Aspiration**		
I	Low (up to 00.98)	00	00.00
ii	Medium (00.99 to 05.11)	104	86.67
iii	High (above 05.11)	16	13.33

Sr. No.	Categories	Respondents (N=120)	
		Frequency	Percentage
8	**Achievement motivation**		
I	Low (up to 00.98)	00	00.00
ii	Medium (00.99 to 05.11)	104	86.67
iii	High (above 05.11)	16	13.33
9	**Self-confidence**		
I	Low (Up to 17.65)	25	20.83
ii	Medium (17.66 to 25.22)	80	66.67
iii	High (Above 25.22)	15	12.50
10	**Decision making ability**		
I	Low (Up to 08.70)	19	15.83
ii	Medium (08.71 to 11.60)	77	64.17
iii	High (Above 11.60)	24	20.00
11	**Skills acquired**		
I	Not acquired (Up to 01.48)	28	23.33
ii	Partially acquired (01.49 to 05.41)	70	58.33
iii	Fully acquired (Above 05.41)	22	18.34
	Total	**120**	**100.00**

The result obtained from Table 1 that, the students were classified into male and female and the equal numbers of the respondents i.e. 50 per cent were male and 50 per cent were female students. Family background of respondents indicates that, majority of the students 71.67 per cent were from rural background and only 28.33 percent were from urban background and regarding their parental occupation it was observed that less than half (45.00 %) of the respondents parents had agriculture as their occupation, followed by agriculture + service (21.67%), agriculture + allied occupation (11.67%), agriculture + business (10.00%) and agriculture + labour and others were (05.83 %) each. The result regarding family income shows that, slightly more than half (51.67%) of the respondents family had annual income up to Rs. 1,00,000/-, followed by 17.50 percent of respondents family had annual income above Rs. 5,00,000/-, and 10.83 per cent of the respondents family had annual income Rs 1,00,001 to 2,00,000/-, while 10.83 per cent and 09.17 percent of the respondents family had annual income Rs. 2,00,001 to 3,00,000/- and Rs. 3,00,001-Rs. 5,00,000/-, respectively. As regards to participation in co-curricular and extra-curricular activities nearly half of respondents (48.33 %) had medium level of participation in co-curricular followed by 40.83 percent had low level and 10.84 per cent of students had high level of participation in co-curricular and extra-curricular activities. It is observed from above table that 86.66 % respondents had medium aspiration level, followed by 13.33 per cent of them had high level of aspiration and 00.00 % of respondents had

low aspiration level. Majority (73.33%) of respondents had medium level of achievement motivation while 13.34 per cent and 13.33 per cent of respondents had high level and low level of achievement motivation, respectively. Regarding self-confidence of respondents it was revealed that majority (66.67%) of the respondents had medium level of self-confidence, followed by 20.83 per cent of them had low level and 12.50 per cent of them had high level of self-confidence .As regards to decision making ability majority (64.17%) of the respondents had medium level of decision making ability, followed by 20.00 per cent respondents had high level of decision making ability and 15.83 per cent of them had low level of decision making ability. Acquired the skills of respondents from above table revealed that more than half (58.33%) of the respondents had partially acquired the skills, followed by 23.33 % respondents had not acquired the skills and 18.34 % respondents had fully acquired the skills.

Attitude of students towards Experiential Learning Programme (ELP)

Table 2 : Distribution of respondents according to their level of attitude towards Experiential Learning Programme (ELP)

(N=120)

Sr. No.	Statements	SA	A	UD	DA	SDA
1.	ELP is helpful in improving practical work experience	48 (40.00)	69 (57.50)	00 (00.00)	02 (01.67)	01 (00.83)
2.	ELP is helpful in improving technical competence	35 (29.16)	80 (66.67)	02 (01.67)	02 (01.67)	01 (00.83)
3.	ELP is helpful in improving planning skills	52 (43.33)	55 (45.83)	09 (07.50)	02 (01.67)	02 (01.67)
4.	ELP is not helpful in improving the professional leadership skills	07 (05.83)	17 (14.17)	09 (07.50)	50 (41.67)	37 (30.83)
5.	ELP is helpful in improving team building skills	40 (33.33)	63 (52.50)	11 (09.17)	06 (05.00)	00 (00.00)
6.	ELP is not helpful in improving the listening skills	13 (10.83)	22 (18.33)	06 (05.00)	40 (33.34)	39 (32.50)
7.	ELP is helpful in improving public speaking skills	47 (39.17)	64 (53.33)	08 (06.67)	01 (00.83)	00 (00.00).
8.	ELP is helpful in improving evaluation skills	42 (35.00)	66 (55.00)	11 (09.17)	01 (00.83)	00 (00.00)
9.	ELP is not helpful in improving reporting skills	7 (05.83)	19 (15.84)	24 (20.00)	52 (43.33)	18 (15.00)
10.	ELP is helpful in knowing one's own learning style	37 (30.83)	76 (63.33)	05 (04.17)	02 (01.67)	00 (00.00)
11.	ELP is not helpful in learning through observation	11 (09.17)	18 (15.00)	24 (20.00)	47 (39.17)	20 (16.16)

Sr. No.	Statements	SA	A	UD	DA	SDA
12.	ELP is helpful in practicing the principle of learning by doing	49 (40.83)	68 (56.67)	02 (01.67)	01 (00.83)	00 (00.00)
13.	ELP is not helpful in providing required preparation for career	10 (08.33)	17 (14.17)	32 (26.67)	42 (35.00)	19 (15.83)
14.	ELP is helpful in providing understanding of commercial perspective of agricultural technologies	39 (32.50)	71 (59.17)	06 (05.00)	03 (02.50)	01 (00.83)
15.	ELP is not helpful in knowing and grabbing the available opportunities in private/public sector	11 (09.17)	16 (13.33)	19 (15.83)	53 (44.17)	21 (17.50)
16.	ELP is helpful in exploring self-employment opportunities	40 (33.33)	67 (55.83)	08 (06.66)	03 (02.50)	02 (01.67)
17.	ELP is informative, obtained pertinent knowledge in entrepreneurship	44 (36.67)	62 (51.67)	10 (08.33)	03 (02.50)	01 (00.83)
18.	ELP is applicable for the real world and in my own life	42 (35.00)	63 (52.50)	13 (10.84)	01 (00.83)	01 (00.83)
19.	I felt active and involved	53 (44.17)	60 (50.00)	06 (05.00)	01 (00.83)	00 (00.00)
20.	I felt the ELP course challenged me	38 (31.68)	64 (53.33)	13 (10.83)	04 (03.33)	01 (00.83)
21.	I observed internal changes in confidence level and knowledge	50 (41.67)	63 (52.50)	06 (05.00)	01 (00.83)	00 (00.00)
22.	Experiential activities helped in integrating course material	48 (40.00)	60 (50.00)	09 (07.50)	03 (02.50)	00 (00.00)
23.	I felt the course required me to exercise independent judgment in evaluating text book theories	40 (33.34)	69 (57.50)	03 (02.50)	07 (05.83)	01 (00.83)
24.	I learned things from this activities that I did not know earlier	54 (45.00)	60 (50.00)	04 (03.33)	02 (01.67)	00 (00.00)

Figures in parenthesis indicate percentage.

SA-Strongly Agree, **A**-Agree, **UD**- Un-Decided, **DA**- Disagree, **DA**- Disagree, **SDA-**Strongly Disagree

Thurstone (1946) defined attitude as the degree of positive or negative affect associated with some psychological object. In present study it was operationally defined as the degree of positive or negative reaction or bent of mind of students towards Experiential Learning Programme (ELP).

From Table 2 it is revealed that, nearly half of respondents (45.00%) were strongly agreed with statement that, I learned things from this activities that I did not know earlier, followed by 44.16 % of the respondents strongly agreed with I felt active and involved, 43.33 % and 41.66 % of them were strongly agreed with ELP is helpful in improving planning skills and I observed internal changes in confidence level and knowledge statement, respectively. While equal percent i.e. 40.00 % of them were strongly agreed with

statement ELP is helpful in improving practical work experience, experiential activities helped in integrating course material, ELP is helpful in practicing the principle of learning by doing. While majority of respondents were agreed with statements that, ELP is helpful in improving technical competence (66.67%), ELP is helpful in knowing one's own learning style (63.33%), ELP is helpful in providing understanding of commercial perspective of agricultural technologies (59.16%), I felt the course required me to exercise independent judgment in evaluating text book theories (57.50%), ELP is helpful in improving practical work experience (57.05 %) ,ELP is helpful in practicing the principle of learning by doing (56.66%) ELP is helpful in exploring self-employment opportunities (55.83%), ELP is helpful in improving evaluation skills (55.00%), ELP is helpful in improving public speaking skills and I felt the ELP course challenged me (53.33%), ELP is helpful in improving team building skills and I observed internal changes in confidence level and knowledge (52.50 %) JSC is the best gift of the government to the drought-prone areas (57.50%), I learned things from this activities that I did not know earlier, experiential activities helped in integrating course material I felt active and involved (50.00%) and ELP is helpful in improving planning skills (45.83%).Whereas the maximum percent of the respondents were undecided with statements that, ELP is not helpful in providing required preparation for career (26.66%), followed by ELP is not helpful in improving reporting skills, ELP is not helpful in learning through observation (20.00%). Furthermore from above table indicated that respondents were disagreed with statements that, ELP is not helpful in knowing and grabbing the available opportunities in private/public sector (44.16%), followed by ELP is not helpful in improving reporting skills (43.33%), ELP is not helpful in improving the professional leadership skills (41.66%), ELP is not helpful in learning through observation (39.16%), ELP is not helpful in providing required preparation for career (35.00%), ELP is not helpful in improving the listening skill, respectively and nearly one third of the respondents were strongly disagree with statements that, ELP is not helpful in improving the listening skills (32.50%), followed by ELP is not helpful in improving the professional leadership skills (30.83%)

Overall attitude of students towards Experiential Learning Programme (ELP)

Table 3 : Distribution of respondents according to their overall attitude towards Experiential Learning Programme (ELP)

Sr. No.	Categories	Respondents (N=120)	
		Frequency	Percentage
1.	Least Favourable	18	15.00
2.	Favourable	87	**72.50**
3.	Highly Favourable	15	12.50
	Total	**120**	**100.00**

It is indicated from table 3 that, majority (72.50%) of the respondents had favourable attitude towards ELP, followed by 15.00 per cent of the students had least favourable attitude towards ELP and 12.50 per cent of them had high attitude towards ELP.

The findings were somewhat in agreement with the result of Yadav (2016) and Kumar (2017).

CONCLUSION

Equal percent i.e. (50.00 %) of student were male and female students. Most of the students were from rural background and their parents occupation had farming having annual income up to Rs. 1,00,000/-. Most of students had medium level of participation in co-curricular and had medium aspiration level and also majority of respondents had medium level of achievement motivation, self –confidence and decision making ability .While most of the students had partially acquired the skills.

It can be concluded that majority of the students had favourable attitude towards ELP.The possible reason might be due to newness of the programme and active involvement of the students in learning process and also given an opportunity to establish agri-business units at the college level, all these facts led them to develop favourable attitude towards ELP.

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RESEARCH ARTICLE

Challenges in agro-ecotourism: a study from Kerala

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ABSTRACT

The paper outlines the challenges that operators face in practicing agro-ecotourism in Kerala. The study was conducted in three districts of Kerala namely Alappuzha, Idukki and Wayanad, with the sample size 90 agro-ecotourism operators. Result indicates that non availability of tourists at vacation or pandemic situations, lack of commercial approach, non-availability of inputs, difficulty in accessing information on agro-ecotourism ecotourism and lack of specific policies were the major challenges faced by the agro- ecotourism operators.

INTRODUCTION

Agro-ecotourism is the concept of visiting an agricultural, horticultural, animal husbandry or agri-enterprise operations for the purpose of enjoyment, education, or active involvement in the activities of the farm or operation. Development of agro-ecotourism is in its nascent stage in the rural areas of Kerala. Being one of the emerging enterprises of agriculture, agro-ecotourism has created an impression of sustainable income generation method. Agro-ecotourism is a global trend which provides city dwellers an opportunity to escape from urban concrete environment and re-discover their roots in rural areas of farming (Deepthi and Davis, 2017).

Agro-ecotourism has immense potential to widen the tourist base in Kerala. Major agro- ecotourism destinations includes, Idukki, Wayanad, Kuttanadu, Palakkad, Kottayam and Pathanamthitta regions (Venugopal and Babu, 2020). Success of agro-ecotourism ventures are influenced by various aspects like good road connectivity, transportation facility, electricity and water supply. Providing the guests with homely atmosphere, maintaining hygiene and cleanliness of the surroundings, providing proper guidance about various farming practices and implementing efficient security measures would propel the inflow of more visitors into the agro-ecotourism unit. In this context, it is important to demarcate the challenges that operators face in practicing agro-ecotourism. Identifying the challenges faced by the agro-ecotourism operators would be helpful in making proper strategies and plans for its effective implementation and outreach.

The following study was conducted among the selected agro-ecotourism units in Alappuzha, Idukki and Wayanad districts of Kerala, which were identified as the major agro- ecotourism destinations. The study was conducted to understand the challenges that operators face in practicing agro-ecotourism.

RESEARCH METHODOLOGY

Thirty agro-ecotourism operators each were selected from Alappuzha, Idukki and Wayanad districts of Kerala for the study thus making a sample size of 90. The challenges were divided into four types namely financial, human resource, technical and policy challenges and was measured using the scale used by Karjigi (2019) with

modifications.

Thus the scale consists of 18 statements which were measured on a five-point continuum ranging from 'very severe, 'quite severe', 'severe', 'not so severe' and 'least severe' with weightage of 5, 4, 3, 2 and 1 respectively. After the data collection the challenges faced by the agro-ecotourism operators were tabularized and analyzed by means of Relevancy Ranking Technique.

Further, the ranking of each challenge was done in accordance to the relevancy coefficient obtained by each challenge such that the challenge which obtained the highest relevancy ranking was ranked as 1st and subsequent ranks were given based on relevancy coefficients.

Relevancy Ranking Technique

Relevancy ranking technique was used to rank the challenges faced in agro-ecotourism. The relevancy coefficient of challenges were obtained by dividing the total score obtained for each challenge with the multiplication product of the maximum value of continuum and the total number of respondents. Further, the challenges were ranked based on the relevancy coefficients obtained in such way that the challenge with higher relevancy coefficient was allotted with 1st rank.

$$RCi = \frac{\text{Total score of all the respondents for } i^{th} \text{ constrain}}{\text{Maximum on the continuum x Total number of respondent}}$$

RESULTS AND DISCUSSION

As mentioned above, the challenges were divided into four types namely financial, human resource, technical and policy challenges. The respective tables represents various challenges faced by the agro-ecotourism operators. The relevancy coefficient is also mentioned along with the challenges.

1. Financial Challenges

Table 1 indicates that non-availability of tourists at vacation time was perceived as the severe financial challenge in all the three districts. Since the study was conducted during the COVID pandemic, the forecast challenge was highlighted and hence the ranking.

Table 1: Financial challenges faced by agro-ecotourism operators

Challenges	Relevancy coefficient		
	Alappuzha	Idukki	Wayanad
Non availability of tourists at vacation time	0.95	0.	0.92
High cost of labour	0.73	0.6	0.66
High cost of land and initial investment	0.86	0.79	0.82
Maintenance charges	0.7	0.76	0.77
No insurance coverage	0.69	0.85	0.79
Lack of awareness about credit and subsidy components	0.68	0.58	0.62

Further, high cost of land and initial investment in Alappuzha (0.86) and Wayanad (0.82), no insurance coverage (0.85) in Idukki were the second most severe financial challenges faced by respondents. Since majority of the agro-ecotourism units were functioning on the existing large scale farm area, where farm

visits and farm stay facilities were offered erstwhile, the cost of establishment was apparently not so severe challenge in Wayanad and Idukki districts.

2. Human Resource Challenges

Table 2 indicates that lack of commercial approach was perceived as the severe human resource challenge in all the three districts, along with lack of organized effort like farmer organizations in Alappuzha (0.88). Further, communication barrier in Alappuzha (0.78) and Wayanad (0.79), lack of organized effort like active farmer organizations (0.73) in Idukki were the second most severe human resource challenges reported by respondents.

Table 2 : Human Resource challenges faced by agro-ecotourism operators

Challenges	Relevancy coefficient		
	Alappuzha	Idukki	Wayanad
Lack of commercial approach like other tourism venture	0.88	0.87	0.89
Communication barrier	0.78	0.73	0.79
Lack of organized effort like farmer organizations	0.88	0.78	0.72

Very narrow difference was observed in the relevancy coefficient between the districts in terms of human resource challenges. Organized efforts were more observed in Idukki and Wayanad in the form of various groups formed through social media, while in Alappuzha there was lack of co-ordination among the operators. Lack of commercial approach was a severe challenge in all the three districts due to lack of suitable agritourism policies.

3. Technical Challenges

Table 3 indicates that non availability of inputs (0.89), was perceived as a severe technical challenge in Alappuzha followed by unfavourable weather conditions (0.88) and difficulty in accessing information on agro-ecotourism (0.88). In the case of Idukki district, difficulty in accessing information on agro-ecotourism (0.91) was the most severe challenge faced followed by non-availability of inputs (0.8). Agro-ecotourism operators in Wayanad district ranked non-availability of inputs as the severe challenge (0.91) followed by unfavourable weather conditions and difficulty in accessing information on agro-ecotourism

Table 3 : Technical challenges faced by agro-ecotourism operators

Challenges	Relevancy coefficient		
	Alappuzha	Idukki	Wayanad
Difficulty in accessing information on agro-ecotourism	0.83	0.91	0.88
Small land area	0.62	0.54	0.49
Unfavourable weather conditions	0.88	0.86	0.88
Non availability of inputs	0.89	0.8	0.91
Limited and irregular power supply	0.67	0.66	0.74

4. Policy Challenges

Table 4 indicates that absence specific policy for promotion of agro-ecotourism (0.89), was perceived as the severe policy challenge in all the three districts. Further, lack of training in hospitality and management was the second most severe policy challenge faced by the respondents.

Table 4 : Policy challenges faced by agro-ecotourism operators

Challenges	Relevancy coefficient		
	Alappuzha	Idukki	Wayanad
Lack of training in hospitality and management	0.87	0.79	0.73
Complexity in getting license from Govt.	0.8	0.7	0.8
No specific policy for promotion of agro-ecotourism	0.9	0.92	0.8
Lack of transportation to interior rural places	0.66	0.64	0.48

CONCLUSION

The result indicates that non availability of tourists at vacation or pandemic situations, lack of commercial approach like other tourism ventures, non-availability of inputs, difficulty in accessing information on agro-ecotourism ecotourism and lack of specific policies were the major challenges in agro- ecotourism, as reported by the operators. The finding is supported by Balu (2017), based on his study 'Socio-economic appraisal of agro-tourism in Maharashtra'.

Major financial challenge faced by the agro-ecotourism operators of the three districts was non availability of tourists at vacation time. Among the human resource challenges, lack of commercial approach like other tourism venture and among the technical challenges, non-availability of inputs was reported as the major challenge faced by agro-ecotourism operators in Alappuzha and Wayanad. In Idukki district, difficulty in accessing literature on agro-ecotourism practice was reported as the most severe challenge. Lack of specific policy for promotion of agro-ecotourism was the major policy challenge as reported by the respondents, in all the three districts

More agro-ecotourism related information and knowledge should be provided to active operators and aspiring operators in order to make them aware of the vast opportunities of agro- ecotourism. Government and travel agencies should promote agro-ecotourism units by providing agro- ecotourism package for the tourists. More tourists should be motivated to choose agro-ecotourism units as their tourism destinations.

Agro-ecotourism operators should take initiation in forming organizations like Farmer Organization so that more opportunities could be made and explored. Proper direction from extension agents and tourism professionals for starting agro-ecotourism is needed to support the operators for gaining a sustainable and secure income from agro- ecotourism.

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RESEARCH ARTICLE

Documentation of available agricultural and allied mobile applications

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ABSTRACT :

The present investigation was carried out to document different mobile apps available for farming community with their technical content in the apps. It is observed that there are total 62 mobile apps documented in this study. These mobile apps were developed by different Government and Private Institutes in the service of farming community. These mobile app were having information on technical know how of agricultural technologies developed by different institutes. Several mobile apps were developed in agriculture and its allied sectors like pure agriculture related apps, farm management including geo-tagging, Fisheries, poultry sectors, livestock, animal husbandry, and food sector etc.

Key Words : Documentation, mobile applications

INTRODUCTION:

The exchange of knowledge in agriculture by providing the necessary information to farmers on production, productivity, marketing aspects, newer technologies and inventions in agriculture that enables in improving farming practices is known as agricultural advisory services. These advisory services are being provided to the farming community for many decades through various approaches that includes Farm and Home visit, where the farmer and the extension agent has a direct face- to –face contact through which information is transferred, Farmer's call, that the farmer makes to the working place of extension agent and obtains information and assistance, personal letter, written by the extension agent to particular farmer for the extension work.

Information and Communication Technology (ICT) enabled services have been increasingly advocated by extension practitioners as an alternative to conventional face-to-face extension approaches.ICT tools like Mobile apps serve as smart decision support tools (DST) and are designed to help users make more effective decisions by leading them through clear decision stages and presenting the likelihood of various outcomes resulting from different options (Dicks et al., 2014 and Parker, 2004).

The mobile software application provides a wide range of facilities like text message service, weather information, market pricing, agro-advisory services, online monitoring of crops, feedback mechanisms, helpline etc. It also provides updates on training programmes organized by different organizations to the agripreneurs and rural youths.Due to these, there is explosion across the world in the number of mobile apps, facilitated by the evolution of mobile networks (World Bank, 2012).

So, the present study was carried out to document different mobile apps available

for farming community.

METHODOLOGY

Present investigation is carried out in the department of Extension Education, Dr. Panjabrao Deshmukh Krtishi Vidyapeeth, Akola. Information of different agriculture based mobile app was calculated through visiting websites of different institutes. As a researcher contacted with the developers of the mobile app and detailed information on technical content of the of the mobile app is documented.

RESULTS AND DISCUSSION

It is observed from Table 1 that there are total 62 mobile apps documented. These mobile apps were developed by different Central Government Departments, ICAR, State Government Departments, State Agricultural Universities and Private Institutes. These mobile app were having information on technical know how of agricultural technologies.

The mobile apps provides a wide range of facilities like crop advisory service, weather information, market pricing, agro-advisory services, online monitoring of crops, feedback mechanisms, helpline etc. It also provides updates on training programmes organized by different organizations for the farmers, agripreneurs and rural youths.

Table 1 : Details of mobile apps developed by different institutes with technical content.

S.N.	Mobile Application	Features
1.	**Kisan Suvidha** Ministry of Agriculture and Farmers Welfare, Govt. of India	Kisan Suvidha is an omnibus mobile app developed to help farmers by providing relevant information. The app provides information to farmers on weather, market prices, dealers, plant protection, IPM practices, seeds, expert advisory, Soil Health Card, godowns and cold storage. The information is currently provided in English, Hindi, Tamil, Gujarati, Odia and Marathi
2.	**Pusa Krishi** Ministry of Agriculture and Farmers Welfare, Govt. of India	It provides information related to new varieties of crops developed by the Indian Council of Agricultural Research (ICAR), resource conserving cultivation practices, farm machinery and its implementation and production technologies, to the farmers. A feedback section enables farmers to have a real time conversation with the stakeholders
3.	**Soil Health Card (SHC) Mobile App** Ministry of Agriculture and Farmers Welfare, Govt. of India	Soil Health Card App gives soil nutrient status to each farmer for his/her land holding and also gives advice on fertilizer dosage and soil amendments needed to maintain soil health in the long run. This will also help to take corrective measures on the soil nutrient deficiencies identified in soil health cards. This application also captures Latitude and Longitude automatically when "Location" is on. The farmer details, land details, crop details and fertilizer details can be entered using this mobile app

S.N.	Mobile Application	Features
4.	**Crop Cutting Experiments Agri Mobile App** Ministry of Agriculture and Farmers Welfare, Govt. of India	This app is for capturing crop cutting experiment data. The app works in both Online and Offline mode. Internet is required only to download this app and for registration. After that Crop Cutting Experiment (CCE) data can be entered using this app without internet connection. As and when internet connectivity is available, data can be pushed to the server
5.	**Bhuvan Hailstorm App** Ministry of Agriculture and Farmers Welfare, Govt. of India	This mobile app has been developed to capture crop loss, which has happened due to hailstorm, along with photographs and geographical locations. An Agriculture Officer would go to the field with a mobile or tablet loaded with this mobile app and collect field data for hailstorm damage assessment.
6.	**Crop Insurance** Ministry of Agriculture and Farmers Welfare, Govt. of India	Crop Insurance mobile app can be used to calculate the Insurance Premium for notified crops based on area, coverage amount and loan amount in case of loanee farmer. It can also be used to get details of the normal sum insured, extended sum insured, premium details and subsidy information of any notified crop in any notified area
7.	**Krishi Video Advice mobile app** MANAGE with NIC, Hyderabad	Krishi Video Advice project has been conceptualized by MANAGE to bridge the information gap between the farmer and the expert. The mobile app works on all smartphones or tabs having android operating system. Any farmer or extension officer can use the mobile app to capture three images of the crop live from the farmer's field itself and upload the same. The Kisan Call center (KCC) expert will provide advice based on the crop images.
8.	**Plantix** PEAT, Germany in collaboration with ICRISAT	Plantix is a mobile app for plant disease diagnostics and monitoring. The App provides users worldwide with customized information concerning best practices, information on preventive measures and independent options for action. Plantix offers the possibility to send pictures of affected plants directly via smartphone and guides through an identification process to determine the plant disease in a very simple manner. All pictures sent via the Mobile App are tagged with coordinates, which enables real time monitoring of pests and diseases
9.	**IFFCO Kisan Agriculture** IFFCO Kisan, a subsidiary of Indian Farmers' Fertilizer Cooperative Ltd.	This app enables access to various modules including agricultural advisory, weather, market prices, agriculture information library in the form of text, images, audio and videos in the selected language. The app also offers helpline numbers to get in touch with Kisan Call Centre Services. The app supports eleven languages across India

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10.	**APEDA Farmer Connect** Agricultural and Processed Food Products Export Development Authority (APEDA)	This mobile app allows a farmer to apply online for farm registration and approval by state government and lab sampling by authorized laboratories. The farmer can track status of applications. An authorized State Government Officer, farmer or registered laboratory can login to access the information. This app has in-built GPS capabilities to identify the farm location
11.	**e-NAM Mobile App** Small Farmers' Agribusiness Consortium (SFAC), Ministry of Agriculture & Farmers Welfare, Govt. of India	National Agriculture Market (NAM) is a pan-India electronic trading portal promoted by the Government of India which networks the existing mandis to create a unified national market for agricultural commodities. The purpose of the Mobile App is to facilitate remote bidding by traders and access to arrivals and price related information to farmers and other stakeholders on their smartphones
12.	**Agri Market** Ministry of Agriculture and Farmers Welfare, Govt. of India	The app has been developed with an aim to keep farmers abreast of crop prices. This app automatically captures the location of the person using mobile GPS and fetches the market price of crops in those markets which fall within the range of 50 km
13.	**Digital Mandi India** Appkiddo	This App helps in checking the latest Mandi prices of agricultural commodities reported from different states and districts/mandis in India One can get commodity wise categorization or state wise categorization
14.	**Rice Xpert** ICAR-National Rice Research Institute (NRRI), Cuttack	It is a bilingual (English and Odia) Android platform with a view to reach the latest rice technologies to the rice farmers in real time basis. It provides real time diagnosis of insect pests, diseases, nematodes, weeds, nutrient deficiencies and toxicities to farmers. It has other features like rice varieties, agricultural implements, news, expert consultation through e-advisory services module, and weather information
15.	**Mana Verusanaga App** Regional Agricultural Research Station, Tirupati, Acharya N.G. Ranga Agricultural University, Andhra Pradesh, India	Provides detailed information to the farmers and extension personnel on all aspects of groundnut cultivation. The content includes varieties, seeds, nutrient management, pest and diseases, farm mechanization, value addition and contact details with photographs
16.	**Mobile App on Castor** ICAR – Indian Institute of Oilseeds Research (IIOR), Hyderabad	This mobile app provides information on castor production technologies, recommended hybrid varieties, intercropping, major insects, pests and diseases and its remedies to castor farmers.
17.	**Solapur Anar** ICAR – National Research Centre on Pomegranate (NRCP), Solapur	This app aims to educate pomegranate growers about scientific pomegranate production practices

18.	**Cane Adviser** ICAR-Sugarcane Breeding Institute, Coimbatore, Tamil Nadu	Cane Adviser is a mobile app for cane growers and millers. It gives details from planting to harvest with text and graphics for tropical and sub-tropical India. The features of the app include static as well as dynamic platforms
19.	**Pashu Poshan** National Dairy Development Board (NDDB)	With the help of this app, balanced ration can be formulated while optimizing the cost considering animal profile, i.e. cattle or buffalo, age, milk production, milk fat, and feeding regime etc. milk producers are advised to adjust the quantity of locally available feed ingredients offered to their animals along with mineral mixture
20.	**Cattle Expert System** TNAU, Coimbatore and C-DAC, Hyderabad	Cattle expert system is a mobile app that covers feeding management for cattle and buffalo, breeding management, disease and control management, production technology, calf management, general care and management, practices etc. for cattle and buffalo
21.	**m-Krishi Fisheries App** TCS Innovation Lab – Mumbai, in collaboration with ICAR-Central Marine Fisheries Research Institute and (INCOIS) Hyderabad	The app provides vulnerable fishermen access to knowledge and information services on weather, potential fishing zones, ocean state forecasts, disaster alerts and market related information
22.	**PDKV WEED MANAGER** Dr. PDKV, Akola.	This app provides farmers a broad view of weed management. Mechanical, and chemical methods of controlling annual, perennial and parasitic weeds, information on available herbicides, method of spraying, spray quantity are given. Weed management techniques in organic farming and various research recommendations on weed management is provided through this app. Farmers can also give their feedback on the app.
23.	**DEE PDKV TOT** Dr. PDKV, Akola.	This app contains information covering all major crops of Vidarbha region and research recommendations and technologies suitable for Vidarbha region.
24.	**PDKV PESTGUIDE** Dept of Entomology, Dr. PDKV, Akola.	App covers all the major and minor pests of every crop in Vidarbha region of Maharashtra. Pest management for commercial crops, vegetables, fruits, oilseeds, pulses, flowers etc are mentioned. Images of the pest and the damade made are given which helps the farmers in proper identification of the pest and take necessary control measures.
25.	**RML Farmer** RML AgTech	Farmer can access information related to weather forecast, market price, crop advisory, farm related news as per their location in their preferred language. The app gives personalized recommendations, keeps track of pest and disease attack

26.	**My Agri Guru** Mahindra Agri Solutions, Mahindra and Mahindra	My Agri Guru connects farmers and agri-experts across the country. The farmer agri expert interactions cover over 90 diverse crops – ranging from Cotton, Wheat, Tomato to non-traditional crops like Tulsi, Aloevera, Flowers etc
27.	**Rythu Nestham** Rythu Nestham Foundation	Rythunestham is a mobile app which helps farmers in organic farming. The mobile app is available in both English and Telugu
28.	**Kultivate** Gowthaman Ramasamy	Kultivate is a software platform aiming to fill the gap in traditional agricultural extension to make "Smart Agriculture Extension Easy for Everyone
29.	**BharatAgri: Smart Farming, Agriculture Expert App** LeanCrop Technology Solutions Pvt. Ltd	Bharat Agri is another application for farmers which helps them in decision making to increase profitability and reduce cultivation cost. Farming community can get advisory for more than 150 crops. The crop advisory includes fertilizer doses management, irrigation management, insect pest and disease management. Application also facilitates farming community with weather forecast, market prices and authentic inputs from verified dealers. Farmers also gets alerts regarding latest techniques advancement and development along with best solutions regarding problems from agri expert through this application.
30.	**ApniKheti-Agriculture Information & Farming App** Punjab Agricultural University, Ludhiana.	Apni Kheti mobile application provides right information at right time in multiple languages through its comprehensive and innovative platform by engaging rural farming community throughout country. This application provides information about field preparation, sowing, fertilizer doses, crop protection, and harvesting of crops. This application also provides information regarding livestock management, feed, breeding, diseases, etc. Farming community can also have access to accurate, rapid and free solutions to all their queries. They can also strategize to improve sustainable production through real time connectivity. Farmers can get access to latest mandi rates and advisories from industry experts and research universities, etc., along with motivated stories of progressive farmers
31.	**Krishi Network-Kheti-App** Ashish Mishra and Siddhant Bhomia, IIT Kharagpur alumni.	This application provides information regarding weather updates, mandi prices, organic farming, seeds, fertilizers, irrigation, micro irrigations like sprinkler, poly house cultivation, land details, recent news, crop insurance, SHC, etc. This application also provides information about various government schemes like PM Kisan, PM Sinchai Yojna, PMFBY, etc.

32.	**Farmitra- Caringly Yours** Bajaj Allianz	This application is dedicated to empowering farming community with the various useful information including weather forecast, advisories for crops, market price for various crops across India, stories and news articles related to farming etc. through mobile technology. Application provides advisory in various regional languages to facilitate farmers from various states. Farmitra application also facilitates farmer with claim services for crop insurance and real time check and raise queries.
33.	**Fertilizer Calculator Goa App** (ICAR – Central Coastal Agricultural Research Institute, India)	It is completely offline app for making soil test based fertilizer recommendations to important crops of Goa. The results would help to use the fertilizer in appropriate amount and in a balanced way
34.	**Phule Krishidarshani** (Mahatma Phule Krishi Vidyapeeth)	This app provides information about all crops, research findings, modern technologies and related information in Marathi.
35.	**Farm-o-pedia** (CDAC Mumbai)	The app is targeted for rural Gujarat and is useful for farmers and anyone involved in agriculture business. The app can be used to get suitable crops as per soil and season, crop wise information.
36.	**Farm Calculator** (University of Agricultural Sciences, Karnataka, India)	The app is used by the farming community to save costs by calculating exact quantity requirement of fertilizers, pesticides and seeds required for farm for sustainability in farming.
37.	**ICAR Technologies** ICAR-IASRI	Consist of proven technologies generated by ICAR institutions in the area of crop improvement, natural resource management, fisheries, veterinary, dairy, animal sciences, horticulture, engineering and social sciences. Provides an easy way to locate appropriate technologies based on major resource, commodity technology group etc. Keywords based search functionality is also available.
38.	**ICAR Directorate of Poultry Research**, ICAR-DPR	Provide information about the genesis, vision, mission and mandate of the institute. Technologies developed by AICRP on poultry breeding, poultry seed project, germplasm availability, latest news etc are available. Basic details to start a poultry business, input requirements and cautions.
39.	**ICAR Directorate of Onion and Garlic Research** ICAR-DOGR	Varieties developed by ICAR DOGR and their regional suitability, information regarding climate, soil, field preparation, transplanting, fertilizer, weeding, irrigation, disease and pest, cropping system, intercropping, grading and storage of onion and garlic.
40.	**Indian Institute of Horticultural Research**	Provides crop management solutions for fruits and vegetables. Consist of technologies, videos, success

	ICAR-IIHR	stories, crop cultivation aspects, disease pest management etc. Farmers queries are received by mail and reply communicated by email by the domain experts.
41.	**Pusa Digifarm** IARI, Pusa, New Delhi	Digifarm app is a chat app for users in the rural areas of India who wnt to share their knowledge, experience, issues and problems related to rural business
42.	**Disease Control App** ICAR-IVRI	Targeted to impart knowledge and skills to graduating veterinarians, field veterinary officers, livestock, poultry and pet owners about important diseases of livestock, poultry and dogs, symptoms, diagnosis Treatment, prevention, and control.
43.	**Bhains Poshahar** ICAR-Central Inatitute for Research on Buffalos	The app provides basic information on different areas of buffalo nutrition like buffalo feed and fodder management, conservation, calf feed management, common nutritional deficiency/metabolic diseases, toxicity or poisoning in animals and faulty feeding practice with unique photographs. Complete app content has audio backup with download facility.
44.	**Bakrimitra** ICAR-Central Institute for Research on Goats	Bakrimitra app developed by Central Institute for Research on Goat (ICAR-CIGR), Makhdum, Mathura and Cooperative Cooperation of Internal Climate Research Institute, Nairobi, Kenya. It was built under the development of goat milk and mass value chain in the state of UP and Bihar.
45.	**AGRIPLEX INDIA** Agriplex Pvt. Ltd.	Farmers friendly app providing a wide range of agricultural input products of top brands. Farmers get an option to choose wide variety of Quality seeds, fertilizers, pesticides of top brands from the mobile application. Farmers can also call Help Point canter to seek free Agricultural advice, the app is available in six regional languages
46.	**Krish-e** Mahindra	Free soil test is conducted and soil health card is provided, farm is geo-tagged providing you with the current weather condition. The advisory ars dynamic and keep on updating itself automatically based on the weather forecast, soil test data, and other conditions. Advisory services are available for the crops like sugarcane, wheat, potato, maize, chilli, paddy across various states
47.	**Disease Control App** ICAR-IVRI	Provide complete information on crop production, protection, smart farming with agriculture and allied services. Online market place for bringing in farmers, agri input, retailers, and fulfilment services on a common digital platform

48.	**Bhains Poshahar** ICAR-Central Inatitute for Research on Buffalos	It provides information to the farmers on the latest technology to make them globally competitive and help them increase their per capita income. The app has achieved a whopping readership in print as well as on the web platform. This app is available in Hindi language.
49.	**Bakrimitra** ICAR-Central Institute for Research on Goats	The app uses phone's GPS for mapping field boundaries, marking flags and entering scouting information for points, lines and polygon areas. It is flexible to use with any crop such as corn, wheat, soybeans, cotton, rice, vegetables and more.
50.	**AGRIPLEX INDIA** Agriplex Pvt. Ltd.	The app gives Filipino farmers access to any information about plant and animal diseases, weather forecast. It also provide automatic geo-tagging which will immediately pinpoint the exact location of the farmer sending the message
51.	**Krish-e** Mahindra	App is used to access real-time market prices, crop management techniques, cold storage services, soil testing etc. and also for crop geo-tagging. About 150000+ farmers across the state of Andhra Pradesh and Telangana used this app
52.	**FARM app** (Department of Agriculture (DA), Philippine.)	App has a geo-tagging system to identify the location of the farmer. Through this, farmers, fishers and other citizens can easily communicate with the DA.
53.	**Scoutdoc – Farm Field Scouting** (AgNition Inc.)	App allows users to open a GPS map, document field information and save information collected when scouting or inspecting field crops. GPS-enabled maps allow the user to document weeds/diseases/ insects in the field.
54.	**Thoondil** (Department of Fisheries, Tamil Nadu govt.)	Showing weather warning messages, GPS location, emergency number and moreover potential fishing zone. Uses offline maps to show the nearest harbor locations for rescue.
55.	**Poultry Farming** (Starkode Limited Company)	App is designed for tracking eggs, feed consumption and performance right on the poultry farming.
56.	**Cattle Expert System** (TANU Coimbatore and C-DAC, Hyderabad)	Covers feeding, breeding Management for cattle and buffalo.
57.	**Apiary Book** (Bogdan Iordache)	It provides hive details and information on the number, health and maintenance of each bees' family etc.
58.	**Food Safety Connect** (Food Safety and Standards Authority of India)	This app allows the consumers to report any malpractices pertaining to food safety along with its related images. Provides a direct link to the FSSAI complaint redressal system. Track the status of concern.
59.	**AgroTech VNMKV** (Vasantrao Naik Marathwada Krishi Vidyapeeth)	This application gives complete detailed information about farming and its technologies.

60.	**Cotton (KAPUS) VNMKV** (Vasantrao Naik Marathwada Krishi Vidyapeeth)	This app provides useful information on package of practices of cotton such as pest and disease management, fertilizer, irrigation, critical growth stages of cotton etc.
61.	**Halad Lagwad VNMKV** (Vasantrao Naik Marathwada Krishi Vidyapeeth)	This app gives complete information about turmeric cultivation, processing and its technologies.
62	**Kheti Bari**	It is a farmer guide app, aims to promote and support 'organic farming' and provide important information/ issues related to farmers.

CONCLUSION

Findings of the study concluded that there are total 62 mobile apps documented during the study. These mobile apps were designed and developed by different Government and Private Institutes including text, voice and video. These mobile app were having information on agricultural technologies developed by different institutes i.e from package of practices to harvesting, grading, processing, value addition and marketing.

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RESEARCH ARTICLE

Utilization of phule krishidarshani mobile App by Users

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ABSTRACT

The present investigation was conducted to find out the utilization of Phule Krishidarshani Mobile App by users and obtain the preferences of the users for content development. The study was conducted purposively in Ahmednagar district of Maharashtra State. For present study the Ex-post facto research design was adopted. A total of 120 user farmers formed the sample of study. The study revealed the features which were frequently utilized by the users of Phule Krishidarshani Mobile App were disease management in field crops (52.48%) followed by Integrated Pest Management for white grub in sugarcane (50.00%), cattle farm management (48.32%), university recommendations on new plant varieties and package of practices (43.33%), milk production (40.82%) and sugarcane cultivation technology (35.00%). Based upon mean preference value the results indicated the preference of users towards contents in Phule Krishidarshani Mobile App. Amongst this, the major preferences were Integrated Pest Management (IPM) for white grub in sugarcane (1.600) followed by disease management in field crops (1.470), sugarcane cultivation practices (1.408), university recommendations, new varieties and package of practices (1.349), protected cultivation technology for vegetables (1.246), cattle farm management (1.215), milk production (1.197) and pomegranate and onion cultivation (1.179).

INTRODUCTION

The 21st century is remarked as a period of innovation as just about every field is linked to ICT (Information and Communication Technology). Indian users contain around 30 per cent of absolute volume of the worldwide element telephone market, making it the second biggest in predefined field. According to the 'Internet and Mobile Association of India (IAMAI)', the amount of users are expected to grow at the rapid rate because of the smartphone makers who are producing cheaper smartphone/feature phones, while, telecom service providers are now offering better connectivity at more cost-effective prices. In addition, mobile literacy is better than computing literacy, despite the fact that mobile devices may create an awful experience for users. Today, farmers receive various facts or information about agriculture, such as seeds, plant selection, cultivation methods, climate and fertilization, pesticides from different sources and they distribute this information to many different places. Indeed, various applications can be used to acquire information, videos and images, however, the issue is that not all information is available along the one platform, a system that is available and contains all key information in all aspects of agriculture (Sharma, 2012). Agricultural mobile apps demonstrated

significant potential for agricultural sector modernization in both developed and emerging nations. For example, they can contribute to increasing the income of small-scale producers, reducing the transaction costs in supplying and distributing products, improving traceability and quality criteria for consumers, as well as providing new opportunities for financial institutions (Constantina *et al.*, 2016).

Mahatma Phule Krishi Vidyapeeth, Rahuri have developed various mobile apps associated with the new technologies. Phule Krishidarshani mobile application was launched in the month of December 2016. This smartphone application gives complete details about farming and its innovations proposed by the University particularly for farmers of Maharashtra. This app provides information about the cultivation of important crops *viz.*, kharif crops, rabi crops, fruit crops, vegetable crops etc. Farmer gets information about different varieties associated with cereals, pulses, oilseeds and commercial crops. Information about disease and pest control measures is additionally included within the app. This app provides information about watershed development programs, modern irrigation techniques, soil and conservation, allied enterprises, weather and soil report in Maharashtra, protection of plant varieties and farmers' rights. It also deals with home science, extension education and agricultural economics. The present investigation was conducted to find out the utilization of Phule Krishidarshani Mobile App by users and obtain the preferences of the users for its content development.

MeTHODOLOGY

The study was conducted purposively in the Ahmednagar district of Maharashtra State. The current research was carried out in the Ahmednagar district because it has the most farmers who utilize the Phule Krishidarshani Mobile App. In Ahmednagar district there are fourteen tahsils out of which two tahsils namely Rahata and Rahuri were selected for study as they have maximum number of Phule Krishidarshani Mobile App users. For present study the Ex-post facto research design was adopted. A total of 120 user farmers form the sample of study. Keeping in the view the objectives of the study a structured interview schedule was prepared. The data were collected by using the personal interview method. The collected data were classified, tabulated, analyzed by using frequency, percentage and correlation coefficient.

RESULTS AND DISCUSSION

1. Utilization of Phule Krishi-darshani Mobile App by the users

The data on the utilization of Phule Krishidarshani Mobile App by the users is presented in Table No.1.

Table 1 : Distribution of the respondents according to their feature wise utilization of Phule Krishidarshani Mobile App

(N=120)

Sr. No.	Purpose/Utilization	Very frequently	Frequently	Less frequently	Very Less	Not at all
1.	University recommendations on new plant varieties and package of practices	21 (17.5)	52 (43.33)	24 (20.00)	13 (10.83)	10 (8.33)
2.	Soil health and nutrition management	0 (0.00)	2 (1.67)	42 (35.00)	61 (50.81)	15 (12.5)

3.	Pomegranate production	27 (22.5)	28 (23.32)	25 (20.82)	21 (17.5)	19 (15.83)
4.	Soybean cultivation	19 (15.83)	23 (19.16)	24 (20.00)	17 (14.16)	37 (30.82)
5.	Sugarcane cultivation practices	27 (22.5)	42 (35.00)	31 (25.82)	18 (15.00)	2 (1.67)
6.	Protected cultivation technology for vegetables	25 (20.82)	14 (11.67)	55 (45.81)	26 (21.66)	00 (0.00)
7.	Chickpea cultivation practices	7 (5.83)	13 (10.83)	16 (13.33)	31 (25.82)	53 (44.14)
8.	Cultivation of fodder crops	18 (15.00)	30 (25.00)	33 (27.49)	23 (19.16)	16 (13.33)
9.	Onion cultivation practices	14 (11.67)	26 (21.66)	51 (42.44)	13 (10.83)	16 (13.33)
10.	Marigold flower production	11 (9.16)	17 (14.16)	34 (28.32)	58 (48.31)	0 (0.00)
11.	Wheat crop cultivation practices	2 (1.67)	41 (34.15)	52 (43.33)	13 (10.83)	12 (10.00)
12.	Farm waste composting	8 (6.67)	10 (8.33)	62 (51.65)	31 (25.82)	9 (7.50)
13.	Integrated pest management (IPM) for white grub in sugarcane	32 (26.66)	60 (50.00)	21 (17.5)	7 (5.83)	0 (0.00)
14.	Disease management In field crops	28 (23.32)	63 (52.48)	9 (7.50)	9 (7.50)	11 (9.16)
15.	Cattle farm management	14 (11.67)	58 (48.32)	14 (11.67)	13 (10.83)	21 (17.5)
16.	Milk production	17 (14.16)	49 (40.82)	21 (17.5)	10 (8.33)	23 (19.16)
17.	Water conservation techniques	0 (0.00)	10 (8.33)	32 (26.66)	18 (15.00)	60 (50.00)
18.	Drip irrigation	12 (10.00)	17 (14.15)	16 (13.33)	30 (25.00)	45 (37.48)
19.	Integrated weed management in orchards	7 (5.83)	11 (9.16)	59 (49.14)	33 (27.49)	10 (8.33)
20.	Handling and management of water lifting devices	13 (10.83)	16 (13.33)	21 (17.5)	38 (31.65)	32 (26.66)

The results in Table No. 1 revealed the features which were frequently utilized by the users of Phule Krishidarshani Mobile App were disease management in field crops (52.48%) followed by Integrated Pest Management for white grub in sugarcane (50.00%), cattle farm management (48.32%), university recommendations on new plant varieties and package of practices (43.33%), milk production (40.82%) and sugarcane cultivation technology (35.00%). It was also revealed that contents like farm waste composting (51.65%), integrated weed management in orchards (49.14%), protected cultivation technology for vegetables (45.81%), wheat crop

cultivation practices (43.33%), onion cultivation practices (42.44%) were less frequently utilized by user farmers.

More than half (50.81%) of the users utilizing soil health and nutrition management at very less frequently followed by marigold flower production (48.31%) and different types of farming systems were utilized very less by farmers. It was also revealed that exact half of the users (50.00%) were not utilizing information regarding water conservation techniques followed by 44.14 per cent of the users who were not utilizing information of chickpea cultivation practices. The present findings are in tune with Chavan (2016), Garme (2018) and Shelke (2020).

1. Preference of user farmers towards content in Phule Krishidarshani Mobile App

The data on preference of users towards the content in Phule Krishidarshani Mobile App is given below in Table No. 2.

Table 2 : Distribution of user's preference towards the content in Phule Krishidarshani Mobile App

Sr. No.	Purpose	Raw score	Mean score	Rank
1.	Integrated Pest Management (IPM) for white grub in sugarcane	357	1.600*	I
2.	Disease management in field crops	328	1.470*	II
3.	Sugarcane cultivation practices	314	1.408*	III
4.	University recommendations, new varieties and package of practices	301	1.349*	IV
5.	Protected cultivation technology for vegetables	278	1.246*	V
6.	Cattle farm management	271	1.215*	VI
7.	Milk production	267	1.197*	VII
8.	Pomegranate production	263	1.179*	VIII
9.	Cultivation of fodder crops	251	1.125*	IX
10.	Onion cultivation	249	1.116*	X
11.	Wheat crop cultivation practices	248	1.112*	XI
12.	Marigold flower production	221	0.991	XII
13.	Farm waste composting	217	0.973	XIII
14.	Integrated weed management in orchards	212	0.950	XIV
15.	Soybean cultivation	210	0.941	XV
16.	Handling and management of water lifting devices	180	0.807	XVI
17.	Drip irrigation	161	0.721	XVII
18.	Soil health and nutrition management	151	0.677	XVIII
19.	Chickpea cultivation practices	130	0.582	XIX
20.	Water conservation techniques	112	0.502	XX
	Overall average	**223**	**1.00**	

The data presented in the Table No. 2 depicted the user's preference towards the content in Phule Krishidarshani Mobile App. Based upon mean preference value the results indicated the preference of users towards contents in Phule Krishidarshani Mobile App. The contents were ranked as Integrated Pest Management (IPM) for white grub in sugarcane (1.600) followed by disease management in field crops (1.470), sugarcane cultivation practices (1.408), university recommendations, new varieties

and package of practices (1.349), protected cultivation technology for vegetables (1.246), cattle farm management (1.215), milk production (1.197), pomegranate production (1.179), cultivation of fodder crops (1.125), onion cultivation (1.116), wheat crop cultivation practices (1.112), marigold flower production (0.991), farm waste composting (0.973), integrated weed management in orchards (0.950), soybean cultivation (0.941), handling and management of water lifting devices (0.807), drip irrigation (0.721), soil health and nutrition management (0.677), chickpea cultivation practices (0.582) and water conservation techniques (0.502). These components in app are required for each and every aspect of agriculture production. These topics are the major contributing factors for increasing farm returns in study area.

The results pointed out that some contents like integrated pest management (IPM) for white grub in sugarcane, disease management in field crops, sugarcane cultivation practices, university recommendations on new plant varieties and package of practices, protected cultivation technology for vegetables, cattle farm management, milk production, pomegranate production, cultivation of fodder crops, onion cultivation and wheat crop cultivation practices were highly preferred by user farmers. These contents have large impact on each and every aspect of farming as well as agribusiness. It has played major role in increasing farm returns and thereby improvement in economic wellbeing of user farmers in study area. Marigold flower production, farm waste composting, integrated weed management in orchards, soybean cultivation, handling and management of water lifting devices, drip irrigation and soil health and nutrition management were moderately preferred by user farmers. These results are consistent with Dhaka and Chayal (2010), Dhumal (2017) and Pawar (2019).

CONCLUSION

Thus, the study concluded that the most frequently features utilized by the users of Phule Krishidarshani Mobile App were disease management in field crops followed by Integrated Pest Management for white grub in sugarcane, cattle farm management, university recommendations on new plant varieties and package of practices, milk production and sugarcane cultivation technology. It was also revealed that contents like farm waste composting, integrated weed management in orchards, protected cultivation technology for vegetables, wheat crop cultivation practices, onion cultivation practices were less frequently utilized by user farmers. Integrated Pest Management (IPM) for white grub in sugarcane was most preferred topic among users followed by disease management in field crops, protected cultivation technology for vegetables, university recommendations, new varieties and package of practices, sugarcane cultivation, cattle farm management, milk production, wheat crop cultivation practices, pomegranate and onion cultivation.

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Research Article

Constraints in adoption of drip irrigation for the farmers of Muktainagar taluka of Maharashtra state

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ABSTRACT

The study was conducted to find the constraints in adoption of drip irrigation for the farmers of MuktainagarTaluka of Maharashtra state. The Socio - personal profile of farmers and their response towards fourteen possible identified constraints in adoption of drip irrigation was evaluated. The response of farmers was converted in quantitative form by assigning score to each constraint based on farmers'response as a constraint is most important, important, less important or not important ranking was given to each constraint based on total score.

The results showed that 42.50 percent of farmers had education level of secondary school or less, 35.83 percent of farmers were depending on farming alone as their source of livelihood and 84.32 percent farmers having land less than 4 ha. As per the perception of the farmers, high initial investment ranked the most important constraint in adoption of drip irrigation system by the farmers with score of 350. Other important reason for non-adoption were more maintenance as compare to surface irrigation (312), damage to system due to rats and other animals (296), problems in farming operations (305), irrigation quantity by drip seems to be insufficient for crop growth (269), problem of clogging of system due to salty / impure water and irrigation is to be done more frequently (256) etc. 91.67 percent of the respondent scored high initial investment as most important. Two constraints (i) No need of drip irrigation as sufficient water is available and (ii) Easy and cheap labour availability incurrent method were least important constraints with score of 43 and 24 respectively.

Key words : Drip irrigation; adoption; constraint; MuktainagarTaluka; survey; high initial

INTRODUCTION

Much of the available irrigation water in India is applied through the conventional surface irrigation methods. Poor irrigation efficiency of these systems not only reduce the anticipated outcomes from investments in the water resources sector of the country, but also create environmental problems like lowering of water table due to over-exploitation of sub-surface water resources, water-logging and soil salinity, thereby adversely affecting the crop yields. Besides government's efforts for promotion of micro irrigation in terms of financial assistance in form of subsidy, the adoption is very low as compare to its potential. Polak*et al.* (2000) opined that the main obstacle to the wider adoption of micro

irrigation technology was its high capital cost which makes installation of drip systems prohibitive for the great majority of farmers in developing countries who cultivate in small and marginal holdings. Thamban*et al*. (2004) observed that high initial investment secured I rank among the constraints for the non adoption of drip irrigation system by the farmers. Planning Commission (2014) reported that although drip irrigation is suitable for all kind of lands, but its adoption varied from region to region, depending upon its natural endowments. The available practical facts are comparatively limited with respect to its constraint in adoption under different farm categories and what are the interventions needed to upscale most important adoption. Keeping in view the points mentioned above, a study is undertaken with objective to find the constraints in adoption of drip irrigation for the farmers of MuktainagarTaluka of Maharashtra state.

MATERIALS AND METHODS

The present study was conducted in Muktainagar Taluka situated in the eastern part of Jalgaon District in Northern Maharashtra AR- Assured Rainfall Zone and is situated between 21.0468^{0}N latitude and 76.0595^{0}Elongitude. The total geographical area of Muktainagar Taluka is 2197 ha. The major field crops cultivated in *Kharif* season are Groundnut, Cotton Maize and Tur. Wheat, Gram, Garlic, Onion and other vegetables are the important *Rabi* crops of the area, in summer the major crops grown are Groundnut and vegetables. Major horticultural crops of this area is Banana and little Papaya crop also. The information was collected from 120 farmers who are non-adopter of drip irrigation in form of survey questionnaire prepared in vernacular language. The Socio - personal profile of the farmers include age, education level,size of family, occupation, land size (ha), annual income from farming and source of information etc. Fourteen possible constrains were identified which are affecting adoption of drip irrigation. Farmers were asked to respond on above mentioned constraints in terms of relative importance of particular constraint with four options as most important/ important/less important/not important. These responses were quantified by assigning the score to each constraint as below.

Response	Score
Most Important	3
Important	2
Less Important	1
Not Important	0

Total score was calculated as below.

Score = (3 X no. of farmers' responded as most important + 2 X no. of farmers' responded as important + 1 X no. of farmers' responded as less important)

Based on the total score as per Farmer's Perception, the constraints were ranked from I to XIV in which the constraint having rank I is the most important constraint in adoption of drip irrigation and constraint ranking XIV being the least important as per farmer's perception.

RESULTS AND DISCUSSION

The Socio - personal profile of the farmers

The analysis and interpretation of results was carried out in terms of socio - personal profile of the farmers and their perception of about constraints affecting adoption of drip irrigation.

The Socio - personal profile of the respondent farmers is given in Table 1.

Table 1. Socio - personal profile of farmers (n=120)

Sr. No.	Variables	Levels / Categories	Frequency	Percent %
I	**Age**	Young (Up to 35 years)	05	04.16
		Middle Age (36 to 54 years)	67	55.84
		Old (55 and above years)	48	40.00
II	**Education level**	Illiterate	12	10.00
		Primary level of education	39	32.50
		Secondary and Higher secondary level of education	51	42.50
		College level of education and above	18	15.00
III	**Size of Family**	Small family (Up to 4 members)	51	42.50
		Medium family (5 to 7 members)	57	47.50
		Big family (8 or more than 8 members)	12	10.00
IV	**Occupation**	Farming	43	35.83
		Farming + Animal Husbandry	31	25.83
		Farming + Job	22	18.33
		Farming + Business	24	20.00
V	**Land Size**	Marginal (Up to 1 ha)	24	20.00
		Small (1.01-2 ha)	35	29.16
		Medium (2.01- 4 ha)	44	36.67
		Large (4.01 and above)	17	14.17
VI	**Annual Income from Farming, Rs.**	Low (Up to Rs. 1,50,000)	18	15.00
		Medium (Rs. 1,50,001 - Rs. 3,00,000)	54	45.00
		High (Rs. 3,00,001 andabove	48	40.00

Age : As revealed in Table 1, maximum number of respondents (55.84 per cent) belonged to middle age group (36-54 years) followed by old age group (40 percent) whereas, only 4.16 percent respondents belonged to young age group (upto 35 years). From the overall view, it can be concluded that majority of respondents belonged to middle age group.

Education : Education is needed for the overall development of a person. It provides knowledge and skill to make life better and helps prevent oneself from various problems. Education was measured in terms of completed formal or non formal education.It becomes clear from the data in table 1 that 42.50 per cent of therespondents were found to have secondary level ofeducation. The respondents from primary and higher secondary level of education and its above level were 32.50 and 15.00 per cent, respectively. 10.00 percent respondent was found illiterate.

Size of family: It is revealed from Table 1 that relatively higher per cent of respondent 47.50 per cent had medium family size followed by 42.50 per cent small i.e. up to 4 members in family and 10.00 per cent big family size i.e. 8 or more than 8 members in family. The probable reason might be fragmentation of land holding and people of present generation have tendency to separate from joint family after marriage.

Occupation : It is clear from the Table 1 that majority 35.83 percent of farmers had farming occupation, while 25.83 percent had farming + animal husbandry activities. So the main occupation of the farmers is farming + animal husbandry.

Land size : It was evident from table 1 that 36.67 percent of the respondents had mediumland size followed by 29.16 per cent of the respondents had smallland size, while 20.00 per cent and 14.17 per cent had marginal and large land size, respectively.

Annual Income from Farming Rs.: It was observed from Table 1 that , 45.00 per cent of respondent had medium annual income Rs.1,50,001 to Rs. 3,00,000 and 40.00 per cent were having high annual income ranging from Rs.3,00,001 and above. Whereas, 15.00 per cent of the respondent had low income uptoRs. 1,50,000.

Table 2.Source of information of modern technology of farming (n=120)

Sr. No	Source	Always	Sometime	Never
1	Electronic media	58	46	16
2	Print media	77	29	14
3	Co-Operative society	48	43	29
4	Agricultural Department / Universities	74	31	15
5	Progressive farmers	120	0	0

It was observed that all farmers were always getting information for modern technology of farming from the progressive farmers. Beside the information from progressive farmers, other sources of information like print media, Agricultural Department/ Universities, electronic media and cooperative society sources respectively, were used as given in Table 2.

Constraints in adoption of drip irrigation

The response of farmers as most important,important, less important and not important abouteach identified constraint is given in Table 3.Ranking of constraints based on total score as pertheir relative importance in adoption of drip irrigationas per farmers perception is given in Table 4.

Table 3 : Scoring of perception of farmers about constraints in adoption of drip irrigation (n=120)

Sr. No	Particular	No. of farmers				Total Score
		Most Imp.	Imp.	Less Imp.	Not Imp.	
1	2	3	4	5	6	7*
1	Irrigation is to be done more frequently	62	24	22	12	256
2	High Initial Investment	110	10	0	0	350
3	No need of drip irrigation as sufficient water is available	0	12	19	89	43
4	Easy and cheap labour availability in current method	0	5	14	101	24
5	Problem of clogging of system due to salty / impure water	43	55	19	3	258
6	Non- availability of technical knowledge and Information	62	24	19	15	253

Sr. No	Particular	No. of farmers				Total Score
		Most Imp.	Imp.	Less Imp.	Not Imp.	
7	Irrigation quantity by drip seems to be insufficientfor crop growth	65	29	16	10	269
8	Negative feedback of other framers about drip irrigation	22	30	46	22	172
9	Non availability of skilled persons for repairing the system	19	31	34	36	153
10	Not satisfying after sales service	58	29	16	17	248
11	Problems in farming operations	65	55	0	0	305
12	Laying and remove drip system isdifficult	50	36	19	15	241
13	Damage to system due to rats and other animals	70	38	10	2	296
14	More maintenance require as compare to surface irrigation	79	34	7	0	312

*7 = (3x3) + (4x2) + (5x1)

High initial investment ranked the most important constraint in adoption of drip irrigation system by the farmers with score of 350. Table 5 shows that 91.67 percent adopter of drip irrigation have indicated high initial investment as most important. In spite of many relative advantages, high material cost may prevent many farmers from adopting the drip irrigation system. Since most of the respondent 90.00 percent falls in the category of marginal, small and medium, high initial costs make the technology economically unfeasible at initial years for small and marginal farmers even with financial support by the government in terms of subsidy. The cost of the system per unit area is higher for small size of farms as cost of head unit is generally fixed.

Table 4 : Ranking of perception of farmers about constraints in adoption of drip irrigation

Sr. No.	Particular	Total Score	Rank
1	Irrigation is to be done more frequently	256	VII
2	High initial investment	350	I
3	Easy and cheap labour availability in current method	24	XIV
4	Problem of clogging of system due to salty / impure water	258	VI
5	Non - availability of technical knowledge and information	253	VIII
6	Irrigation quantity by drip seems to be insufficient for crop growth	269	V
7	Negative feedback of other framers about drip irrigation	172	XI
8	No need of drip irrigation as sufficient water is available	43	XIII
9	Non availability of skilled persons for repairing the system	153	XII
10	Not satisfying after sales service	248	IX
11	Problems in farming operations	305	III
12	Laying and remove drip system is difficult/problematic	241	X
13	Damage to system due to rats and other animals	296	IV
14	More Maintenance require as compare to surface irrigation	312	II

Percentage of farmers assigning score as mostimportant out of four options to a particularconstraint is given in Table 5.

Table 5 : Scoring as most important constraint by Farmers

Sr. No	Particular	Percentage
1	Irrigation is to be done more frequently	51.67
2	High initial investment	91.67
3	No need of drip irrigation as sufficient water is available	0
4	Easy and cheap labour availability in current method	0
5	Problem of clogging of system due to salty / impure water	35.83
6	Non- availability of technical knowledge and information	51.67
7	Irrigation quantity by drip seems to be insufficient for crop growth	54.17
8	Negative feedback of other framers about drip irrigation	18.33
9	Non availability of skilled persons for repairing the system	15.83
10	Not satisfying after sales service	48.33
11	Problems in farming operations	54.17
12	Laying and remove drip system is difficult/problematic	41.61
13	Damage to system due to rats and other animals	58.33
14	More Maintenance require as compare to surface irrigation	65.83

There is a need to redesign low cost drip irrigation systems to suit the needs of the smalland marginal farmers. There is good scope for reducing the system cost by slight modifications in the agro-techniques to suit small and medium farms like paired row planting. The efforts can made to modify in present system of financial assistantship in form of subsidy and standardization of cost of the system by government which may reduce the cost of the system. As per the farmers' perception, more maintenance as compare to surface irrigation wasranked II with a score of 312.

Problems in farming operations was ranked III in the constraint adoption of drip irrigation.The reason no need of drip irrigation as sufficient water is available for present method and easy and cheap labour availability in current method were found to be least important for adoption of drip irrigation. Due to diminishing water resource and irregular pattern of rainfall due to climate change has made the farmers aware about using water saving technologies for irrigation.

High initial investment ranked the most important constraint in the adoption of drip

irrigation system by the farmers with score of 350 with 91.67 percent of farmers indicting it as most important. More maintenance require as compare to surface irrigation and problems in farming operations ranked II and III with a score of 312 and 305 respectively. No need of drip irrigation as sufficient water is available and easy and cheap labour availability was least important constraints with the score of 43 and 24 respectively.

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RESEARCH ARTICLE

Perception of farmers towards climate change

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ABSTRACT

The present investigation was carried out in Vidarbha region of Maharashtra State of India. Out of 11 districts Vidarbha region namely Yavatmal was selected for the study. For the purpose of study 6 villages form Yavatymal district were selected randomly. In this way, a total of 120 farmers were considered as respondents for a study. Ex-post facto research design was used for study. Data were collected through personal interview method with the help of structural schedule. Then the data was subjected to statistical analysis for interpretation.

It is observed that a majority of farmers (85.83%) agreed (SA+A) that there was an "Increase in temperature as compared to previous years" whereas 5.83 percent (SDA+DA) disagreed with this and (8.34%) farmers were 'undecided' about increase in temperature as compared to previous years. In response to a statement "intensity of heat during summer has Increased" majority of farmers (80.84%) agreed (SA+A) with this statement. Where as (71.66%) percent of farmers agreed (SA+A) that changes of high temperature and heat wave occurrence have increased. Further, 84.18 percent (SA+A) farmers observed changes in rainfall as compared to last few year. while, 83.32 percent (SA+A) farmers reported that "there was the changes in timing of rainfall.

INTRODUCTION

Climate change is predicted by scientists to have the main impact on agriculture, economy and livelihood of the populations of developing countries and India is one of them, where large parts of the population depend on climate sensitive sectors like agriculture and forestry for livelihood. By adversely affecting freshwater availability and quality, biodiversity and desertification, climate change ends to disproportionately affect the poorest in the society, exacerbating in equities in access to food, water and health. The capacity to adapt is a function of access to wealth, scientific and technical knowledge, information, skills, infrastructure, institutions and equity and therefore varies among regions and socio-economic groups. Climate change therefore is intrinsically linked to other environmental issues and to the challenge of sustainable development.

Thus perception about climate changes and plays an important role to support farm-level decisions during the cropping cycle. The people and their livelihoods are inextricably entwined with their climate and a very small change can affect them and diseases, on water needs, on nutrient requirements and also harvesting and marketing time of the produce.

Considering this factual information

a study on a '**Perception of farmers towards climate change**' was proposed with following objectives

Objectives :

1. To study the profile of farmers
2. To find out farmers perception towards climate change
3. To identify and document the views of farmers on climate change

METHODOLOGY :

The present investigation was carried out in Vidarbha region of Maharashtra state of India. Out of 11 districts Vidarbha region namely Yavatmal districts was selected for study.For the purpose of study 6 villages form each district were selected randomly. In this way, a total of 120 farmers were considered as respondents for a study. Ex-post facto research design was used for study.Data were collected by using simple random sampling method with the help of personal structural schedule. Mean and standard deviation, frequency, percentage, coefficient of correlation method of statistics were used for interpretation of data.

RESULTS AND DISCUSSION :

Personnel, Socio-Economic, Communication and Psychological Characteristics of perception of farmers towards climate change

1. **Age :** The distributional analysis pertaining to age of the indicated that, majority (64.16%) percent of respondents in 'middle age' category followed by (25.84%) percent respondents 'young age' category.
2. **Education:** It was found that, more than (35.84%) percent in Middle school whereas (30.83%) percent in primary school of the respondent were educated up to middle school category.

Table 1 : Distribution of farmers according to profile (N=120)

Sr. No	Category	Respondents (N=120)	
		Frequency	Percentage (%)
	Age		
1.	Young (Up to 35 years)	31	25.84
2.	Middle (36 yrs. to 50 years)	77	64.16
3.	Old (Above 50 years)	12	10 .00
	Education		
1	Illiterate	07	05.83
2	Primary school	37	30.83
3	Middle school	43	35.84
4	High school	24	20.00
5	College	09	07.50
	Family Size		
1.	Small	21	17.50
2.	Medium	82	68.34
3.	Large	17	14.16

	Family Type		
1.	Nuclear	93	77.50
2.	Joint	27	22.50
	Occupation		
1.	Labour	07	05.83
2.	Caste Occupation	04	03.33
3.	Business	03	02.50
4.	Farming	101	84.18
5.	Service +Farming	05	04.16
	Land holding		
1.	Marginal	36	30.00
2.	Small	50	41.67
3.	Semi-medium	24	20.00
4.	Medium	07	05.83
5.	Large	03	02.50
	Farming Experience		
1.	Low	36	30.00
2.	Medium	73	60.84
3.	High	11	09.16
	Annual Experience (Rs.)		
1.	Low(up to 28836)	16	13.33
2.	Medium(28837-338585)	95	79.17
3.	High (above 338586)	09	07.5
	Cropping Pattern		
1.	Seasonal	84	70.00
2.	Biseasonal	22	18.33
3.	Annual	04	03.33
4	Biannual	03	02.5
5	Perennial	07	05.84
	Economic Motivation		
1.	Low	30	25.00
2.	Medium	51	42.50
3.	High	39	32.50

3. Family size: It was found that, more than (68.34%) percent were found to have 'medium' sized family and (17.5%) percent small family size category.

4. Family type: The findings also revealed that a large majority of respondent (77.50%) percent were nuclear family and followed by (22.50%) percent had joint family category.

5. Occupation : The findings also revealed that a large majority (84.18%) percent of respondent of them were engaged in farming alone where as only 15.82 percent of the respondents had other occupation along with farming.

6. Land holding : The findings revealed that maximum number of respondents (41.67%) of the respondents were belongs to small farmers category while (30.00%) percent of the respondents

were belongs to marginal farmers category and (20.00 %) percent of the respondents belonged to semi-medium farmers category

7. **Farming experience:** The findings revealed that majority of respondent (60.84%) percent medium 'farming experience category while (30.00%) percent respondent belongs to low farming experience category.

8. **Annual income:** The findings revealed that the majority (79.17%) of farmers had medium annual income and (7.5%) farmers had high annual income category.

9. **Cropping patterns :** It is found that majority of respondents (70.00%) percent had seasonal cropping patterns category while (18.33%) per cent respondents belongs to biseasonal category and (3.33%) percent annual patterns category.

10. **Economic motivation:** The study found that majority of respondents (42.5%) percent comes under medium economic motivation, (32.5%) percent of respondents under high category.

11 **Access to weather forecast:** The findings revealed that maximum number of (51.67%) percent of the respondent having no access to weather information level and (48.33%) percent of them had reported access to weather information.

Perception about climate change

The findings given in table 1 reveled that majority of farmers (50.83%) have Medium level of perceptions towards climate change followed by 43.34 percent high and 5.83 percent low perception towards climate change.

Table 1: Overall distribution of respondents according to their perception about climate

Sr. No	category	Respondent (N=120)	
		Frequency	Percentage
1.	Low	07	05.83%
2.	medium	61	50.83%
3.	High	52	43.34%
Total		**120**	**100.00**

The findings of the study are similar to that of Mundhe *et al.* (2019), Where in it was found that the majority of the farmers had medium level of perception towards Climate change (Temperature, Rainfall).

It is evident from the table 2 that a majority of farmers (85.83%) agreed (SA+A) that there was an "Increase in temperature as compared to previous years" whereas 5.83 percent (SDA+DA) disagreed with this and (8.34%) farmers were 'undecided' about increase temperature as compared to previous years.

In response to a statement "intensity of heat during summer has Increased" majority of farmers (80.84%) agreed (SA+A) with this statement.

Table 2: Statement wise distribution of the respondents according to perception towards climate change (N=120)

Sr. No	statements	Responses				
		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
		N	N	N	N	N
		%	%	%	%	%
1.	Agreed that there is increase in temperature as compared to previous years.	74	29	10	04	03
		61.67%	24.16%	8.34%	3.33%	2.50%
2.	Agreed that intensity of heat during summer has increased.	66	31	14	06	03
		55.00%	25.84%	11.66%	5.00%	2.50%
3.	Agreed that changes of high temperature and heat wave occurrence have increased.	56	30	19	09	06
		46.66%	25.00%	15.84%	7.5%	5.00%
4.	Agreed that duration of dry spell during rainy season increased.	53	27	19	11	10
		44.16%	22.5%	15.84%	9.16%	8.34%
5.	Agreed that there are changes in the rainfall.	61	40	11	05	03
		50.84%	33.34%	9.16%	4.16%	2.5%
6.	Agreed that frequency of heavy rains have decrease.	53	35	18	08	06
		44.16%	29.17%	15.00%	6.67%	5.00%
7.	Agreed that there are changes in the timing of rainfall.	59	41	11	05	04
		49.16%	34.16%	9.17%	4.17%	3.34%
8.	Agreed that amount of rainfall decreased as compared to last year's.	55	38	15	08	04
		45.84%	31.66%	12.5%	6.67%	3.33%
9.	Agreed that ground water table compared to previous years has increased.	21	20	13	32	34
		17.5%	16.67%	10.83%	26.67%	28.33%
10.	Agreed that night temperature compared to previous years has increased.	34	37	29	12	08
		28.34%	30.83%	24.16%	10.00%	6.67%
11.	Agreed that total rainy days as compared to previous years have increased.	21	18	17	26	38
		17.5%	15.00%	14.16%	21.67%	31.67%

When asked "Do you agree that changes of high temperature and heat wave occurrence have increased" (71.66%) percent of farmers agreed (SA+A) with this statement; and when asked "Do you agree that more dry spell during this season", more than 66.66 percent (SA+A) respondents replied in the affirmative.

Further, it was revealed that 84.18 percent (SA+A) agree that changes in rainfall as compared to last few year. It was revealed that 83.32 percent (SA+A) farmers

agree to the statement that "there was the changes in timing of rainfall.

When asked "Do you agree that frequency of heavy rains have decrease" 73.33 Percent agreed (SA+A) with it, about (55.00%) percent disagreed (DSA+DA) with the statement that "Do you agree that ground water table compared to previous years has increased".

Additionally, when asked "Do you agree that total rainy days as compared to previous years have increased", it about 53.32 percent disagreed (SDA+DA) with the statement.

When probed further whether "Do you agree that night temperature compared to previous years has increased" 59.17 percent agreed (SA+A) with the statement.

View of the farmers about climate

Table 3: Distribution of respondents according to their views about climate change

Sl.	statements	Response %		
		Strongly Agree	Agree	Disagree
1.	Increase in temperature	61.66	24.17	
2.	Changes in rainfall	**55.00**	25.84	
3.	Changes timing of rainfall	49.16	34.16	
4.	Long dry spells	44.16	22.53	
5.	Occurrence of drought	57.50	26.66	

The view of the farmers about climate change was investigated in the present study. There were statements about which the views of the respondents were observed and presented in the table 15. revealed that increases in temperature were strongly observed by 61.66 percent respondents and followed by 24.17 percent respondents agree it.

As far as the statements about changes in rainfall was concerned **55.00** percent respondents were absolutely agreed and 25.84 percent were agreed with statement.

The 49.16 percent respondents also strongly observed that the changes timing of rainfall followed by 34.16 percent agreed and 44.16 percent respondents also strongly observed that the long dry spells during last year and followed by 22.53 percent agreed it.

The (57.50%) percent respondents also strongly observed that the Increases in pest and disease and followed by 26.66 percent agreed it.

The respondents also expressed that occurrence of drought; decreases in productivity were as farmer's view of climate change.

The farmers view of climate change as perceived by the respondents were arranged as Increase in temperature, changes in timing of rainfall, changes in rainfall, long dry spells, occurrence of drought, Increase in pest and disease, decreases in productivity.

CONCLUSION

Findings of the study concluded that majority of farmers were middle aged, middle to primary school, family had medium sized with nuclear family, having farming is main occupation with medium farming experience in small landholding, medium annual income with medium economic motivation. Majority of the

respondents had seasonal cropping patterns, most of them had no access to weather forecast, overall it was concluded that they had medium level of views of farmers on climate change.

With regards to farmers perception towards climate change it was revealed that majority of the farmers were having medium perception index range. Most of them perceived that the temperature has increased as compared to previous years.

With regard to relationship between socio-economic, psychological and communication characteristics of farmers with perception of farmers about climate change,

It was found that, amongst six independent variables education, land holding, farming experience, cropping patterns, access to whether forecast and view of farmers towards climate change were found to be positively and highly significant with perception of farmers towards climate change and age, family size, family type, annual income were found to be positively non significant with perception of farmers towards climate change.

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RESEARCH ARTICLE

Use of communication technologies in development of farming communities

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ABSTRACT

Agriculture sector is main source of income in rural areas of India. It is called as the backbone of the Indian economy because agriculture is the most important occupation for most of the Indian families and Indian agriculture has contributed, 48 per cent to 60 per cent of the total national production in the last two decades. Farmers play a very important role in development of India but past researches revealed that farmers are facing many problems due to lack of information, education on many aspects. Present paper aim is to discuss the role of communication technologies for better farming.

Key words: farming, communication, technologies

INTRODUCTION

Agriculture plays an important role in meeting the basic needs of humans and animals. India has a wide variety of geographical conditions, which are unique to agriculture as well as provide a wide range of favorable conditions. Various favorable conditions encourage farmers to do agriculture related work throughout the year. It is an important source of raw material supply for many agro-based, small and large industries. The use of science and technology in India for the betterment of the agricultural sector is also commendable, which is constantly making inventive efforts. The use of science and technology is playing an important role in increasing production as well as saving farmer's time.

According to **Wagh and Dongre (2016)**, more than 58 per cent of rural households in India depend on agricultural related activities as their main means of livelihood. As we know that agriculture is of great importance to run the economy of India smoothly and India is one of the top two countries in the world which is moving ahead in agriculture and allied sectors. About 50 percent of India's geographical area is under agriculture, which proves that India is an agricultural country.

In India, agriculture sector accounts of 15.2 per cent of India's Gross Domestic Product (GDP) and it provide employment to more than half population of the country directly or indirectly. More than half population in India directly and indirectly depends on the agriculture. According to **Kekane, 2013,** the food grain production has risen from 51 million tonnes (MT) in 1950-51 to 250MT during 2011-12 highest ever since independence**.** India is one of the largest producers of many crops in world such as wheat, sugarcane, rice, pulses, and cotton, as well as the highest producer of milk and second-largest producer of fruits/vegetables **(Deshpande, 2017)**. In India, Agriculture supplies the raw material like jute, cotton, sugar to various agro based industries. All food processing industries are directly dependent on agriculture.

Agriculture sector is providing high employment opportunities to the unemployed people and labour force that reduce the high rate of unemployment in the developing countries. In India Agriculture contributes to economic development leading to increased national income levels as well as the living standard of people have been improved.

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 & 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.

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.

Status of farmers in India

The condition of most farmers is awful. More than 80 per cent farmers are marginal of small land holders. Agriculture supports 60 per cent employment and contributes 17 per cent in GDP. According to the NCRB report data, the number of farmer suicides in the country was 11,379 in 2016 as against 12,360 in 2014 and 12,602 in 2015. It is certainly true that the Indian farmer is a **hard-working farmer** with a good ability to manage the variations of nature and circumstances. By adopting the latest scientific tools, he is learning many ways of farming, a lot of awareness in farming through education. But unfortunately Indian farmers are not aware about many new and innovative techniques due to lack of knowledge, information and education on many aspects. Today is an ICTs era. Many new ICTs tools as mobile apps, portals are used to aware the farmers on new aspects.

Role of information in sustainable development

Information is consider as a valuable resource like land, labor, and capital and described as the main stimulating factor in the sustainable growth of any sector. According to **Sharma (2013),** the right information given at right time empowers the farmers and information is necessary for agricultural development. The most

important function of information is to upgrade the level of knowledge to reduce uncertainties.

According to **Rogers (2003)** the knowledge stage is the first stage of the innovation-decision process. Any information is termed as effective if it is disseminated with accuracy at a right time. Importance of access to information and improved communication will be a major step towards development in any field, and dairy is not an exception to this. Many new high-yielding production technologies were revolutionized in recent decades by the hard work of researchers and scientists. Yet, there is a huge difference in the development of technologies and rapid transfer of the technologies. One of the reasons for this gap is the lack of access to information, which could be due to the scarcity of extension personnel and technical human resources. In India extension workers to farmer ratio is 1:5000 **(Ragasa *et al.*, 2013),** due to which extension personnel cannot reach every household and not be able to tackle the problem of individual farmers. Thus, to decrease the information gap e- extension came up which means electronic technology are being used to enhance the face to face and paper based transaction.

Routinely, agricultural information dissemination was facilitated by newspaper, television, magazine, and radio. Now there is a paradigm shift in the past several years from radio, television, and newspaper to digital media. This media is easily accessible and its use in the agriculture and allied sector increased across the world. There has been an increased use of web-based services like mobile applications and web portals in the last decade. Earlier, information services offered through mobile phones had their own limitation of sending short text messages due to which communication remained one way as farmers needed to wait for professional's advice and most of the time their problems remain unheard. **(Narechania, 2015).** Mobile-based communication services were lacking feedback on animal recovery, but with the help of social media instant feedback can be taken from farmers which will be able to reduce one way communication. Digital India is one of the best initiatives taken by the government to ensure that all the facilities are available to all citizens electronically including delivering new techniques and information in the field of agriculture.

Social media

Social media is a term that people loosely apply to refer web-based tools for generating content, connecting with people, collaboration, and many other forms of people-to-people interaction. These are often referred as Web 2.0**.** The original version of the web services (Web 1.0) was a one-way information provider like a Mobile-based SMS service where receivers only do passive viewing of content and for more information users were expected to visit the website**.** On other hand, this web 2.0 is the advanced second-generation version of World Wide Web that offers two-way communication. Social media allows the user to personally and informally interact, create, share, retrieve, and exchange information and ideas in any form of text, pictures, video, etc. that can be discussed upon, archived, and used by anyone in virtual communities and networks **(Saravanan and Bhattacharjee , 2013).**

Kaplan and Haenlein (2010) defined social media as a group of internet-based applications that build on the ideological and technological foundations of Web 2.0 and that allow the creation and exchange of user-generated content. The Social media is more about sociology and psychology of communication than about technology.

Social media mostly used by the youngsters and teenagers has proved to be a myth. Irrespective of age, gender, religion, and geography, people are entering the world of social media. The transformation in people's preferences of broadcast media monologue to social media dialogue has been clearly seen from the last several years. The reason of people shifting from broadcast media to social media is affordability of cheaper mobile data and broadband services. Earlier, only urban areas were active users of social media; now in rural areas also, social media usage is spreading very swiftly.

Table1.1: Leading countries based on social media users in the year of 2020-2021 (in Millions)

Country	Number of Users (in millions)
China	999.95
India	639.47
United States	295.48
Indonesia	193.43
Brazil	159.01
Russia	103.98
Japan	96.95
Nigeria	43
Bangladesh	61.76
Mexico	84.01

Source: Statista data report 2021

Social media in the farming sector

Several studies highlighted many emerging Information Communication Technologies in the context of the agriculture sector. One of them is social media, which is having a maximum potential of reaching out to the common people, despite the presence of other traditional media. It created a high level of awareness and knowledge worldwide. The people remained connected and informed and it provided them a platform to highlight their stories, news, and products.

In terms of the Agriculture sector, social media is still a proven milestone so, it is necessary to utilize the power of social media by farmers and other stakeholders. For gaining any scientific information on the various aspects of farming WhatsApp, YouTube and Facebook were the most commonly used social media tools by a majority of the farmers. **(Raj *et al.* 2019).** In recent years, communication is being revolutionized through social media by making people aware and informed. It is clearly helping to agriculture extension advisory services as the extension organizations should start making an effective social media page, getting followers to collaborate for practical actions on the information shared through the social media pages, and keep the followers involved by continuous engagement through conversations to form a mutually created knowledge pool **(Typhina *et al.* 2015).** It provide a networked system where awareness and information dissemination is rapid, it makes capital more easily as farmers can easily entertain the consumer, can solve farm-related problems at one platform, and lastly, the small dairy farmers who are supplying their milk to the factory or society can be on upper hand by deciding market place on their own. Besides, it will not be wrong if we conclude that social media is the new nugget in the pool of digitalization that has surely opened a new panorama for the extension advisory services and for disseminating information to the rural farmers.

Types of social media platform

Kaplan & Haenlein (2010) Classified social media in six different categories. These are- Blogs, Social Networking Sites, Collaboration Projects, Content Communities, Virtual Social Worlds, and Virtual Game Worlds. In addition to these, different types of social

media platforms have emerged in a recent decade. Some of the most frequently used platforms were classified below based on their functions:

Social networking sites: These platforms are used to build social and personal interaction with a friend, colleague, and peer. They are the most popular social media platform and having the highest reach. Examples Google +, Orkut, Facebook

Collaborative projects: It is used for joint and collaborative creation and acts as the main source of information due to diversity and broad base content. Example -Wikis is a web app that allows users to delete, add and modify the content in collaboration with others.

Professional networking site: These platforms increase the scope of scientific discussion amongst experts of the field and peers. It increases networking among professionals, increases the scope of researches to be disseminated amongst a wider audience. For example -LinkedIn, Research gate, Academia.edu .

Content communities: It shares a specific type of content in a very interesting way. It is having high media richness. The content is created and shared in the form of video, slideshow, PDF, and audio. Social media under content communities are Youtube, Slide share, Podcasts

Blogs and Vlogs: These are the earliest form of social media. They are mostly personal web pages that are used by corporate companies for reaching their client like Blogger, Word press. The trend of Blogs and Vlogs reduced due to the popularity of mini-blogs and other social media platforms, but still, it is in function in corporate houses.

Micro blogs: These are nowadays the trending source of collecting information. Twitter had a character restriction of about 140 characters; people can create and share the content in it. Use of hashtags (#) is most commonly used in micro blogs to highlight the content and make it easily searchable. Apart from this, Instagram also has a fan-base and popularity like Twitter.

Socially integrated for messaging- This platform has recently gained most of the popularity because of its group messaging option. Contents can be created and send to an individual and to the group. For example- WhatsApp, Facebook messenger, Snapchat.

Table 1.2: Top Social media platforms and their active users for the year 2020 in India

Sr. No.	Social media	Active users (in millions)
1.	Whats App	390.1
2.	Facebook	357.9
3.	YouTube	225
4.	Instagram	180
5.	Linked In	65
6.	Twitter	22.1

Source: Statista data report 2021

WhatsApp

It is one of the most popular social media platforms founded by Jan Koum and Brian Acton in 2009, through which text, pictures, audio, and video could be sent with end-to-end type encryption. India is the biggest market for WhatsApp as it has 340 million users that are the largest among other countries. The majority of the Indian population including the farmer's community uses WhatsApp because of its availability on every Smartphone and its zero-cost communication facilities.

WhatsApp does not require any extra cost except the cost of internet connectivity. It is the easiest way to be connected with a group of people and share information. It can establish the link between farmers due to group messaging options and high media richness. The global

prevalence of WhatsApp showed that it handled more than ten billion messages per day at one period of time **(Olanof, 2012).** Many a times unpredictable problem leave the farmers clueless and in the confused state that delay timely intervention needed to the ailing animal as a result farmer faces many animal loss. WhatsApp can provide timely information and advice and can significantly reduce major complications likely to emerge in case the animal remains unattended by the basic veterinary aids suggested by **(Thakur, 2017)**

Mobile Apps for dissemination Agricultural information

According to the International Telecommunication Union, mobile connections in 2015 have reached 7.08 billion. The smartphone market grew 13 per cent and it is estimated that in 2017 more than one third of the World's population will own a smartphone. Today users are using mobile phone for communication, entertainment, information, daily life and business but dissemination of information through proper channel is necessary. Mobile phones play a very important role in disseminating the information among the farmers. According to Karetsos *et.al.*, (2014) mobile apps provide the information on health, agriculture, tourism, banking etc. Agriculture apps are limited and just related to farmers and these apps are providing information on weather forecast and new technologies for farming etc. According to the World Bank the benefits of these apps in the development of the agricultural sector could be achieved through providing better access to information, better Agricultural information, better connection with market and distribution network, better funding opportunities. **Thapar *et al.* (2019)** studied utilization of new media among farmers of Punjab. The study indicated that Cooperative society needed to be pushed in to create WhatsApp groups to provide information to respective society members. It was revealed that the majority of respondents had their own mobile phones whereas 60 per cent of them had availability of internet on their mobiles phones. A few of them were using mobile to make calls to extension experts and to establish a link with markets.

Use of mobile apps in farming

[1] Krish-e: Krish-e is a popular Agriculture mobile app. This is developed by Mahindra and Mahindra. This app provides personalized crop calendar for farms as well as useful agriculture information such as land preparation, crop sowing, crop planning, fertilizer management, seed treatment, pest and disease management, crop diagnosis, and treatment, weed treatment, and irrigation. This is available in eight language. Krish-e plans help Indian farmers in solving the issues faced by farmers in identifying pests and crop diseases that damage their crops.

[2] IFFCO Kisan Agriculture: This app was launched in 2015 and managed by IFFCO. This is a subsidiary of Indian Farmers' Fertilizer Cooperative Ltd. This app is helpful for Indian farmers to provide them information and to make informed decisions through customized information related to their needs**.** With the help of this app user can access a variety of informative modules including agricultural advisory, weather, market prices, agriculture information library in the form of text, imagery, audio and videos in the selected language at the profiling stage. The app also offers helpline numbers to get in touch with Kisan Call Centre Services.

[3] Crop Insurance: Crop Insurance app help the farmers to calculate insurance premiums for notified crops. This app provides information on cut-off dates and

company contacts for their crop and location. This app works as a reminder and calculator for farmers about their insurance. This app can also be used to get details of the normal sum insured, extended sum insured, premium details, and subsidy information of any notified crop in any notified area. This app is further linked to its web portal which caters to all stakeholders including farmers, states, insurance companies, and banks.

[4] Kheti- Badi: This is a social initiative app. This app aims to promote and support 'Organic Farming'. This app is very helpful for farmers. This app is also helpful to move the farmers towards organic farming. This app is currently only available in four languages.

[5] Agri-Market: This app is developed with the aim to keep farmers abreast of crop prices and discourage them to go for distress sales. Farmers can get information related to prices of crops in markets.

[6] Shetkari: Shetkari Mitra is a multi-functional app. This is made for farmers. This app provides information and knowledge regarding Government schemes. This app also provide the information on crop management, market rates etc.

[7] Kisan Suvidha: This app is launched by PM Narendra Modi in 2016**.** This app work towards the empowerment of farmers and the development of villages. This app provides the information on current weather**,** knowledge on fertilizers, seeds, machinery etc.

Based on above discussion, this can be concluded that mobile apps are very useful for farming. Although there are many social media platform which is used to provide the information among the rural people. Among all these media mobile apps are very useful tools to provide information online as well as offline. Social media also play a very important role as Whatsapp groups are very important ICTs tools through which information can disseminate among the rural people and they can ask the questions or take the suggestions through the help of these groups.

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RESEARCH ARTICLE

Determining knowledge index of buffalo calf rearers in Kerala

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ABSTRACT

The consequence of COVID-19 leads to the usage of technological development in as many as sectors possible. During and after the COVID-19 pandemic many extension services provided via technology enabled webinars. Webinars are existed even since before in scientific society, but the webinars for farmers have been recognized during pandemic. The Department of Veterinary and Animal Husbandry Extension Education, College of Veterinary and Animal Sciences, Pookode organized webinar for the buffalo calf rearing farmers in collaboration with Directorate of Entrepreneurship, Kerala Veterinary and Animal Sciences University during July, 2021. The required data were collected from the 36 registered farmers by using semi-structured interview schedule. The knowledge level was also assessed through teachers made knowledge test. Large majority of the farmers were male (88.89%) and had less than 5 years of experience in buffalo farming (94.44%). Two-thirds of the respondents were aged below 45 years and none of them were illiterate. Nearly ninety per cent of the farmers rearing buffalo along with other livestock. Only 47.22 per cent of respondents were attended the knowledge test. Overall knowledge index was 53.48 per cent. The buffalo calf rearing farmers had more knowledge about management practices including healthcare and housing followed by marketing and feeding practices.

Keywords : Farmer, Knowledge, Index, Webinar, Buffalo

INTRODUCTION

India holds the first position in terms of milk production since 1998 and produced 209.96 million tonnes of milk with a per capita availability of 427grams milk/day during 2020-21. Buffalo plays vital role in the dairy industry of India and they shared about 45% of the total milk produced in India (Anonymous, 2022). Milk yield of an average indigenous buffalo is two times more that of an indigenous cow. India is having more than one-half of the world buffalo population which provide milk, meat and draught power (Anonymous, 2020). Buffalos not only contributed significantly to national milk pail of the country but also have great demand for meat owing to banning of cattle slaughter (Rajadurai *et al.*, 2022). They also efficiently utilize the poor-quality crop residues and convert to milk and meat as compared to cattle (El-serafy, 1991). India accounts for about 43% of the world buffalo meat production and has exported 1175193.02 MT of buffalo meat products to the world for the worth of Rs. 24613.24 Crores/ 3303.34 USD Millions during the year 2021-22 (APEDA, 2022). The rearing of male buffalo calves for meat production is an economically viable enterprise as

integration with crop and fodder (Kumar, 2021). Consequences of COVID19 leads to technological enabled webinar for farmers to deliver the extension advisory services. Department of Veterinary and Animal Husbandry Extension Education, College of Veterinary and Animal Sciences, Pookode and Directorate of Entrepreneurship, Kerala Veterinary and Animal Sciences University jointly organised many webinars for the different categories for farmers during and post COVID19 pandemic. With this background the study was conceived with the objective to measure the knowledge level of buffalo farmers who reared buffalo calves for fattening purpose.

RESEARCH METHODOLOGY

The present study was conducted to assess the knowledge level of buffalo calf rearing farmers on different rearing practices for fattening buffalo calves for meat purpose. The primary data were collected from all 36 farmers who registered and attended the webinar organised by the Department of Veterinary and Animal Husbandry Extension Education, College of Veterinary and Animal Sciences, Pookode in collaboration with Directorate of Entrepreneurship, Kerala Veterinary and Animal Sciences University between 5th and 7th July, 2021. The semi-structured interview schedule was prepared in consultation with the subject matter specialist and published literature. Teacher-made knowledge test was developed to measure the knowledge about buffalo calf rearing. Statements on knowledge about buffalo rearing were formulated based on the package of practices recommendations 2016 published by Kerala Veterinary and Animal Sciences University. Altogether, twenty two questions from three domains, which includes, feeding management of buffalo calf's (9- questions), management practice including healthcare and housing (7- questions) and marketing of fattened buffalo calf's (6- questions) were finalized for the study. It was pre-tested among non-sampling study population and necessary modifications were made before actual data collection. The data were collected through google forms. One score was given for each correct answer and zero score for wrong answer. The collected data were analysed using descriptive statistical analysis. Knowledge index was worked out by using the following formula

Knowledge Index (%) - (Scores obtained/ Obtainable score) × 100 (Gadekar and Kalal, 2022)

RESULTS AND DISCUSSION

From Table 1, it could be noted that majority of buffalo calf rearing farmers (36.11%) were old aged followed by middle (33.33%) and young aged (30.56%). More or less all the age group of farmers were equally involved in buffalo husbandry activities. These results were not in favour with Sarkar *et al.,* (2013) who opined that majority of the buffalo rearing farmers were aged more than 30 years. Large majority of them were males (88.89%) and rest were females (11.11%). The reason might that the buffalo husbandry activities are labor intensive activity. Further, the table reveals that none of the farmer under study were illiterates and more than one-half of them had education up to collegiate level. Thus the education level of farmers could be right tapped to disseminate the latest scientific buffalo rearing practices. This contradicts with the findings of Siddiki *et al.,* (2015) who reported that more than one-half of the buffalo rearing farmers had no formal education. Two-thirds of the respondents had nuclear family (66.67%) and had up to five members in their family (69.44%).

While studying their livestock possession, it was found that nearly 90.00 per cent of them had buffalo calves along

with other livestock and rest reared only buffalo calveses (11.11%). Considering, the buffalo farming experience, 94.44 and 05.56 per cent of the farmers had less than 5 years and more than 5 years of experience, respectively. Regarding land holdings, more than three-fourths of the farmers were marginal (88.89) followed by landless (05.56%) and small and large famers (02.78% each).

Table 1. Socio-economic status of the farmers engaged in buffalo farming (N=36)

Sl. No	Variable	Category	Frequency	Percentage
1	Gender	Male	32	88.89
		Female	04	11.11
2	Age	Young (<35 years)	11	30.56
		Middle (36 – 45 years)	12	33.33
		Old (>45 years)	13	36.11
3	Education	Illiterate	00	-
		Primary Education	02	05.56
		Secondary Education	15	41.67
		Graduated	19	52.77
4	Family type	Nuclear family	24	66.67
		Joint family	12	33.33
5	Family members	Up to 5 members	25	69.44
		More than 5 members	11	30.56
6	Landholding	Landless	02	05.56
		Marginal (up to 2.5 acres)	32	88.89
		Small (2.5 – 5.0 acres)	01	02.78
		Large(more than 5.0 acres)	01	02.78
7	Livestock possession	Buffalo alone	04	11.11
		Buffalo along with other livestock	32	88.89
8	Buffalo farming experience	Up to 5 years	34	94.44
		More than 5 years	02	05.56

The knowledge level was assessed through the teacher made knowledge test and the test questions were send to all the 36 respondents as a google forms and we had received total of 17 responses with the response rate of 47.22 per cent. From the contents of Table 5 it could be inferred that the overall knowledge index of the buffalo rearing farmers was 53.48 per cent. The sample farmers had more knowledge in the area of management practices including health care and housing management with the knowledge index of 68.63 per cent followed by marketing management with

the knowledge index of 58.82 per cent. The buffalo rearing farmers under study had low level of knowledge about feeding management practices with the knowledge index of 40.64. The findings of current study is in agreement with the findings of Meena and Sharma (2006), who reported that the buffalo rearing farmers of Rajasthan had more knowledge about housing followed by improved breeds and feeding practices.

Table 2. Buffalo rearing farmer's knowledge about different buffalo farming activities (N=17)

Sl. No.	Domain	Knowledge Index (%)
1	Feeding management of claves for meat production	40.64
2	Management practices including health care and housing management	68.63
3	Marketing management of fattened buffalo calves	58.82
	Overall	53.48

Table 3. Buffalo rearing farmer's knowledge about feeding of calf's (N=36)

Sl. No.	Statements / Questions	Knowledge Index (%)
1.	Daily green fodder requirement for buffalo calf of body weight 450 Kg is _____ **(Correct Answer - 25 Kg)**	52.78
2.	How much percentage of the body weight of buffalo calve is its feed intake____ **(Correct Answer - 2.5%)**	25.00
3.	According to the body weight of the buffalo, _____ Kilo gram. of concentrate need to be fed daily**(Correct Answer - 2 to 3 Kg.)**	36.11
4.	How much percentage of the body weight of a Milch dairy buffalo under lactation is its feed intake. **__(Correct answer - 3.0%)**	33.33
5.	Feed conversion efficiency of an adult buffalo calf is **__(Correct answer - 8:1)**	25.00
6.	How much is the permitted level of Urea in buffalo feed. **(Correct Answer - 1.00%)**	55.56
7.	How much percentage of body weight of feed is to be fed to a growing buffalo bull calve? **(Correct answer – 25.00%)**	44.44
8.	Average percentage of crude protein level in CO3 variety of green fodder is ____ **(Correct answer - 8.00%)**	38.89
9.	Indicate the feeding practices/ feeds which are to be avoided while feeding buffalos – **(Correct answer - easily fermentable feeds, boiled rice/cereals, sudden change in feed and feeding patterns)**	55.56

Table 4. Buffalo rearing farmer's knowledge about management practices including health care and housing. (N=36)

Sl. No.	Statements / Questions	Knowledge Index (%)
1.	Vaccination against Foot and Mouth Disease in buffalo must be taken at ____ **(Correct Answer - every six months interval.)**	33.33
2.	The act of being in shallow waters or dam muddy area by buffalo is known as _____ **(Correct Answer - Wallowing.)**	66.67

Sl. No.	Statements / Questions	Knowledge Index (%)
3.	An adult Murrah buffalo requires a floor space of ____ **(Correct Answer - 5.00 square metre.)**	30.56
4.	Which breed of buffalo is known as black gold of Haryana ____ **(Correct Answer – Murrah)**	94.44
5.	Name a buffalo breed which can be reared for meat purpose___ **(Correct answer – Murrah)**	94.44
6.	Major cause of poor body weight gain in buffalo calf is due to internal parasitic infection especially worms – **(Correct answer –True)**	94.44
7.	Most important management practice to be followed for ensuring the growth rate of buffalo calf is – **(Correct answer - regular examination of dung and proper deworming)**	66.67

Table 5. Buffalo rearing farmer's knowledge about marketing of fattened buffalo calves (N=36)

Sl. No.	Statements / Questions	Knowledge Index (%)
1.	What is the average body weight gain for buffalo bull calf at the age of 6 months. **(Correct Answer - 500gm/day)**	58.33
2.	The average adult body weight attain by Murrah male buffalo is__ **(Correct Answer - 450-500Kg.)**	47.22
3.	The dressing percentage of male buffalo after slaughtering is _____ **(Correct Answer -50-55 per cent.)**	77.78
4.	The ideal age for selection of male buffalo calf for commercial meat production is____ **(Correct Answer - 6 -8 months)**	44.44
5.	What is the marketable body weight of male buffalo : 300 Kg.	72.22
6.	Male buffalo calf after reaching 9 months of age will show a growth rate of _____ **(Correct Answer - 350gm/day)**	52.78

CONCLUSION

Buffalo rearing ensures the livelihood of the rural poor and nutritional security in access to animal protein in the form of milk. The present study revealed that farmers of all age, educated involved in buffalo farming activities. The study also revealed that the knowledge about improved buffalo husbandry management practices were low especially in feeding management. Hence suitable scientific rearing practices in buffalo husbandry may be developed for better adoption so as to ensure higher income and provides livelihood support to the rural poor. Further, farmer friendly extension approaches may be evolved to disseminate the technical know-how to the buffalo rearing farmers.

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REVIEW ARTICLE

Basalt fiber for green and sustainable development

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ABSTRACT

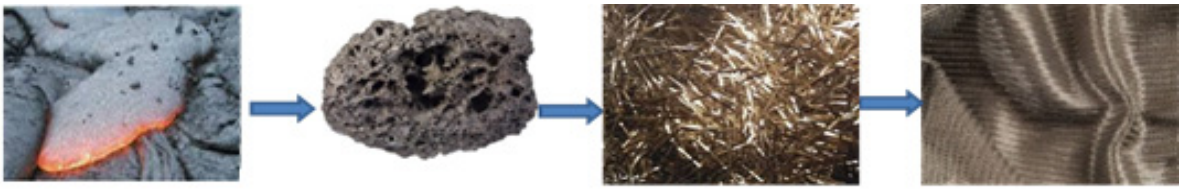
When volcanic lava cools down sufficiently to harden, it solidifies into basalt, an igneous rock that is present in many regions of the world. It is mostly utilized in construction and transportation engineering as crushed rock. Basalt rocks can be used to create fibers that are continuous or stapled. Excellent mechanical, chemical, and thermal qualities may be found in basalt fibers. They are extremely resilient to radiation, oxidation, salt attack, alkalis, and acids. The best uses for basalt fibers are in shoreline, bridge, and concrete reinforcement. Hence, basalt fiber has drawn more interest as a reinforcing material than typical glass and carbon fibers. In this regard, numerous researches looking at composites reinforced with glass and carbon fiber take basalt fiber's relevance as a novel reinforcing material into consideration. Basalt fiber is being used more and more frequently in a wide range of products, including geotextile, composite materials, automotive textiles, clothing for firefighters, and sound-absorbing fabrics. Continuous basalt fibers have recently gained popularity for electro-technical applications as insulation and a natural flame retardant. A thorough analysis of the production of basalt fiber, eco-friendly construction methods, the characteristics, uses, and products of premier fiber has been made.

Key words: basalt fibres, mineral fibres, hybrid composite, sustainable development, textiles

INTRODUCTION

The term basalt is originated from the Latin word *basaltes* which means very hard stone. Basalt is 100% natural and inert originated from volcanic magma and flood volcanoes a very hot fluid or semi-fluid material under the earth crust, solidified in the open air which become gray, brown or dark brown in colour (https://en.wikipedia.org/wiki/Basalt).

It is an alternative raw material for fiber forming because of its relatively homogeneous chemical structure, large scale availability throughout the world, freedom from impurities and ability to form fibers in the molten state. Basalt fiber is mainly composed of three silicate minerals: plagioclases, pyroxenes and olivines. Its chemical composition depends on the nature of the magma. Basalt fiber is known as green industrial material as they have no toxic reaction with air or water, non-combustible and explosion proof (**Kumbhar, 2014**). It is similar to glass fiber, having better physico-mechanical properties than glass fiber. They have potential to high performance and cost effectively replacement of glass fiber, steel fiber, polyamide fiber and carbon fiber product in many applications. 1 Kg basalt fiber replaces 9.6 Kg steel reinforcement. Basalt fiber is also a good electric insulator (http://basaltm.com/en/bazaltovye-porody/rowbasalt.html).



Volcanic magma | Volcanic rock | Fiver | Fabric

Figure1: Transformation of basalt fibre

Types of basalt fibers

1. **Basalt Continuous fiber (BCF)** having diameter 6-21 microns and length 40-60 km. Basalt continuous fiber are used for the production of basalt rebar that is the replacement of traditional steel rebar used in construction.
2. **Super Thin Basalt fiber** or **Basalt Wool** (STBF) having diameter 1-3 µm, average length of fiber is 50 mm. Super thin fibers are used for textile applications mainly for production of woven fabric.
3. **Thin Staple Basalt fiber** (TBF) having diameter 6-12 µm, average length of fiber is 30-60 mm. The thin staple basalt fiber is used for production of geogrid, unidirectional and multiracial fabric and in form of chopped strand for concrete reinforcement.

Basalt scale (BSc) having diameter 2-5µm, area 0.5-4 mm^2. Basalt scale is a unique material used in fillers for friction materials like brake pads, clutch plates.

Table 1: Comparison between basalt fiber and other fibers on the basis of properties

Properties	Basalt fiber	Glass fiber	Carbon Fiber
Density	2.7 g/cm^3	2.5 g/cm^3	1.78 g/cm^3
Tensile strength	4840 Mpa	3,444 Mpa	3500 Mpa
Colour	Golden brown, dark brown	White	Black
Modulus of elasticity	85-95 Gpa	76 Gpa	230 Gpa
Tensile elongation	3.5 %	2.75 %	1.5 %
Moisture content	0.1 %	0.1 %	1 %
Sound absorption coefficient	0.9-0.99 %	0.8-0.93 %	-
Melting point	1400°C-1700°C	1225°C-1360°C	1150°C-1200 °C

(Source:https://www.google.com/search?q=glass+fiber+properties&rlz=1C1CHBF_enIN841IN841&sxsrf=ACYBGNRkTRQdNijokh2hBrAwSF5MAMnMcg:1573614288020&)

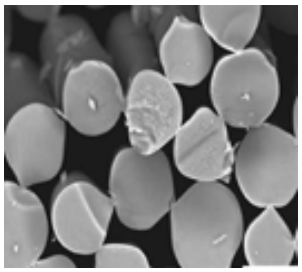
Vikas and Sudheer (2017) found that the basalt fiber as a potential candidate to be used as reinforcement material with different polymer matrices. Due to its unique properties, it has become an emerging cost effective replacement to glass and carbon fibers. The wide spread use of basalt fiber polymer composites demands detailed study of their behavior with several matrices, different orientation, varying fiber content, processing methods, aerial density and different loading conditions. With the thorough investigations, the possibility of its use can be explored.

Table 2 : History of basalt fibre

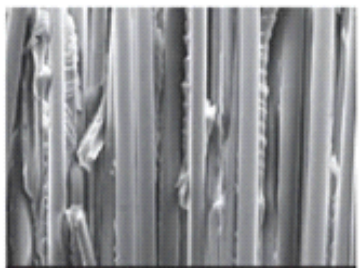
Year	Development
1923	French Paul Dhe was the first person with the idea to extrude fibres from basalt. He was granted a U.S. patent on it.
1960	Soviet Union investigated basalt fibre application for aerospace purposes and developed production technology for preparation of continuous basalt fibres.
1979	U.S. Patent was granted to Austin and Subramanian in which a process for increasing the tensile strength properties of basalt fibres by adding both ferrous and ferric oxides to the natural molten rock.
1985	Another U.S. Patent was granted for new chemical modification of basalt fibres composition, modified with alkaline earth metal oxides.
1990	Japanese industry investigated basalt fiber applications in automobile industries for making interior and exterior parts.
2000	Aslanova developed a production strategy to shorten the industrial cycle and to increase the basalt fiber thermal endurance and granted a U.S. patent on it.
2006	U.S. Patents granted to Brik for multifunctional apparatus and method to produce high quality continuous amorphous basalt fibers with flexible/ductile properties.
2010	Brik improved in production technology to increase the mechanical properties of the composites based on basalt fibers in terms of tensile strength and elastic stiffness.

Microscopic structure of basalt fiber

X-ray diffraction indicates that the bulk structure of the fiber is non-crystal with short range order. SEM observation indicates that basalt fiber is circular in cross-section and smooth in longitudinal direction. (Source: from https://www.google.com/search?q=sem+image++of+basalt+fiber&tbm)



Cross sectional view
Figure 2



longitudinal view
Figure 3

Production Techniques of Basalt fiber

The technology of production of basalt fiber is a one-stage melting and extrusion process. It consists of the following steps (Anthony RB 2018):

1. Preparation of raw material (grinding and washing)
2. Melt homogenization and delivery to bushing
3. Melt drawing through bushing units
4. Drawing of elementary filaments and application of sizing agents
5. Winding on bobbins.

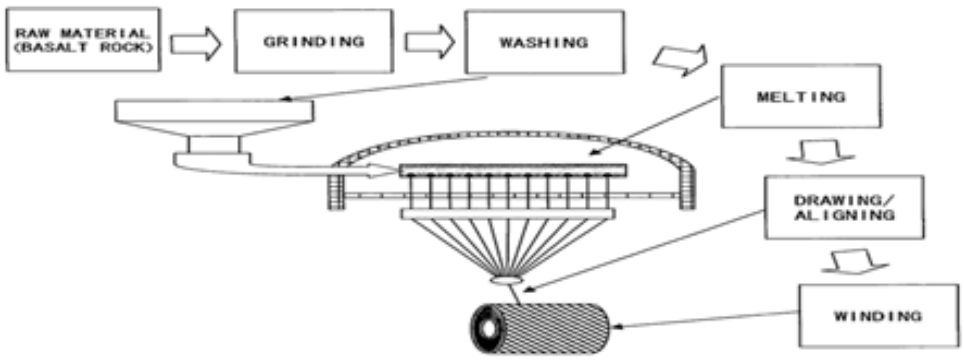


Figure 4 : Production Techniques of Basalt fiber

Basalt fiber production process

- Basalt rock is carefully grounded and washed before it is loaded into furnaces and heated using air gas mixture or electrically.
- Some electrodes are generally immersed into the melting bath in order to promote uniform heating and to reduce the time for achieving thermal equilibrium.
- Once the melting process is completed, molten basalt is poured onto platinum-rhodium heated bushings, from which filaments are drawn under hydrostatic pressure (Anthony RB 2018).
- The bushing plate is the most important part of the machinery for making the fiber. This is a small metal furnace containing nozzles for the fiber to be formed through. It is made of platinum alloyed with rhodium for durability.
- Bushings are the major expense in fiber production. The nozzle design is also critical. The number of holes in the nozzle ranges from 200 to 4000. The important part of the nozzle in continuous filament manufacture is the thickness of its walls in the exit region, inserting a counterbore here reduced wetting.
- After the cooling process, filaments are collected together to form a strand, whose integrity and chemical stability are ensured through a preliminary lubrication step.
- The filament size (in the order of some micrometers in diameter) is controlled by varying the drawing speed and the melt temperature.
- Basalt fibers can be spun in a way which is substantially similar to that used for glass fibers.

Properties of basalt fiber

Physical Properties

- Color: Golden brown/ Dark brown
- Density: 2.75 g/cm^3
- Coefficient of friction: The coefficient of friction ranges between 0.42 μ to 0.50 μ.

Figure 5

Chemical Properties

- Basalt fibers have very good resistance against alkaline environment, with the capability to withstand pH up to 13-14. It also has good acid and salt resistance.

Thermal Properties

- Minimum and maximum operation temp. is -260°C to + 980°C.
- Sustained operation temp. is 700°C.
- Thermal conductivity is 0.031 – 0.038w/mk.
- Melting temp. is 1400°C.

Mechanical Properties

The specific tenacity (rupture stress to density ratio) of basalt fibers exceeds that of steel is 2.5 times. Basalt fibers are non-capillary, non-hygroscopic and good moisture resistance.

According to Sim and Park (2005) they investigated the thermal stability of basalt, glass and carbon fibers, the fiber samples were heated in a high-temperature oven for 2h at 100, 200, 400, 600 and 1200^{0}C. 1200^{0}C temperature is good simulation of fire event. Up to 200^{0}C, the variation in strength was neither significant nor clear in tendency. Over 200^{0}C, however, a decrease in strength became distinctive as the heating temperature increased. The reduction was more significant in the carbon and the glass fibers but the basalt fibers retained about 90% of the normal temperature strength up to 600^{0}C. At 1200^{0}C, the carbon fibers looked completely molten losing volumetric stability and the glass fibers partially. The basalt fibers still maintained its shape. **Mingchao *et. al.*, (2008)** reported that after boiling basalt fibre for 3h in water, sodium hydroxide and hydrochloric acid, the mass loss and tensile strength of the fibre changes and it declines more in hydrochloric acid than in sodium hydroxide, showing that the alkali resistance of the basalt fibre is better than acid resistance. **Akinci (2009)** studied the mechanical and morphological behavior of basalt filler in low density polyethylene (LDPE) with 10% to 70% wt. polymer composites. It was found that increase in addition of basalt filler to the LDPE resulted in a decrease in elongation at break values. **Deak and Czigany (2009)** investigated the mechanical properties of glass fiber, basalt fiber and continuous basalt fiber. They concluded that all tested fibers have a rigid behavior, without plastic deformation. The tensile modulus and strength of continuous basalt fibers and glass fibers are quite similar, while basalt fibers are considerably less stiff. According to **King *et. al.*, (2018)** as a result of its characteristics and properties, basalt fiber can be really considered as the material of our future for a green and sustainable development. The basalt fiber is a popular choice for the material scientists and research fellows for the replacement of carbon fiber and steel due to its high rigidity and low elongation at break. Its supreme tenacity values make it a useful reinforcement material in the present and also for the future era to come.

Application areas of basalt fiber

1. Fire fighter garments
2. Sound absorption material
3. Insulation material
4. Basalt fibre used in automotive industry
5. Filter bag
6. Geo textiles
7. Construction
8. Composites

1. **Fire fighter garments:** Basalt super thin fiber (BSTF) is usually used for textile applications. Fire fighter garments consists of three layers: two internal layers from natural, synthetic fabric or their mixes; one external layer from basalt super thin fabric. Garments used

in protective clothing for ultra-low temperature and high temperature. Garments made from basalt don't burn at the high temperatures during fire exposure, undamaged and tied together. During fire exposure they don't release any harmful or dangerous substances into atmosphere.

2. **Sound absorption material:** Because of the porous structure and the irregular arrangement of the basalt fiber, the sound absorption capacity of the basalt fiber is good. The absorbability of basalt fiber is enhanced with the increase of the thickness of the fiber layer and the decrease of the density. The basalt fiber used for sound absorption is 100% recycled. They are available in different densities and thicknesses. Usually it is applied as internal coatings, they can be glued to a wall surface and daubed (sticky substance) with plasters. The sound absorption materials made of basalt fibers are widely used in the aviation industry, shipbuilding industry, electrical/electronics and machinery industry (**Li, Z., 2018).**

3. **Insulation material Heat- insulated mat:** The heat-insulated mats are made from basalt super thin fibers. Incombustible, fireproof, fire safe, resistant to vibration (does not ruin), resistant to microorganisms, rodents and aggressive environment. Durable (serviceability more than 50 years). Does not increase diffusion resistance of the construction (superb vapor permeability). Low hygroscopic property (does not absorb moisture from the air). The Heat-insulated mats are widely used in the aviation industry, shipbuilding industry, chemical industry, electrical/electronics and machinery industry.

Heat-insulated panels: Basalt fiber insulation panels are innovative materials for buildings, electrical/electronics and chemical industry. The basalt fiber insulating panels are effective material when compared to glass panels. Basalt fiber panel is added to the walls of the buildings, it can produce good shielding for all kinds of electromagnetic waves because permeability of the electromagnetic wave is excellent. The panels are highly effective protection against weathering, shock resistant and chemical resistant.

Basalt exhaust tape: Basalt exhaust tape is made from high-quality basalt fibers (2-inch tape). Recommended for a continuous operating temperature (980°C). Basalt tape provides an excellent exhaust heat shield, thermal insulation and radiant heat protection. These are used in automotive industry (motorbikes and cars).

Basalt exhaust sleeves: Basalt exhaust sleeves installed on vehicle's exhaust tubes and pipes as an exhaust wrap, basalt sleeve facilitates an increase in the efficiency of a vehicle's emission control system through the retention of high temperatures as gases flow through the exhaust system. Sleeve provides an exceptional combination of heat resistance, thermal performance and durability when compared to typical glass fiber sleeve. Basalt exhaust sleeves are used in automotive industry.

Needle-punched basalt mat: The base material for needle-punched basalt mat is the continuous basalt fiber. Needle punched basalt mats are a superior insulation material due to its excellent mechanical and thermal properties they are also ideally suited for sound insulation.

Needle-punched mat does not

shrink during installation and exploitation. Consequently, no gaps will appear between the insulation material and the protected surface. The mat can be easily cut, is flexible and very easy to handle. The mat is highly resistible to aggressive media. Excellent use of needle punched basalt mats in the area of engineering, automotive industry and power plants.

4. **Basalt fibre used in automotive industry:** Today automotive manufacturers widely use basalt fiber composites as alternative to metal to reduce cost of production. With its outstanding mechanical properties, resistance to high temperature and green advantages. Fabrics made with basalt fiber are used by car producers in this application because of its attractive dark-brown color, high mechanical properties, fire-resistance and competitive price.

Brake pads and clutch plates

- Basalt scale is used as an alternative to asbestos in brake pads and clutch plates.
- Basalt pads are 2-3 times longer service life,
- Resistance to chemically aggressive conditions
- Eco friendliness

5. **Filter bag:** The main filter materials are natural fiber, synthetic fiber, inorganic fiber and metal fiber all the filter material can't solve the problem of filtering high-temperature resistance medium, but the basalt fiber filter bag with excellent heat-resistance, can be used for a longer time under 300°C (Glass fibers is 260°C and aramid fiber is 200°C).

Good dust peeling property with good dimensional stability, contraction rate of fiber itself is zero when under the operating temperature. Good performance of chemical and weather resistance. Non moisture absorption and the validity of filtering can be as high as over 99.5%. It is widely used in cement plant, iron and steel plant, heat-engine plant, and chemical industries.

6. **Geo textiles:** Basalt fiber geo textiles are permeable which is used in association with soil have the ability to separate, filter, reinforce, protect, or drain. They are non-inflammable and they can carry out distributed load. The cost is 4-5 times lower than other geo textile material. Basalt fiber also be used as one component of hybrid fabrics containing natural fibers for creation of geo textiles with enhanced resistance in soil burial conditions. Basalt is environment friendly, it is appropriate for use in soil and embankment stabilization.

7. **Construction:** Basalt continuous fiber rebar offer prospect of completely new range of construction materials. Low cost high performance fibers offer potential to solve the largest problem in the cement and concrete industry, cracking and structural failure of concrete.

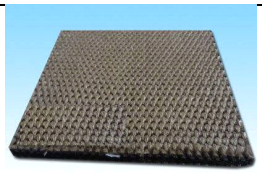
High strength to weight ratio, Chemical and corrosion resistance, Low thermal conductivity and Zero electrical and magnetic conduction.

The usage of unidirectional and multi axial basalt thin fiber as external reinforcement is a cost-effective and reliable way to increase load-bearing capacity and provide earthquake protection in various applications for the construction industry.

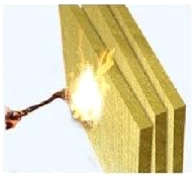
8. **Composites:** Basalt fibers are promising to find applications in basalt fiber composites. Basalt fiber has better mechanical, chemical and thermal

properties. Basalt fiber has gain increasing attention as a composites material compared to glass and carbon fibers. A very high young modulus, ultimate tensile strength and good wetting properties of basalt fiber is utilized for making high performance composites. Different binders like melamine, latex, urea formaldehyde or PVA can be used for making basalt composites. The basalt fiber composite is a new material which is widely applied in civilian area, aerospace, cement and concrete industry, agriculture and automotive Industry.

Fire fighter garments



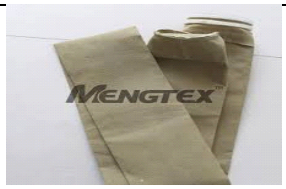
Needle-punched basalt mat



Heat-insulated mat

Basalt fibre used in automotiv

Brake pads and clutch plates



Filter bag

Basalt exhaust tape

Construction

Figure 6: Application areas of basalt fiber

Geo-composites caps: Basalt materials don't absorb the radioactive radiations, which makes them to consider as the potential material in production and transformation of radioactive materials in nuclear power plants. Protective cap using geo-composites in the waste disposal sites incorporating basalt materials can offer the best protection for the human health and environment against the radioactive wastes. The use of such capping for the long term includes ability to function in a semiarid to sub humid climate **(Dhand, et. al. 2015). Rossi *et. al.*, (2009)** studied the use of basalt fiber composites for fire protection. Flame test was performed with an oxyacetylene torch. Tests showed basalt fiber better flame resistance than a fiberglass and polyester resin composite and another thermal isolative.

Mingchao *et al.*, (2008) investigated chemical durability and corrosion behavior of basalt fiber reinforced polymer (BFRP) by immersing unidirectional basalt fiber/F46 epoxy resin composite specimens in 8 kinds of chemical medium at room temperature. After each period of immersion, the flexural property was determined by a three-point flexural test. Experiment results indicated that BFRP corrosion behavior in two kinds of medium differs greatly due to the different corrosion mechanisms of basalt fiber in acid and alkali mediums. In alkali medium, the flexural modulus keep steady as the strength comes down, whereas in acid medium the flexural strength and flexural modulus declined in the same way. **Fiore *et. al.*, (2011)** investigated the glass and basalt/epoxy composites for ship

applications using three point-bending tests. Tensile tests were also carried out to evaluate the impact number and position of basalt layers. The results exhibited that the existence of external layers of basalt composites could cause the highest escalations in mechanical properties with respect to glass fiber reinforced. **Lopresto *et. al.*, (2011)** studied the mechanical characterization of basalt fiber reinforced polymer. They have concluded that the basalt fiber reinforced polymer has good mechanical properties when compared to other glass fiber reinforced polymer and also it has good fire resistance properties.

Lazcano and Weidong (2014) investigated the thermal performance and characterization of basalt fiber for firefighter protective clothing. Basalt and Glass fabric coated with aluminum foil and uncoated was used for comparing the thermal properties. Chemicals bonding and molecular structure that cause higher thermal stability of basalt fiber was identified using FTIR (Fourier transform infrared spectroscopy), while low thermal degradation was performed using TGA(Thermo-gravimetric Analysis). FTIR result showed greater Si-O molecular networking and chemical bonding for basalt fiber, thus higher thermal stability, because according to TGA results only 0.58% of mass was lost at 900^{o}C temperatures. Result suggested that basalt fiber possess excellent thermal performance and stability at high temperature, with great potential for application in firefighter protective clothing.

Bhat *et. al.*, (2015) studied the thermal response, mechanical response and softening response of basalt composite to fire. Finally they have concluded that the basalt fiber composite has low thermal conductivity, high oxidation resistance, high softening and melting temperatures, higher young's modulus, tensile strength properties and better fire resisting property compared to glass fiber. **Wu *et. al.*, (2015)** studied the tensile properties of basalt fiber and basalt fiber composites in corrosive environment and found that tensile strength and elastic modulus of basalt fiber composites are 47% and 16% higher than the basalt fibers. **Li *et. al.*, (2018)** revealed that the high thermal stability, high acoustic and thermal insulation properties of basalt fiber is widely used in adiabatic insulation because of its low thermal conductivity, large working range and good seismic performance. In addition, basalt fiber has porous structure and irregular arrangement mode, and has good sound absorption property, so it can be used as acoustic insulation material for production equipment. **Pareek and Saha (2019)** explained properties and performance of basalt fiber and basalt fiber reinforced polymer (BFRP) as a replacement of steel and other composite material. Basalt, when in acidic medium, displayed the most effective results. The reviews of different experimental data suggested that BFRP resists better chemical attack than CFRP and GFRP in acidic and salt water solution. Alkali resistance, thermal stability of Basalt fiber as well as flexural strength, temperature variation and adhesive nature of Basalt Fiber Reinforced polymer was studied. They found that basalt composites exhibited higher tensile strength when subjected to higher temperature for different time periods then GFRP. The adhesion between the Basalt fiber and its composites is better as compared to carbon fiber and its composites.

Market segment of basalt fiber

On the basis of region, the basalt fiber market has been segmented as follows:

- North America

- Europe
- Asia Pacific (APAC)
- Middle East & Africa (MEA)
- Latin America

On the basis of form, the basalt fiber market has been segmented as follows:

- Continuous
- Discrete

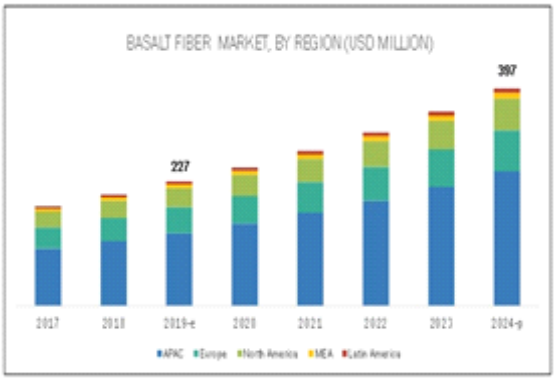


Figure 7: Market segment of basalt fiber

(Source : https://www.marketsandmarkets.com/Market-Reports/basalt-fiber-market-39388070.html)

The Asia-Pacific market is the leading market of basalt fiber, there is a growing demand of the basalt fiber in numerous sector such as automotive, electrical/electronics, construction and infrastructure industry. China is the leading market in the Asia-Pacific region.

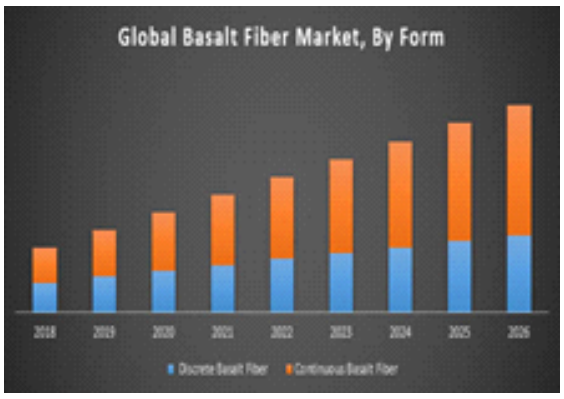


Figure 8 : Market segment of basalt fiber

Continuous basalt fibers account for a higher share in the overall basalt fiber market. This high growth is mainly due to the growing demand from the construction & infrastructure sector. Continuous basalt fibers possess characteristics, such as superior efficiency, higher tensile strength, and excellent mechanical properties. Continuous basalt fiber is also eco-friendly, which makes it suitable for various applications. **Sharma (2016)** reported that due to the wide application of basalt fibers in markets such as building & construction, automotive, electronics, textiles and others, the global basalt fiber market is expected to reach $200 million by 2020, growing at a rate of 13.1% from 2012 to 2020. Growing demand of basalt Continuous fiber from new application markets of the world is also expected to contribute to the growth of the basalt fiber market.

Basalt fiber produces in India

- Moldex composites Pvt. Ltd., Surat, Gujrat, India
- Arrow Technical Textiles Pvt. Ltd., Mumbai, Maharashtra, India

Basalt fiber producers in world

- Kamenny Vek (Russia),
- Zhejiang GBF Basalt Fiber Co., (China),
- Mafic SA (Ireland),
- Technobasalt-Invest LLC (Ukraine),
- Russian Basalt (Russia),
- ISOMATEX SA (Belgium),
- INCOTELOGY GmbH (Germany),
- Sudaglass Basalt Fiber Technology (US),
- Shanxi Basalt Fiber Technology Co., Ltd (China),
- Mudanjiang Basalt Fiber Co., (China).

China also has a huge manufacturing capacity of basalt fiber,

which can cater to any sudden increase in demand.

CONCLUSION

In today's world, when everyone is talking about cost cutting and reducing the input cost without affecting the quality of product. Basalt fiber production uses basalt rock which is abundant in nature. The share of raw materials cost in the final cost of production is less than 5%. It is an alternative raw material for fiber forming because of its relatively homogeneous chemical structure, large scale availability throughout the world, freedom from impurities and ability to form fibers in the molten state. It is mainly composed of three silicate minerals: plagioclases, pyroxenes and olivines. It is similar to fiberglass, having better physico-mechanical properties than fiberglass. It has wide range of applications such as in fire fighting garments, composites, geo textiles, sound absorption material, insulation material and construction etc. Compared to other materials basalt fibre considered as green material because during production process don't use any chemical additives as well as any solvents, pigments or other hazardous materials. Continuous basalt fibers account for a higher share in the overall basalt fiber market. This high growth is mainly due to the growing demand from the construction & infrastructure sector.

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RESEARCH ARTICLE

Use of traditional *phulkari* embroidery motifs for creation of stylized designs

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ABSTRACT

In India, textiles are everywhere which used for many purposes like for wearing, gift, for household articles and are prepared by using traditional craft that is embroidery. The embroidery design is created on the fabric by a variety of methods. Most of embroidery is worked by the hand; some embroidery has to be worked on a tight fabric stretched on a frame. The *Phulkari* embroidery is also done by both techniques i.e. hand and machine technique. Through use of this activity women of Punjab are earning a heavy amount of income directly customers and shop keepers. The present study was conducted for the collection and development of *phulkari* motifs for contemporary use on apparels. Motifs were collected from direct visit of local markets of Punjab and Haryana States.

Key Words: Traditional, Embroidery, *Phulkari*, Motifs, Designs

INTRODUCTION

Embroideries of India represent our country as well as our place with creativity, inventive creativity infatuated, hereditary etc. by use of the creators from different areas of our country. The traditional effort display the connection between the land and close areas anywhere which were made or commonly in use starting from ancient times. The traditional work or craft i.e. embroidery is a deep-rooted type of needlecraft in Punjab state and this is famous for its exceptional needlework for decoration of fabric as well as house hold articles.

By change in time can say modernization as well as immigration, the traditional talent of people has finished though the repulsion and craze for the expertise which helped in revive the traditional talent by introducing new and innovative technique. The conservative *Phulkari* embroidery patterns are created through use of advanced technology i.e. CAD/CAM and Photoshop softwares used for creation of textile designing as well as other designing.

From time to time, artisans have created a wide range of needle craft patterns based on their own imaginations. The Indian embroideries may be divided into two categories: manufacturing technique and production area. The following are the regional classifications for Indian embroideries in this chapter: a) North part of India i.e. Kashida in Kashmir; (ii) *Phulkari* from Punjab state; (iii) Chamba rumal from Himachal state b) From India's western states i.e. Gujarati needlework; (ii) Parsian needlework c) India's central states i.e. Chikankari, Zari work and Phul Pati work in Uttar Pradesh d) India's south-north states i.e. Karnatak's Kasuti; (ii) Andhra Pradesh's lambadi embroidery e) The eastern state of

the India i.e. Kantha of West Bengal, Bihar's craft is Sujani and appliqué work from Orissa called Pipli were also utilized to adorn the cloth.

Phulkari region: The *Phulkari* embroidery method originated in Punjab. It is worn and embroidered in Punjabi cities such as Jalandar, Amritsar, Kapurthala, Hoshiarpura, Ludiana, Ferozpur, Batinda, and Patiala. A rumal embroidered by Bibi Nanaki, Guru Nanak dev's sister, in the 15th century is the first documented example of *Phulkari* embroidery. Needlework means "work of flower" which derivative from the two words i.e. *phul* and *kari* words. *Phulkari* pass on from simple to densely embroidered shawl, dupata, suits and this densely embroidered work known as baghs in which the base material is not visible (Michael, 2000).

Common motifs used in *Phulkari* embroidery

The motifs on the plush represent birds, animals, vegetables, rivers, sun, moon, fields and other scenes of images based on different divisions; like dhaniya, motia, leheria bagh, surajmukhi, mor, kukad etc. Various accessorieslike hasali, teeka, kaada, sringar-pati and gulbandithese can also be seen in these types of works (Beste, 2000).

Punjabi rural women used motifs in their domestic affairs and the natural environment was a natural source of takrn. Women also create designs based on their thoughts, way of thinking and sentiment as well as encouragement from natural things (Malik, 2011). Geometric patterns: In Bagh, geometrical patterns were also use as triangular shapes, quadrangle and straight and parallel lines with alternating ways. *Phulkari* is made up of floral, natural world and man-women species and many other objects prepare from geometric shapes. Vegetables, fruits and varieties of flowers: Nature offers a wide variety of creative art. The name of *Phulkari* itself implies 'mounting floral', different varieties of flowers which were developed by ladies from their thoughts for example: Genda, Surajmukhi, Motia, and Kol were mostly used for type of *Phulkari* and Bagh. At times, the pulpit was prepared by use of minute shapes known as "Butian". Among the various fruits, santra, pomegranat, mango piece, and chuhare were also taken as the motif of *Phulkari*. From the vegetables, the ladies use the metaphors of krela, cauliflower, chilli and dhania.

Silk floss in a variety of vivid colors and color combinations is used to make phulkari. Rumal, the Kerchief, and *Phulkari* are some of the several goods created using *Phulkari* works. *Phulkari* is a significant aspect of Punjabi females. Girls wear *Phulkari* duppatas and suits in simple and elaborate function, festivals, at time of marriage. This embroidery is part of the favorable, symbol of pleasure, wealth and 'suhag' of married ladies (Asthana, 2017).

CAD systems are used by many textile and fashion designers. The designer can begin by sketching a few crude embroidered patterns by hand. The photos are then scanned into a computer and CAD is used. A designer utilizes computer-aided design (CAD) to make adjustments to design documents. Different types of CAD software may be used depending on the sort of textile a designer develops. (Arun, 2000)

METHODOLOGY

The present study was conducted Bhiwani city of Haryana state. Markets of Punjab and Haryana were selected for collection of traditional motifs of *Phulkari* embroidery. These motifs were converted in

to stylized designs by use of Corel Draw 12 software. A total of Forty motifs were collected by direct visit to the local markets of Punjab and Haryana states. Motifs were found geometrical, floral, human and animal figures. Majority of the motifs were geometrical because of trend i.e. geometrical motifs were highly preferred by consumers as on apparel. After collection of these motifs these were screened created into different stylized designs. Screening of motifs was done by experts. Out of forty motifs total fifteen motifs were selected for further designing. These fifteen motifs were used for creation of designs and total of forty five designs were created by use of Corel Draw 12. The selection of motifs was done on the basis of experts opinion.

RESULTS AND DISCUSSION

At first *Phulkari* was a home based craft, a spare time action, done with enthusiasm for self use or to be gifted to loved ones and not for the sale purpose. Throughout royally rule, these became element of gift baskets nearby described as Dali, which were presented to the British and other high officials on Christmas and also as a sign of satisfaction. The local craft of embroidered *Phulkari*s was also shaped into women's coats to be worn over sarees during winter in cities, as referred by Hitkari (1980).

Collection of traditional *Phulkari* embroidery motifs

For collection of *Phulkari* motifs different markets were randomly selected by researchers to fulfil the need of study. The required motifs were collected from the shops through cliking the picture on suits, dupattas, sari and other sources. *Phulkari* embroidery motifs were gathered from markets of Hisar, Karnal, Chandigarh, Patiala cities which are presented in this Table:

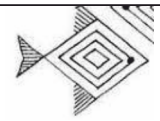
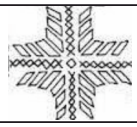
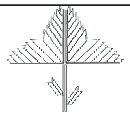
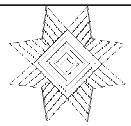
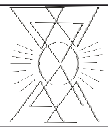
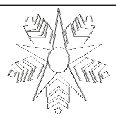
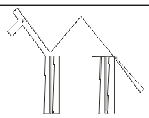
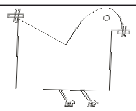
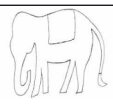
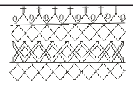
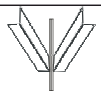
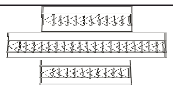
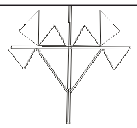
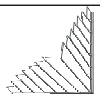
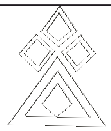
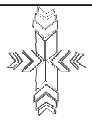
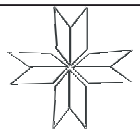
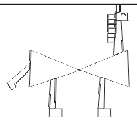
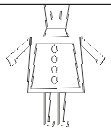
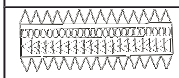
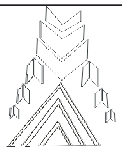
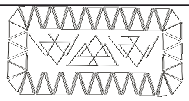
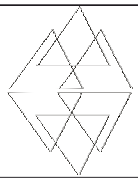
Table 1: Collection of traditional *Phulkari* embroidery motifs

Sr. no.	Category	Response	
		Frequency(f)	Percentage (%)
1	Geometrical	26	65.00
2	Animal	07	17.50
3	Floral	05	12.50
4	Human	02	05.00

The data presented in Table 1found that the number (65%) of geometric motifs were in use in the local market of the cities of Hisar, Karnal, Chandigarh, Patiala, followed by animal, flower and human at 17.50, 12.50 and 05.00 percent respectively. Geometric designs were mostly found in all local markets in various apparel such as *kurtis*, suits, saris, shirts, tops, *dupattas*, household items and women's clothing items, while animal motifs and flower motifs were used in the markets were less in comparison with geometrical motifs. Geometric motifs were used for embroidery on apparel, household as well as accessories articles. But human figures were least used for embroidery on articles. The present results are supported by **Saini, 2013** that majority of the motifs were collected from the markets were geometrical followed by floral, animal and bird. Geometrical motifs were highly accepted by consumers so the geometrical motifs were highly used on apparel products like suits, dupatta, saree etc.

These are selected motifs which were collected from Hisar, Karnal, Chandigarh, Patiala local markets. A total of forty motifs were collected from all selected markets. The stores were physically visited by the researchers and necessary information was collected from the shops.

Table: 2 Collected motifs of Phulkari for contemporary use

					
1	2	3	4	5	6
					
7	8	9	10	11	12
					
13	14	15	16	17	18
					
19	20	21	22	23	24
					
25	26	27	28	29	30
					
31	32	33	34	35	36
					
37	38	39	40		

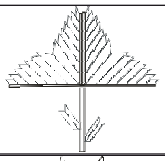
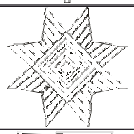
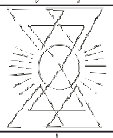
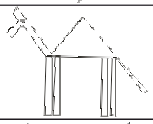
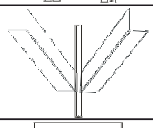
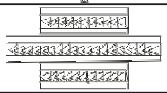
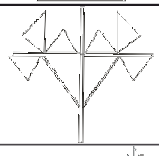
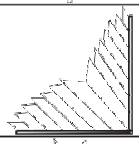
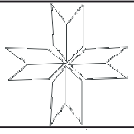
A total of forty motifs used in the local markets of Hisar, Karnal, Chandigarh and Patiala are presented in Table 2. After collection of forty motifs from local markets of selected cities, fifteen motifs were selected by selected experts for further work. The experts were from different nearby colleges. The collected motifs were randomly arranged in table not category wise.

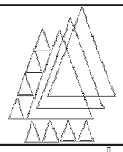
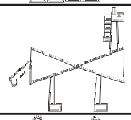
The results are in the lines of supported by **Wasley, (2020)** that CAD software enables designers to reduce manufacturing costs, work faster and smarter, and complete projects more quickly. Companies may keep their teams small since designers can work more effectively. This enables businesses to generate high-quality, low-cost items while also allowing them to release things more quickly and make modifications on the fly as needed. This is a significant competitive edge in today's global business. **Gupta and Goel (2016)** developed thirty designs using selected Chinese motifs with the help of Corel DRAW software. Cotton, cotton silk,

glaze cotton and crushed fabrics were used for construction of embroidered *kurti*; A survey was conducted on 100 women regarding the concept of designing using various motifs on Indian traditional dress i.e. *kurti*; before discharge of these designs on articles and after developing the product. The study concluded that the concept of designing embroidery using Chinese motifs was highly acceptable by women in overall appearance of *kurti* before and after creation of designs.

Fifteen motifs are presented in Table 3 that were selected from a total of forty selected motifs based on their weighted mean scores. The selected motifs based on their obtained weighted mean scores are presented in the table below:

Table 3 Experts preferences for selected traditional *Phulkari* Motifs n=30

Sr. No.	Motif no.	Motifs	WMS	Ranks
Geometrical, Floral and Animal				
1	10		2.80	I
2	11		1.80	XI
3	12		1.75	XII
4	14		2.60	II
5	15		2.00	VIII
6	20		2.30	V
7	21		2.20	VI
8	22		2.40	IV
9	23		2.10	VII
10	29		2.50	III

11	30		1.70	XIII
12	31		1.85	X
13	35		1.90	IX
14	38		1.60	XIV

WMS- Weighted Mean Score

Table 3 shows that fifteen motifs selected out of forty are ranked according to expert preference with their weighted mean scores. Selected motifs were from geometrical, floral, animal patterns were 10th, 11th, 12th, 14th, 15th, 20th, 21th, 22st, 23rd, 29th, 30th, 31th, 35th, 38thand 40th.

It is clear from the table that motif no. 10 secured first position with a weighted mean score of 2.80 followed by motif no. 14 was ranked second with a weighted mean score of 2.60, motif no. 29 secured the third position with a weighted mean score of 2.50 and figure numbers 22, 20, 21 with their weighted mean score of 2.40, 2.30 and 2.20 were ranked 4th, 5th and 6th respectively.

Whereas motifs no. 23rd, 15th, 35th, 31st got VII, VIII, IX and X ranks with the weighted mean score 2.10, 2.00, 1.90 and 185 respectively. XI and XII ranks were obtained by motif no. 11 and 12.

The motifs no. 30, 38 and 40 got ranked 13th, 14th and 15th with their weighted mean score 1.70, 1.60 and 1.50 respectively. The geometrical motifs were highly preferred by respondents as compared to human figure and animal figure.

CONCLUSION

From the data concluded that geometrical motifs were highly used in embroidered products of *Phulkari* in all the visited shops. Geometrical patterns were more as compared to others. Also we can say that these geometrical patterns were in trends or in fashion. As per fashion the geometrical motifs or patterns were highly drawn on products according to the preferences of consumers.

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RESEARCH ARTICLE

Constraints perceived by the peri-urban dairy farmers in adapting changing climate issues in Navsari district, Gujarat

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ABSTRACT

The present study was carried out to analyse the constraints faced by the dairy farmers in Navsari district. Data for the study were collected through random sampling method from a total of 100 respondents using both qualitative and quantitative techniques. The data were analysed using frequency and percentage. The findings of present study show that the five major constraints were insufficient technical guidance to adopt livestock practices (88 per cent), non-availability of critical inputs of adaptation strategies (84 per cent), lack of proper training or knowledge to use adaptation strategies (78 per cent), lack of local body to create climate awareness (67 per cent) and too little availability of livestock insurance policies for milch animals (61 per cent).The study suggested that improving information access on climate risk management, access of institutional credit on soil and water conservation practices, and capacity building programmes strengthens the peri urban dairy famers' adaptation capacity under changing climate scenario.

Keywords : Climate change, Dairy sector, Peri urban

INTRODUCTION:

The Intergovernmental Panel on Climate Change (2007) defines climate change as change in state of the climate that can be identified by change in the mean/or variability of its properties that persist for an extended period, typically decade or longer. Evidence from the Intergovernmental Panel on Climate Change (IPCC, 2007) is now overwhelmingly convincing that climate change is real. Milk production has been increased gradually from 112.2 million tons in the year 2008-09 to 176.3 million tons in the year 2017-18 with 5.24 % growth rate to assert India as the largest producer in the world. The credit for this healthy scenario should also go to various development projects, which have been simultaneously undertaken to give a fillip to agriculture and dairy production (Anonyms, 2019). Gujarat state shared about 7.7% of total milk produced in the country and ranked 4th position. Gujarat is gifted with four indigenous buffalo breeds and together with other non-descript buffaloes contributed about 52.3% of the total milk produced in the state (Anonyms, 2017). About 20.5 million people depend upon livestock for their livelihood particularly women in principal and subsidiary status. The farmers in India maintain mixed farming system *i.e.* a combination of crop and livestock where the output of one enterprise becomes the input of another enterprise there by realize the resource efficiency. It generates a continuous stream of income and reduces seasonality in livelihood patterns particularly of the rural poor (Birthal and

Ali,2005). Adaptation to climate change and variability is now considered as an important response option worthy of research and assessment, not simply to guide the selection of the best mitigation policies, but rather to reduce the vulnerability of groups of people to the impacts of climate change and minimize the costs associated with inevitable (Smit and Pilifosova, 2001).

METHODOLOGY

Peri-urban dairy farmers having minimum 3 years of experience in livestock rearing, owning at least one species among cattle and or buffalo, having minimum 3 lactating animals at the time of study and obtaining major part of their income from livestock enterprise were considered as respondents for this study. An interview schedule was developed after due consultation with the faculty members of the discipline and the data were collected by following the personal interview through random sampling method. Data was collected from 100 peri urban dairy farmers from Navsari district. Descriptive statistics tools were used for data analysis.

RESULTS AND DISCUSSION

Table 1 : Distribution of respondents according to different constraints faced by peri-urban dairy farmers for mitigating changing climate (n=100)

Sr. No.	Constraints	Frequency	Percentage	Rank
1.	Insufficient technical guidance to adopt livestock practices	88	88.00	I
2.	Non-availability of critical inputs of adaptation strategies	84	84.00	II
3.	Lack of proper training or knowledge to use adaptation strategies	78	78.00	III
4.	Lack of local body to create climate awareness	67	67.00	IV
5.	Too little availability of livestock insurance policies for milch animals	61	61.00	V
6.	Paucity of money	57	57.00	VI
7.	Unable to access timely weather forecast	45	45.00	VII
8.	Insufficient field veterinary extension services	38	38.00	VIII
9.	Insufficient animal healthcare services at grass root level	23	23.00	IX
10.	Lack of organized milk marketing facilities in village leve	l08	08.00	X

The constraints were ranked on the basis of frequency and percentage of respective peri –urban dairy farmers of Navsari district, who expressed them as constraints for adapting climate change mitigation strategies framework. On the basis of present study peri-urban dairy farmers claimed the following constraints which are enlisted rank wise in table-1.The constraints were listed down and it was reported that there were ten constraints facing for adapting climate change mitigating strategies which five major constraints were insufficient technical guidance to adopt livestock practices (88 per cent), non-availability of critical inputs of adaptation strategies (84 per cent), lack of proper training or knowledge to use adaptation strategies(78 per cent), lack of local body to create climate awareness (67 per cent) and too little availability of livestock insurance policies for milch animals (61 per cent).Other constrains reported that paucity of money (57 per cent

), unable to access timely weather forecast (45 per cent) ,insufficient field veterinary extension services(38 per cent), insufficient animal healthcare services at grass root level (23 per cent) and lack of organized milk marketing facilities in village level (8 per cent).The findings are corroborated with the findings of Adger *et al.,* (2007) and Chukwudumebi and Agwu (2013).

Table 2 : Suggestions of the peri-urban dairy farmers to overcome the constraint for mitigating changing climate (n=100)

Sr. No.	Suggestions	Frequency	Percentage	Rank
1.	Peri-urban dairy farm beneficiaries should be provided with adequate financing and subsidies	77	77.00	I
2.	Create awareness among peri-urban dairy farmers regarding necessity of availing livestock insurance scheme	65	65.00	II
3.	On/Off campus training programmes for peri-urban dairy farmers regarding coping strategies on adverse climatic conditions	58	58.00	III
4.	Establishment of fodder banks so that farmers can get fodder during natural disaster or scarcity period	51	51.00	IV
5.	Responsibility for VLWs to inform about climate variability	49	49.00	V

The result in table 2 revealed the major suggestions given by the respondents in descending order of rank were; Peri-urban dairy farm beneficiaries should be provided with adequate financing and subsidies (77 per cent),create awareness among peri-urban dairy farmers regarding necessity of availing livestock insurance scheme (65 per cent), on/off campus training programmes for peri-urban dairy farmers regarding coping strategies on adverse climatic conditions (58 per cent), establishment of fodder banks so that farmers can get fodder during natural disaster or scarcity period (51 per cent) and responsibility for village level workers (VLWs)s to inform about climate variability (49 per cent).

CONCLUSION

In adapting to changing climate, the major constraints were insufficient technical guidance to adopt livestock practices, non-availability of critical inputs of adaptation strategies, lack of proper training or knowledge to use adaptation strategies , lack of local body to create climate awareness and too little availability of livestock insurance policies for milch animals. The most important suggestions received from the respondents to overcome the constraints were peri-urban dairy farm beneficiaries should be provided with adequate financing and subsidies, create awareness among peri-urban dairy farmers regarding necessity of availing livestock insurance scheme, on/off campus training programmes for peri-urban dairy farmers regarding coping strategies on adverse climatic conditions , establishment of fodder banks so that farmers can get fodder during natural disaster or scarcity period and responsibility for village level workers (VLWs)s to inform about climate variability. On the basis of research study it can be suggested that government agencies, NGOs, universities, KVKs, communities organisation to create grassroot base awareness about the changes in current climatic conditions through appropriate ICT based communication tools which are

available with peri urban farmers such as government livestock extension functionaries, commodity based farmer groups, agro input dealer, radio and television to minimize the severity of these constraints.

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RESEARCH ARTICLE

Water use efficiency of beneficiary farmers towards Pradhan Mantri Krishi Sinchai Yojana

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ABSTRACT

The present study on "Attitude of Beneficiary Farmers Towards Pradhan Mantri Krishi Sinchayee Yojana" 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. The 94.16 per cent of the beneficiary farmers were agreed upon the statement that high soil salinity is avoided which caused by excessive fertilizer application while 93.33 per cent of the beneficiary farmers were agreed upon the statement that there is efficient utilization of fertilizers. 91.66 per cent of the beneficiary farmers were agreed upon the statement that there is increase in crop irrigation intensity and equal percent of the beneficiary farmers were agreed upon the statement that there is decrease in water conveyance losses. 80.00 per cent of the beneficiary farmers were agreed upon the statement that there is reduction in direct evaporation during irrigation. About 72.50 per cent of the beneficiary farmers were agreed upon the statement that there is increase in area under irrigated crops. Majority (68.34 per cent) of the beneficiary farmers had medium water use efficiency and (20.00 per cent) of them had high water use efficiency. Whereas (11.66 per cent) of beneficiary farmers had low water use efficiency. The major constraint faced by large majority (95.00 per cent) of beneficiary farmer was clogging of drippers by suspended material while (91.66 per cent) of beneficiary farmers faced the constraint that require frequent maintenance of micro irrigation system. The (86.66 per cent) of the beneficiary farmers faced difficulty to maintain proper water pressure, (80.84 per cent) of beneficiary farmers faced difficulty in intercultural operations and (69.16 per cent) of beneficiary farmers faced lack of proper training. Majority (60.00 per cent) of the beneficiary farmers said that they faced irregular supply of electricity. Large majority (92.50 per cent) of the beneficiary farmers stated that subsidy should be increased. Further (82.50 per cent) of the beneficiary farmers given suggestion that trainings should be organized frequently. About (75.83 per cent) of the beneficiary farmers reported that electricity charges should be decreased.

Keywords: Water use efficiency, Pradhan Mantri

The Government of India has been implementing Centrally Sponsored Scheme on Micro irrigation with an objective to enhance water use efficiency in the agriculture sector by promoting appropriate technological interventions like drip and sprinkler irrigation technologies and encourage the farmers to use water saving and conservation technologies.

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.

RESULT AND DISCUSSION

Table 1: Distribution of beneficiary farmers according to their water use efficiency in terms of efficient utilization of water achieved by beneficiary farmers

Sr. No	Water use efficiency in terms of efficient utilization of water	Respondents (n=120)	
		Frequency	Percentage
1.	Low (Up to 8 score)	14	11.66
2.	Medium (9 to 11 score)	82	68.34
3.	High (12 score and above)	24	20.00
	Total	**120**	**100.00**

It is observed from the table 1 that, majority (68.34 per cent) of the beneficiary farmers had medium water use efficiency in terms of efficient utilization of water and (20.00 per cent) of them had high water use efficiency in terms of efficient utilization of water. Whereas (11.66 per cent) of beneficiary farmers had low water use efficiency in terms of efficient utilization of water. Thus, it is concluded from the given data that majority of the beneficiary farmers had medium to high water use efficiency in terms of efficient utilization of water.

Table 2 : The statement wise findings on water use efficiency terms of efficient utilization of water

Sr. No	Water use efficiency in terms of efficient utilization of water	Response	
		Agree	Disagree
1.	Increase in crop irrigation intensity	110 (91.66)	10 (08.34)
2.	Decrease in water conveyance losses	110 (91.66)	10 (08.34)
3.	Reduction in direct evaporation during irrigation	96 (80.00)	24 (20.00)
4.	Reduction in water losses due to over irrigation	108 (90.00)	12 (10.00)
5.	Most of the available land came under irrigation	82 (68.33)	38 (31.66)
6.	Energy saving by its working on low pressure	109 (90.83)	11 (09.17)
7.	Efficient utilization of fertilizers	112 (93.33)	8 (06.67)
8.	Increase in quality and quantity of yield by proper irrigation	85 (70.83)	35 (29.17)
9.	Avoided high salinity caused by excessive fertilizer application	113 (94.16)	7 (05.84)
10.	Increase in area under irrigated crops	87 (72.50)	33 (27.50)
11.	Decrease in labour cost	101 (84.16)	19 (15.84)
12.	Saving of water up to 50.00 per cent	106 (88.33)	14 (11.67)

(Figures in parenthesis indicates percentage)

The 94.16 per cent of the beneficiary farmers were agreed upon the statement that high soil salinity is avoided which caused by excessive fertilizer application while 93.33 per cent of the beneficiary farmers were agreed upon the statement that there is efficient utilization of fertilizers. 91.66 per cent of the beneficiary farmers were agreed upon the statement that there is increase in crop irrigation intensity and equal percent of the beneficiary farmers were agreed upon the statement that there is decrease in water conveyance losses. About 90.83 per cent of the beneficiary farmers were agreed upon the statement that it is energy saving by its working on low pressure, 90.00 per cent of the beneficiary farmers were agreed upon the statement that there is reduction in water losses due to over irrigation and 88.33 per cent of the beneficiary farmers were agreed upon the statement that there is saving of water up to 50.00 per cent. Near about 84.16 per cent of the beneficiary farmers were agreed upon the statement that there is decrease in labour cost while 80.00 per cent of the beneficiary farmers were agreed upon the statement that there is reduction in direct evaporation during irrigation. About 72.50 per cent of the beneficiary farmers were agreed upon the statement that there is increase in area under irrigated crops, 70.83 per cent of the beneficiary farmers were agreed upon the statement that there is increase in quality and quantity of yield by proper irrigation and 68.33 per cent of the beneficiary farmers were agreed upon the statement that most of the available land came under irrigation.

Table 3. Constraints faced by beneficiary farmers

Sr. No.	Constraints	Respondents (n=120)	
		Frequency	Percentage
1.	Clogging of drippers by suspended material	114	95.00
2.	Require frequent maintenance	110	91.66
3.	Difficult to maintain proper water pressure	104	86.66
4.	Difficulty in intercultural operations	97	80.84
5.	Delay in sanction of subsidy	87	72.50
6.	Lack of proper training	83	69.16
7.	High technical skill required	79	65.84
8.	Electricity charges are expensive	76	63.34
9.	Irregular supply of electricity	72	60.00

The major constraint faced by large majority (95.00 per cent) of beneficiary farmer was clogging of drippers by suspended material while (91.66 per cent) of beneficiary farmers faced the constraint that require frequent maintenance of micro irrigation system. The (86.66 per cent) of the beneficiary farmers faced difficulty to maintain proper water pressure, (80.84 per cent) of beneficiary farmers faced difficulty in intercultural operations, (72.50 per cent) beneficiary farmers said that they faced delay in sanction of subsidy, (69.16 per cent) of beneficiary farmers faced lack of proper training. Further, it was found that (65.84 per cent) of beneficiary farmers faced the constraint high technical skill required to handle micro irrigation system. Followed by (63.34 per cent) beneficiary farmers said that electricity charges are expensive. Majority (60.00 per cent) of the beneficiary farmers said that they faced irregular supply of electricity.

Table 4. Suggestions given by beneficiary farmers

Sr. No.	Suggestions	Respondents (n=120)	
		Frequency	Percentage
1.	Subsidy should be increased	111	92.50
2.	Subsidy should be received on time	107	89.16
3.	Training should be organized frequently	99	82.50
4.	Electricity charges should be decreased	91	75.83
5.	Knowledge regarding fertilizer application through drip irrigation should be provided	88	73.33
6.	Electricity supply should be regular	83	69.16

Large majority (92.50 per cent) of the beneficiary farmers stated that subsidy should be increased. (89.16 per cent) of the beneficiary farmers suggested that subsidy should be received on time. Further (82.50 per cent) of the beneficiary farmers given suggestion that trainings should be organized frequently. About (75.83 per cent) of the beneficiary farmers reported that electricity charges should be decreased while (69.16 per cent) of beneficiary farmers suggested that electricity supply should be regular. (73.33 per cent) of the beneficiary farmers given suggestion that knowledge regarding fertilizer application through drip irrigation should be provided.

CONCLUSION

Most of the beneficiary farmers had medium water use efficiency. 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

Constraints faced and suggestion made by the poultry keeper regarding poultry management aspects

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ABSTRACT

Backyard poultry production has been globally recognized to overcome the worsening problems of poverty, hunger and malnutrition in developing countries. Traditional backyard poultry production in India is practiced since time immemorial which was the primary source of animal protein and supplementary income for the rural pour. The present study was conducted in Solapur district of Maharashtra state. The constraints faced by poultry keepers majority 92 per cent of the poultry keeper expressed the constraints regarding high cost required on poultry shed. Whereas 84.46 per cent of respondent expressed the constraints regarding desi birds are costly. In suggestions majority 70 per cent of respondent had suggested the knowledge about improved backyard poultry management practices should be provided. Whereas, 62 per cent respondent suggest demonstration exposure, visits training should be organized at village level.

Keywords: Constraints, suggestions ,poultry keeper, poultry management aspect

InTRODUCTION

Livestock is emerging as a driving force in the growth of agriculture sector, which adds 24.90 percent to the country's agriculture out-put and accounts for 4.7 percent of the GDP. Livestock sector provides regular employment to eight percent of the labour force of the country. Beside acting as a tool for poverty alleviation and rural development presently the livestock sector in India has taken a modern view as industry. (Nimbalkar 2004). The poultry population in the country is about 480012 crore. They produce about 45.2 billion eggs per year. The annual growth rate of egg production is 5-8 percent. India produce about 3.6 percent of global egg production. It ranks fourth in the world. India has 72.22 percent of its population living in rural area. About 89 percent rural livestock householders rear poultry as an important supplementary source of cash income. In India commercial farms are concentrated more in urban and semi urban area much of eggs and meat produced are consumed by the Urban or semi urban population while the rural and mable area have little access therefore the villages must have to be independent in the poultry to meet their needs the demand of eggs and meat of rural areas to be met by backyard poultry rearing (Gayathri *et al*, 1998, Nandi *et al* 2007, Panda *et al* 2008). Backyard poultry rearing also find an important role to fulfill the need of stress free and harmful residues free birds (Khandekar 2003, Mandal *et al*. 2006).

Objective

Constraints faced and suggestion made by the poultry keeper regarding poultry management aspects

MeTHODOLOGY

The present study was conducted in Solapur district of Maharashtra state. 5 villages were selected from each tahsils thus total 15 villages were selected for the study. The Solapur district consist of 11 tahsils. Among these tahsils three tahsils *viz.*, Barshi, Karmala and Madha were selected on random basis following the criteria of more poultry population.From each tahsil ten villages were selected on purposive basis considering the criterion of having largest population of poultry. A list of villages in each tahsil were obtained from the Livestock Development Officer of Panchayat Samiti. Three stage random sampling technique was used for selecting the respondents of the study. In the first stage the tahsils were selected and in second and third stage villages and respondent were selected for the study.From the selected village, list of Backyard poultry keeper was prepared with the help of Livestock Development Officer and village level functionaries *viz.*, Talathi and gramsevak on the population of poultry birds they possessed. Ten respondent from each village were selected. Hence in all three tahsils fifteen villages and 150 backyard poultry keeper were covered under present study. Constraints were taken as circumstance or causes which prohibited backyard poultry keeper to followed improved management practices of backyard poultry keeping. It was ascertained by asking open ended question to the respondent as which factor were responsible for non adoption of management practices in backyard poultry. Open end question technique was specially used for elicit real cause of non adoption of recommended practice of poultry management. This technique helped to secure spontaneous response of the respondent statement as responded by backyard poultry keeper were recorded while compiling, statement of similar nature/response were grouped together and presented with frequencies and percentages. By using open end question technique suggestion were secured from the goat keeper to overcome the problems faced by them in housing feeding, breeding, disease management and marketing of birds. The suggestions were grouped and the frequencies and percentages were worked out.

RESULTS AND DISCUSSION

Table1: Constraints faced in backyard poultry keeping

Sr. No.	Name of problems	Number of respondent N=150	Percentage
I)	**Availability of birds**		
1.	Non availability of desi bird at time in local market	69	46.00
2.	Death rate of bird is high	17	11.33
II)	**Economic constraints**		
1.	High cost required on poultry shed	138	92.00
2.	Desi birds are costly	127	84.46
3.	Price of feed is high	95	63.33
III)	**Marketing constraints**		
1.	Low egg price during summer	140	93.33
2.	Irregular payment of sale of eggs	87	58.00
3.	Wholesale price of eggs is low	132	88.00

Sr. No.	Name of problems	Number of respondent N=150	Percentage
4.	Breakage of eggs during transportation	42	28.00
IV)	**Management constraints**		
1.	Loss due to change in environment condition	34	22.66
2.	High incidence of disease	43	28.66
3.	Improper service of veterinary doctor at village level	123	82.00
4.	Unhygienic condition of the surrounding area	58	38.66
5.	Lack of time due to farm work	27	18.00
6.	Protection of bird from other animal	150	100.00
7.	Complaints from the neighbour	72	48.00

The information on constraints faced by the backyard poultry keeper in adoption of different poultry management aspects were collected and analysed. About 46 per cent of backyard poultry keeper faced the constraint regarding the non availability of bird at time. A small proportion 11.33 per cent of the respondent pointed the constraints of high death rate of poultry birds. Great majority 92 per cent of the poultry keeper expressed the constraints regarding high cost required on poultry shed. Whereas 84.46 per cent of respondent expressed the constraints regarding desi birds are costly. About 63.33 per cent of respondents expressed the constraints regarding higher price of feed. Almost all 93.33 per cent the backyard poultry keeper expressed the constraints regarding the low egg price during summer season, whereas 88 per cent respondent expressed the constraints toward low wholesale price of egg. About 58 per cent of respondent expressed the constraint regarding irregular payment of sale of eggs while 28 per cent of respondent expressed the constraints regarding breakage of eggs during transporation. About 22.66 per cent respondent pointed out the constraints regarding the losses due to change in environment condition whereas the 28.66 per cent respondent expressed the constraint regarding high incidence of disease. About 82 per cent respondent expressed the constraint regarding improper service of veterinary doctor at village level and 38.66 per cent respondent faced the constraints of unhygienic condition of the surrounding area about 18 per cent respondent expressed the constraint lack of time due to farm work near about 100 per cent respondent faced the constraint regarding protection of birds from other animal. About 48 per cent respondent expressed the constraints regarding complaints from the neighbour.

Suggestion given by the backyard poultry keeper to overcome the constraints in poultry management aspects

Table 2 : Suggestion of backyard poultry keeper to overcome the constraints

Sr. No.	Name of suggestion	Number of respondent N=150	Percentage
1.	Knowledge about improved backyard poultry management practices should be provided	105	70.00
2.	Demonstration exposure visits training be organized	93	62.00

Sr. No.	Name of suggestion	Number of respondent N=150	Percentage
3.	Organization of small scale poultry entrepreneurs be established	64	42.66
4.	Veterinary aid should be made readily available	102	68.00
5.	Regular service at veterinary doctors at village level	84	56.00
6.	Rate of poultry feed should be lowered	63	42.00
7.	The Govt. should launch special programme for backyard poultry development	42	28.00

Considering the constraints faced by the backyard poultry keeper in poultry management practices. They were asked to suggest solution in order to overcome the constraint and increase the profit from poultry. These suggestion were collected and are presented in Table 2 revealed that majority 70 per cent of respondent had suggested the knowledge about improved backyard poultry management practices should be provided. Whereas, 62 per cent respondent suggest demonstration exposure, visits training should be organized at village level. About 42.66 per cent respondent suggest organization of small scale poultry entrepreneur should be established followed by 68 per cent and 56 per cent respondent suggest the veterinary aids should be made readily available and regular service of veterinary doctors at village level. About 42 per cent respondent suggest the rate of poultry feed should be lowered and about 28 per cent respondent suggest the government should launch special program or scheme on backyard poultry development.

CONCLUSION

It was found that a majority of the poultry keepers were not aware about breeding, feeding and disease management practices and had a medium level of adoption of improved poultry keeping technology. This implies that the extension agencies concerned with livestock development need to orient their programme towards educating the poultry keepers regarding these practices of poultry rearing and management by giving training, organising field tours and conducting demonstrations. The study pointed out that a majority of the poultry keepers facing problems pertaining marketing of poultry birds, low selling price of birds, non-availability of veterinary facilities, non-availability and costly feed mixture which results into lowering the profit margin to them. It also make them compulsory for not to feed the mixtures to the poultry birds which leads sometimes towards under feeding of poultry birds reared by them. It implies establishing, strengthening or recognizing a co-operative marketing mechanism so that they may purchase inputs for poultry keeping and also sale the birds and its products.

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RESEARCH ARTICLE

Profile of the backyard poultry keeper

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ABSTRACT

Backyard poultry production has been globally recognized to overcome the worsening problems of poverty, hunger and malnutrition in developing countries.Traditional backyard poultry production in India is practiced since time immemorial which was the primary source of animal protein and supplementary income for the rural pour. The present study was conducted in Solapur district of Maharashtra state. The data were collected with the help of well structured interview schedule following personal interview method. It was found that majority of the poultry keeper were from middle age group, having medium size of family, medium use of information sources, low level of social participation, having medium size of flock of poultry birds, medium annual gross income, medium size of land holding, medium level of market orientation, medium monetary benefit occurred from backyard poultry and medium level of knowledge.It was observed that the majority of the poultry keepers had medium level of improved management aspects of backyard poultry.

Keywords: profile, backyard poultry keeper

INTRODUCTION

Livestock is emerging as a driving force in the growth of agriculture sector, which adds 24.90 percent to the country's agriculture out-put and accounts for 4.7 percent of the GDP. Livestock sector provides regular employment to eight percent of the labour force of the country. Beside acting as a tool for poverty alleviation and rural development presently the livestock sector in India has taken a modern view as industry. (Nimbalkar 2004). The poultry population in the country is about 480012 crore. They produce about 45.2 billion eggs per year. The annual growth rate of egg production is 5-8 percent. India produce about 3.6 percent of global egg production. It ranks fourth in the world. India has 72.22 percent of its population living in rural area. About 89 percent rural livestock householders rear poultry as an important supplementary source of cash income. In India commercial farms are concentrated more in urban and semi urban area much of eggs and meat produced are consumed by the Urban or semi urban population while the rural and mable area have little access therefore the villages must have to be independent in the poultry to meet their needs the demand of eggs and meat of rural areas to be met by backyard poultry rearing (Gayathri *et al*, 1998, Nandi *et al* 2007, Panda *et al* 2008). Backyard poultry rearing also find an important role to fulfill the need of stress free and harmful residues free birds (Khandekar 2003, Mandal *et al.* 2006).

Objective

To study the profile of the backyard poultry keeper.

METHODOLOGY

The present study was conducted in Barshi, Madha and Karmala tahsil of Solapur district. 5 villages were selected from each tahsils thus total 15 villages were selected for the study. From the selected villages, 150 randomly selected backyard poultry keepers were interviewed which formed the final size of sample of the study. The data were collected with the help of well structured interview schedule. The collected data were processed through primary and secondary tables and statistically analysed. The collected data were classified and tabulated by the use of appropriate statistical methods like frequency and percentage.

RESULTS AND DISCUSSION

Table1: Profile of the backyard poultry keepers

Sr. No.	Characteristics	Frequency	Percentage
I)	**Personal characteristics**		
	A) Age		
1.	Younger (up to 34 years)	28	18.66
2.	Middle (35 to 53 years)	97	64.66
3.	Older (above 54 years)	25	16.66
	Total	150	100.00
Mean = 43.51, SD = 9.50			
	B) Education		
1.	Illiterate	14	09.33
2.	Primary education (up to 5th std.)	17	11.33
3.	Secondary education (6th to 10th std.)	70	46.66
4.	Higher secondary (11th to 12th std.)	27	18.66
5.	College education (above 12th std.)	22	14.66
	Total	150	100.00
	c) Family size		
1.	Small size family (up to 4 member)	37	24.66
2.	Medium size family (5-6member)	80	53.33
3.	Large size family (above 6 member)	33	22.00
	Total	150	100.00
Mean = 4.75 , SD = 1.00			
II)	**Social characteristics**		
	D) Use of source of information		
1.	Less use (Score up to 5)	42	28.00
2.	Medium use (Score 6-8)	79	52.66
3.	More use (Score above 9)	29	19.33
	Total	150	100.00
Mean = 6.31, SD = 1.34			
	E) Social participation		
1.	No participation (score 0)	23	15.33
2.	Less participation (Score 1)	71	47.33
3.	Medium participation (Score 2)	51	34.00
4.	High participation (Score above 3)	05	03.33
	Total	150	100.00

Sr. No.	Characteristics	Frequency	Percentage
III)	**Economic characteristics**		
	F) Flock size		
1.	Small flock size (up to 10 birds)	30	20.00
2.	Medium flock size (11 to 22 birds)	97	64.66
3.	Large flock size (above 22 birds)	23	15.34
	Total	150	100.00
Mean = 16.81 , SD = 6.15			
	G) Annual gross income		
1.	Low (up to Rs. 80,000)	38	25.33
2.	Medium (Rs. 80,000 to 1,70,000)	84	56.00
3.	High (Above Rs. 1,70,000)	28	18.66
	Total	150	100.00
Mean = 120946 ,SD = 49988			
	H) Size of land holding		
1.	Small holding (up to 0.8 ha)	37	24.66
2.	Medium holding (0.8 to 3 ha)	80	53.33
3.	Large holding (Above 3 ha)	33	22.00
	Total	150100.00	
Mean = 1.94, SD = 1.10			
	I) Market orientation		
1.	Low (Score up to 3)	32	21.33
2.	Medium (Score 4 to 6)	74	49.33
3.	High (Score above 6)	44	29.33
	Total	150	100.00
Mean = 4.78 , SD = 1.47			
	J) Monetary benefit		
1.	Low (up to Rs. 4,500)	22	14.66
2.	Medium (Rs. 4501 to Rs. 9500)	88	58.67
3.	High (Above Rs. 95001)	40	26.67
	Total	150	100.00
Mean = 7003 , SD = 2461			
IV)	**Psychological characteristics**		
	K) Knowledge		
1.	Low (Score up to 34)	28	18.66
2.	Medium (Score 35 to 40)	100	66.66
3.	High (Score above 41)	22	14.66
	Total	150	100.00
Mean = 36.92 , SD = 2.93			

I) Personal characteristics

The data in Table 1 revealed that, there was the highest proportion of backyard poultry keepers (64.66 per cent) belonged to middle age category of 35 to 53 years. Whereas 18.66 per cent backyard poultry keepers were young below 34 years by their age. The backyard poultry keeper above the age of 54 years i.e. older were less in number (16.66 per cent). Thus, it can be inferred

that, a majority of the respondent of study belonged to the middle age group.

Ahire (2007) reported that majority of the backyard poultry keeper (44 per cent) were from middle age group while 35.33 per cent and 20.67 per cent from young and old age group respectively.

Khalache (2003) reported that majority of the respondent (82 per cent) had middle age group while 60 per cent and 8 per cent respondent belong to young and old age group respectively. The results of which are in agreement with the present findings. The level of formal education attained by an individual tends to influence the extent to which he exposed to new ideas and information. It is observed from Table 1 that half of the backyard poultry keeper (46.6 per cent) had secondary level of education. The 11.33 per cent of poultry keeper received primary

Size of family

The size of family refers to the total number of individual having blood relationship and living under common roof. The data in Table 4 (c) and in figure 2 indicated that highest proportion of backyard poultry keeper (53.33 per cent) belonged to the category of medium size family (5 to 6 members) and 24.66 per cent of poultry keeper belonged to the category of small size family (up to 4 member) Remaining 22 per cent were belonged to category of large size family (above 6 member).

Khalache (2003) reported that the majorily of the (42.62) per cent respondent had medium size of family followed by small size (29.33 per cent). The 22.67 per cent respondent had large size of family. Ahire (2007) reported that majority of the keeper (48 per cent) belong to medium size of family. While 38.67 per cent and 11.33 per cent respondent had small and large size of family which are in agreement in present findings.

II Social characteristics

D) Use of sources of information.

Attempts were made to know the use of channels and sources for receiving information regarding backyard poultry keeping.

Data presented a majority i e 52.66 per cent of the poultry keeper had medium use of sources of information where as 28 per cent of poultry keeper had less use of sources of information. Only 19.33 per cent of the poultry keeper had high level of use of sources of information.

Khalache (2003), Saha (2005) and Mandal (2006) reported that the 58.86 per cent, 60.4 per cent and 40.42 per cent respondent had medium use of sources of information. Ahire (2007), reported that 14 per cent respondent had medium use of information sources. These results which are near to the results obtained in present study. These might be due to a majority of poultry keeper are from rural area and only medium source of information is reaching to rural areas and high level information is stagnated to near by Urban areas.

E) Social participation

Social participation refers to the membership and/or holding of an official position in any of the organization and village institution in or around the village. It brings individual in close contact with other member of social organization. This provides an opportunity to exchange ideas, information and experience. The social participation of an individual may help him in getting information about farm innovation.

Data in Table 4-E and in figure (2) indicated that, large proportion of backyard poultry keepers i.e. 47.33 per cent had less participation in their village organization whereas 34 per cent of the poultry keepers had medium social participation. The 15.33 per cent of the poultry keepers had no any social participation in their village only 3.33

per cent of the backyard poultry keeper were found to had high social participation. This might be due to main source of livelihood of respondent agriculture. Therefore the backyard poultry keepers are remain away from the social participation of other village organization that are of least interested to them.

Ahire (2007) and Kamble (1995) reported medium social participation (44 per cent) while Deoraj (2001) reported 67.33 per cent respondent had medium social participation which agree with the present study

III) Economic characteristics

F) Flock size of poultry

In the present investigation those backyard poultry keepers who were having flock size of poultry bird to be 7 to 22 were studied.

Data in Table 4 (F) and in Figure (2) indicate that a larger proportion of the backyard poultry keeper (64.66 per cent) had medium flock size (11 to 22 poultry birds) followed by 20 per cent having small size of flock (up to 10 birds). Remaining 15.34 per cent of them had large flock size (more than 23 birds). This might be due to other source of occupation *viz.*, dairy business and cultivation of owned land. Mandal (2006) reported that the majority of the respondents had medium flock size (70 per cent) Gupta (2006) reported that average 15.80 ± 1.60 number desi birds per family were reared which is agrees with present study.

G) Annual gross income

Annual gross income refers to the total income of the backyard poultry keeper from main, secondary and poultry keeping occupations it is an important variable which influence the adoption of management practices pertaining to feeding, breeding, housing, etc. of backyard poultry rearing by allowing the keeper to invest more amount on inputs.

It is observed from Table 4 (G) and Figure 6 that most of the poultry keepers (56 per cent) had medium level of annual income followed by 25.33 per cent of poultry keeper who had low level of annual income while, remaining 18.60 per cent of poultry keeper had high level of annual income. Khalache (2003) and Ahire (2007) reported that majority of respondent 69.33 and 46 per cent had medium annual income respectively. Kamble (1995) reported that majority of therespondent (46 per cent) had medium annual income which are in agreement in present findings.

H) Size of land holding

It refers to the number of hectares of total land owned, cultivated and managed by the backyard poultry keepers. It largely determines both economic and social status of family in rural area.

Data in Table 4 (H) and Figure 9 indicated that a majority of the poultry keeper (53.33 per cent) had medium size of land holding i. e. 0.8 to 3 ha followed by 24.66 per cent having small sized farms. Only 22 per cent of them had large size of land holding.

Khalache (2003) and Ahire (2007) reported that majority of respondent 48 and 421 per cent had medium size of land holding respectively. Mandal (2006) reported that the majority of the respondent (47.92 per cent) had marginal land which agrees with the present investigation. This might be due to poultry research business is considered as subsidiary business to agriculture.

I) Market orientation

It refers to the source of market, nature of market attended by poultry keeper and marketing channels are used by backyard poultry keeper in their marketing of poultry produces. It will be show the market oriented knowledge level of backyard poultry keepers.

Data in Table 4 and Figure 11 indicate that a majority of backyard poultry keeper (49.33 per cent) had medium level of market orientation followed by 21.33 per cent of poultry keeper had low level of market orientation while remaining 29.33 per cent of poultry keeper had high level of market orientation. Mandal (2006) reported that the poultry owners (88.99 per cent) had marketed the eggs at own home while 55.56 per cent village shopkeeper. Rajshekhar (2006) reported 65 per cent respondent had medium ration marketing behaviour which does not agree with present study. This might be supported to the present investigation.

J) Monetary benefit

It refers to the monetary benefit have been worked out on the basis of expenditure incurred by the keeper on different management aspect of their backyard poultry unit and earning through sale of poultry birds and eggs.

Data in Table 4 and Figure 10 indicate that most of the backyard poultry keeper (58.67 per cent) had medium level of monetary benefit followed by 26.67 per cent of the poultry keeper had high level of monetary benefit while remaining 14.66 per cent of poultry keeper had low level of monetary benefit (upto Rs. 4500). Amos (2006) reported that backyard poultry production was more profitable than broiler production i. e. Rs. 434 from layer production per month. Bishnupanda (2007) reported that average annual income from backyard poultry is Rs. 2200 per household. Stevam (2004) reported that average annual income from poultry sale of eggs and birds were Rs. 2667, Rs. 6971 and Rs. 15273 from small, medium and large scale poultry production. These result of which are near to result obtained in present investigation.

IV) Psychological characteristics

K) Knowledge

Knowledge is one of the component of human behaviour. It plays an important role in the covert as well as overt behaviour of an individual for the present study the knowledge was operationalised as those behaviour and situation which emphasized the remaining by reorganization or recall of ideas material or phenomena about the backyard poultry rearing. Knowledge about an innovation is the stage that initiates the process of its adoption. The knowledge of respondent toward improved backyard poultry keeping determined by asking question regarding various aspects of improved poultry keeping technology. The measurement technique used has been discussed in methodology.

It is observed from Table 1 the majority of the backyard poultry keepers (66.66 per cent) were observed to be in medium level of knowledge category followed by 18.66 per cent poultry keeper low level category and high level category 14.66 per cent level of knowledge categories, respectively. Rahman (2002) reported that 71.43 per cent respondent had high level of knowledge while 24.29 per cent medium level and 4.28 per cent low level of knowledge. Thammi (2007) reported that the majority of the respondent (37.21 per cent) layer keeper had medium level of knowledge. These results of which are near to the result obtained in the present investigation.

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RESEARCH ARTICLE

Constraints faced by the farmers in adoption of drip irrigation system in kagzilime orchard

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ABSTRACT

The study revealed that majority constraints faced by the farmers in the adoption of drip irrigation system in Kagzilime orchards were heavy initial investment for the installation, high cost of equipment / spare parts, difficult to keep proper water pressure, frequent clogging of drippers and micro tubes, inadequate and uncertainly supply of electricity in the area, non-availability of spare parts at proper time with reasonable rates, lack of spirit among the farmers regarding drip irrigation system and lack of motivation etc. Company should make high quality drip material with reasonable rate, provisions of regular guidance and free service from company agents, demonstrations by manufactures should be organized frequently, co-operative bank should grant the entire amount as loan for drip irrigation system, procedure for getting loan should be make easy and knowledge about acid treatment should be provided were important suggestions to overcome/minimize the constraints in adoption of drip irrigation system by the farmers in kagzilime orchards.

Keywords **:** *constraints, suggestions & drip irrigation system*

INTRODUCTION

The water is a major natural resource which is limiting factor in agricultural production. Therefore, it is necessary to adopt water management technology for utilizing the available water resources. At the end of this century, a drop of water will be more costly than the drop of oil. Parmar and Thorat (2016). However, due to the scarce conditions of water for irrigation, many parts of the land were unutilized or underutilized. This is mainly due to the fact that the rainfall is irregular and uneven in many parts of country. Maharashtra is no exception under this situation, shortage of water has become one of the main problems in Maharashtra agriculture. Therefore, efficient use of available water has become extremely important which can be done through drip irrigation.

Drip irrigation is still in its infancy in India and there is a need to make it popular among the farmers. Even though there is a phenomenal growth in the area under drip irrigation, a lot of work is still to be done to explain and convince the farmers, especially those in the dry land area about the high potentialities of this new system. The main purpose of this study was to get a clear-cut picture of the present situation of adoption of drip irrigation system in Maharashtra especially in Ahmednagar district where problems of scarcity as well as abundance of water were there. Therefore, the present study was planned with the following specific objectives.

OBJECTIVES

(1) To identify the constraints faced by the farmers in the adoption of drip

irrigation system in kagzilime orchards

(2) To seek suggestions to overcome the constraints faced by the farmers in the adoption of drip irrigation system kagzilime orchards

METHODOLOGY

The present study was purposively undertaken in the two talukas *viz.*, Karjat and Jamkhed talukas of Ahmednagar district of Maharashtra state. Five villages were purposively selected from each taluka on the basis of higher number of farmers having drip irrigation system. Thus, total ten villages were purposively selected. From each selected village, 12 farmers were selected randomly by making a sample of 120 respondents.

An interview schedule was developed according to objectives of study and the data were collected by arranging personal interview with 120 respondents. The collected data were classified, tabulated and analysed in order to make the findings meaningful. A simple ranking technique applied to measure the problems and suggestions to overcome problems of adoption of drip irrigation system in kagzilime orchards.

RESULTS AND DISCUSSION

Constraints faced by the farmers in the adoption of drip irrigation system in kagzilime orchards

As far as the problems confronting the farmers in adoption of drip irrigation system are concerned, there are certain circumstances, which restrict in adoption of improved technology. It is well known fact that the problems in adoption of improved technology can never be removed, but they may be minimized. The farmers were asked to express their problems in adoption and during operation of drip irrigation system. Frequencies and percentage were computed and ranked were given to the collected information.

Table 1: Distribution of respondents according to constraints faced by them in adoption of drip irrigation system in kagzilime orchards (n=120)

Sr. No.	Constraints	Frequency	Per cent	Rank
I	**economic Constraints**			
1.	Heavy initial investment for the installation	112	93.33	I
2.	High cost of equipment / spare parts	102	85.00	II
3.	Inadequate credit facilities for the farmers from banks	90	75.00	III
4.	Lack of capital for covering entire area under drip irrigation system	85	70.83	IV
II	**Technical constraints**			
1.	Difficult to keep proper water pressure	97	80.83	I
2.	Frequent clogging of drippers and micro tubes	87	72.50	II
3.	Required time-to-time attention for minor repairs	78	65.00	III
4.	Problems of water leakages in the system	49	40.83	IV
III	**Administrative (extension) constraints**			
1.	Inadequate and uncertainly supply of electricity in the area	117	97.50	I
2.	Non-availability of spare parts at proper time with reasonable rates	108	90.00	II
3.	Difficult procedure for getting loan/subsidy	80	66.67	III
4.	Lack of after sell service from the company dealers	72	60.00	IV

Sr. No.	Constraints	Frequency	Per cent	Rank
IV	**Personal and socio-psychological constraints**			
1.	Lack of spirit among the farmers regarding drip irrigation system	101	84.16	I
2.	Lack of motivation	92	76.67	II
3.	Frustration due to failure of drip irrigation system in work	67	55.83	III
4.	Resistance from family members	54	45.00	IV

Economic constraints:

The perusal of data presented in Table 1, reveal that out of the major four economic constraints experienced by the respondents in adoption of drip irrigation system, respondents had assigned first rank to heavy initial investment for the installation (93.33 percent) followed by high cost of equipment / spare parts (85.00 percent), inadequate credit facilities for the farmers from banks (75.00 percent) and lack of capital for covering entire area under drip irrigation system (70.83 percent), respectively.

Thus, it can be concluded that the major economic constraints were observed as, heavy initial investment for the installation and high cost of equipment / spare parts (Romade et al. 2011 and Parmar et al. 2016).

Technical constraints:

It is evident from the Table 1, that difficult to keep proper water pressure (80.83 percent) was perceived as most important constraint and occupied first rank within the category. Followed by frequent clogging of drippers and micro tubes (72.50 percent), required time-to-time attention for minor repairs (65.00 percent) and problems of water leakages in the system (40.83 percent), respectively.

It clearly indicates that, the difficult to keep proper water pressure, frequent clogging of drippers and micro tubes.

Administrative (extension) constraints:

A glance at Table 1, indicates that the more constraints perceived by drip adopters with respect to administration (extension) were, inadequate and uncertainly in power supply was first major constraint followed by non-availability of spare parts at proper time with reasonable rates, difficult procedure for getting loan/subsidy and lack of after sell services from the company dealers, second, third and fourth rank, respectively. It is evident from the above results that, inadequate and uncertainly in power supply, non-availability of spare parts at proper time with reasonable rates, were major administrative (extension) constraints (Romade et al. 2011 and Parmar et al. 2016).

Personal and socio-psychological constraints:

The data reported in Table 1, reveals that the personal and socio-psychological constraints are concerned lack of spirit among the farmers regarding drip irrigation system was first rank constraints followed by, lack of motivation, frustration due to failure of drip irrigation system in work and resistance from family members were second, third and fourth ranked constraints, respectively. The present findings are in conformity with those reported by Romade et al. (2011), Vinaya et al. (2016) and Parmar et al. (2016).

Suggestions to overcome the constraints faced by the farmers in the adoption of drip irrigation system

Suggestions were collected from the farmers to overcome their problems and difficulties for better management of drip irrigation system. The responses were

converted in frequency, percentage and on the basis of percentage the rank assigned to each suggestion and same is presented in Table-2. The farmers were asked to suggest possible solution to overcome the problems associated with drip irrigation system.

Table 2 : Distribution of respondents according to seek suggestions giving by them overcoming the constraints faced in adoption of drip irrigation system

n=120

Sr. No.	Suggestions	Frequency	Per cent	Rank
1.	Company should make high quality drip material with reasonable rate	105	87.50	I
2.	Provisions of regular guidance and free service from company agents	82	68.33	II
3.	Demonstrations by manufactures should be organized frequently	78	65.00	III
4.	Co-operative bank should grant the entire amount as loan for drip irrigation system	63	52.50	IV
5.	Procedure for getting loan should be make easy	61	50.83	V
6.	Knowledge about acid treatment should be provided	52	43.33	VI

A perusal of data presented in Table 2, reveals that a thumping majority of the drip adopters endorsed suggestions, company should make high quality drip material with reasonable rate (87.50 percent), respondents had assigned first rank.

The next notable suggestions given were, provisions of regular guidance and free service from company agents (68.33 percent) and demonstrations by manufactures should be organized frequently (65.00 percent) assigned second and third rank, respectively.

Half of the drip adopters (52.50 and 50.83 percent) suggested co-operative bank should grant the entire amount as loan for drip irrigation system and procedure for getting loan should be make easy had assigned ranked as fourth and sixth, respectively.

The other suggestions like, knowledge about acid treatment should be provided (43.33 percent) had assigned ranked as sixth. Similar suggestions were also reported by Kalasariya *et al.* (2003), Romade et al. (2011) and Parmar et al. (2016).

CoNCLUSION:

From the above findings it can be concluded that heavy initial investment for the installation, high cost of equipment / spare parts, difficult to keep proper water pressure, frequent clogging of drippers and micro tubes, inadequate and uncertainly supply of electricity in the area, non-availability of spare parts at proper time with reasonable rates, lack of spirit among the farmers regarding drip irrigation system and lack of motivation were the major constraints as perceived by the respondents in adoption of drip irrigation system.

The suggestions as sought out from the respondents overcome the constraints were: for company should make high quality drip material with reasonable rate, provisions of regular guidance and free service from company agents, demonstrations by manufactures should be organized frequently, co-operative bank should grant the entire amount as loan for drip irrigation system, procedure for getting loan should be make easy and knowledge about acid treatment should be provided.

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RESEARCH ARTICLE

Knowledge level of farmers on common purslane (*Portulaca oleraceae*) in Tamil Nadu using simple random sampling method

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ABSTRACT

The present investigation was carried out in southern state of India. Tamil Nadu is one among the southern states of India comprises of 38 districts which are formed as four sub-regions by objective regionalization with an objective to obtain the knowledge level of farmers about common purslane. Simple random sampling method was used to select a total of 200 respondents. The data were gathered using structured interview and analyzed with appropriate statistics tools. It was discovered that majority of the farmers are elders and had completed elementary schooling. Out of their total landholdings small and medium areas were under cultivation of leafy vegetables. Majority of the respondents in the sample had medium level of knowledge on common purslane. The study recommends nutritionists and horticulturists to utilize the crop for research and provide reliable information about the crop and standardize the cultivation practices for the crop.

Keywords: *Common Purslane, Portulaca, Tamil Nadu.*

INTRODUCTION

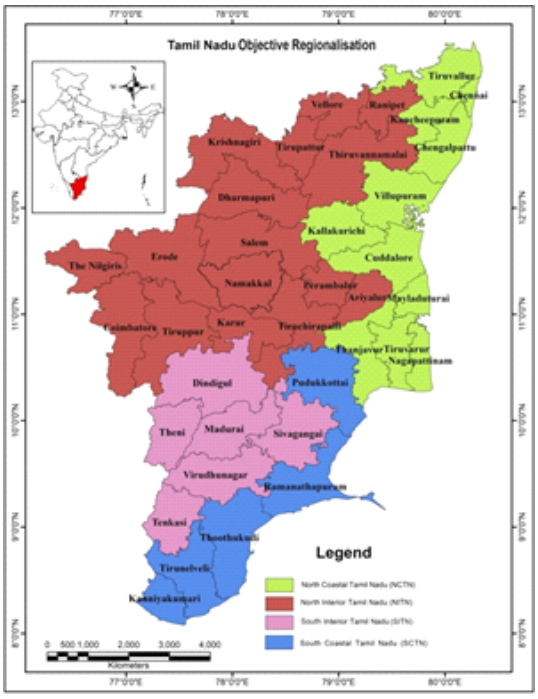
India is a developing country where industrial revolution is inevitable. The industrial globalization coupled with population explosion causes major issues to people and plant species. Nowadays it becomes common that people suffer Non-communicable diseases (NCDs) like cardiovascular diseases (CVD), diabetes, chronic respiratory diseases and cancer. These diseases are driven by forces that include rapid unplanned urbanization, globalization of unhealthy lifestyle. Recently many traditional medicinal plant species are threatened with extinction through urbanization and the force of industrialization. NCDs have become a major global burden in both developed and developing nations (WHO, 2012). Dietary supplements are widely used and offer the potential to improve healthy lifestyle (Rautiainen *et al*., 2016). Purslane (*Portulaca oleracea* L.) belongs to the family Portulacaceae is most commonly identified as a weed but, it is considered to be an important under-utilized green leafy vegetable in human diet. World Health Organization (WHO) has listed it as mostly used medicinal plants, and it has been given the term "Global Panacea" (Xu *et al*., 2006). Purslane is a very good source of omega-3 fatty acid; it has been shown to contain five times higher omega-3 fatty acids than spinach (Kamal *et al*., 2013). Levels of triglycerides were substantially lowered by omega-3 fatty acids in some clinical trials (Campbell *et al*., 2013), three trials reported that omega-3 fatty acids supplementation (1.0–1.8 g) reduced total CVD or coronary events by 8–19% (Gissi, 1999; and Tavazzi *et al*., 2008). Type 2 diabetes is accelerated rates of micro- and macrovascular

complications, extract of purslane suppresses hyperglycemia and diabetic vascular inflammation, and prevents the development of diabetic endothelial dysfunction for the development of diabetes and its vascular complications (Lee *et al*., 2011). Purslane is a hidden gem it deserves a special attention from agriculturalists as well as nutritionists (Uddin *et al*., 2010). So growing dietary supplement foods during these centuries is an utmost importance among the farmers. Therefore farmers must have knowledge on purslane. In this regards, a study was conducted in Tamil Nadu to know the knowledge of farmers about purslane.

MATERIALS AND METHODS

The current study was conducted in Tamil Nadu, which is one of the southernmost states of India. The proximity of sea influences the climate of eastern and southern part of Tamil Nadu whereas hilly orography and distance from the sea play an important role over rest of the state. Tamil Nadu is comprised of 38 districts and for the present study it is difficult to collect sample from all the districts. So, for the study purpose based on objective regionalization 38 districts were formed into four sub regions mainly based on their proximity to coast and their geographical location for the purpose of regional level survey of knowledge level of purslane among Tamil Nadu farmers (Fig.1). They are namely, (1) North Coastal Tamil Nadu (NCTN), (2)South Coastal Tamil Nadu (SCTN), (3) North Interior Tamil Nadu (NITN) and (4) South Interior Tamil Nadu (SITN). It shall be noted that objective regionalization is not a factor for the classification of districts for administrative purposes. Objective regionalization is based on various climate variables like temperature and rainfall are the basis for division of large areas into many sub regions (Asokan and Sivagnanam, 2014). Barring (1987) applied common factor analysis for the regionalization of daily rainfall of Kenya. Also objective regionalization was done by Sumner *et al* (1993) for Mallorea, Periago *et al* (1991) for Catalonia and Romero *et al* (1999) for whole of Spain. Tamil Nadu possesses diverse climatic regions where all sort of vegetables can be cultivated. Among vegetables, green leafy vegetable holds a special place in Indian cuisine due to its medicinal value, high nutritional profile and easy availability. Some greens are recognized as traditional medicines and still in use. But they are suitable for local markets only, due to its perishability and seasonal availability. Under-utilized crops are neither grown commercially nor traded (Bhavithra *et al*., 2019). Purslane is under-utilized or utilized by specific people throughout the world and even diminished in use which leads to the species extinct. It is a crop that possess nutraceutical properties but not popular among farmers and people. Considering these facts a total of 200 leafy vegetable farmers from Tamil Nadu were chosen using simple random method (50 respondents from each regions) and collected data through personal interview in an informal way from respondents.

Fig.1. Districts and four sub-regions of Tamil Nadu



RESULTS AND DISCUSSION

Table 1. Descriptive characteristics of green leafy vegetable farmer

S.No	Characteristics	Minimum	Maximum	Average
1.	Age	22	65	42.36±12.68
2.	Education	2	12	5.89±2.65
3.	Operational landholding (in acres)	0.4	15	4.53±2.31
4.	Area under leafy vegetables (in acres)	0.4	3	1.05±0.63

Data are mean values with standard deviations

Table 2. Knowledge level of purslane among the farmers

n=200

S.No	Particulars	Yes		No	
		f	%	*f*	%
1.	Identification of Purslane	184	92	16	8
	1a. Weed	122	61	78	39
	1b. Green leafy vegetable	16	81	84	92
	1c. Medicinal crop	10	5	195	95
	1d. Ornamental crop	36	18	164	82
2.	Cultivation of purslane	11	5.5	189	94.5
	2a. (*If yes*) Specific management practices	0	0	200	100
	2b. (*If no*)Presence of purslane as weed in the field	166	83	34	17
3.	Utilization of purslane				
	3a. Vegetable	24	12	176	88
	3b. Medicine	6	3	194	97
	3c. Animal feed	15	7.5	185	92.5
4.	Marketing of purslane	17	8.5	183	91.5
	4a. Local market	7	3.5	193	96.5
	4b. Nearby city	10	5	190	95
	4c. Export	0	0	200	100
5.	Dumping as weed	183	91.5	17	8.5
6.	Cultivation of purslane on growing demand in future	200	100	0	0

f – Frequency; % - Percentage; n – Total respondents.

The descriptive characteristics of leafy vegetable farmers surveyed in the study area are depicted in Table 1. On average, the age of the sampled leafy vegetable farmers was 42.36 years indicating 'elder' people were largely engaged in greens cultivation. Most of the growers were educated from 'elementary' to 'secondary' level; few farmers are illiterate and some of the farmers possess 'master degree', reflecting that greens cultivation involves all people of the society. Generally, sampled respondents had average landholding of more than 4.00 acres indicating that most of the farmers are small farmers. Further, Table 1 also indicated that respondents did leafy vegetable cultivation in small areas of the total landholdings. This revealed the diversified category of the farmers was engaged in leafy vegetable farming.

From Table 2 the knowledge level of farmers about the common purslane is known. Most of the respondents were full

time farmers, 92 per cent of them have knowledge about the crop and 8 per cent of farmers did not know about the crop. The respondents who have identified the crop were asked further about the identity of the crop, majority of the respondent identified purslane as a weed crop 56 per cent, 16 per cent of them identified it as leafy vegetable, 10 per cent of respondent called purslane as medicinal crop and some of them 3 per cent are still using it as traditional medicine, since purslane are also grown for ornamental purpose the question was asked surprisingly 18 per cent of the respondent identified it as ornamental crop which is higher than leafy vegetables and medicinal crop count. During a particular season 5.5 per cent of the farmers of some regions cultivate purslane, and they are lack of package of practice (POP) to grow purslane. There are 3.5 per cent of the farmers who sell the purslane in their local markets and the repondents from NCTN & NITN sell purslane to the nearby cities (5 per cent) which is higher than the local markets that ensures the knowledge of crop among the urban consumers. Apart from the growers 83 per cent of the farmers from various regions had encountered the existence of pursalne, it is a warm-climate, herbaceous succulent annual plant with a cosmopolitan distribution (Yan *et al.*, 2015).Among the respondents 12 per cent of the farmers are using the purslane as leafy vegetable including cultivators and non-cultivators. Whereas the excess of purslane from their field are dumped as weed 91.5 per cent and some of them 7.5 per cent feed it for their live-stocks. Although after explaining about the nutritional profile of the crop all respondents understood the potentiality of the crop and showed green signal to raise the crop on demand among the consumers.

Table 3 : Over all knowledge level of farmers on purslane (*Portulaca oleraceae*)

n=200

S.No	Overall Knowledge	Frequency	Percentage
1	Low	30	15.00
2	Medium	120	60.00
3	High	50	25.00

The data in table 3 reported that majority 60 per cent of the respondents were found to have a medium level of overall knowledge followed by 25 per cent high level of knowledge and 15 per cent of them possess low level of knowledge on common purslane. These finding derive support from Balaji and Manjunath (2011).

CONCLUSION

The study discovered that the majority of the farmers are ready to grow purslane commercially. According to the leafy vegetable growers there are some challenges to grow greens, so from the study it recommends the horticulturist to conduct several researches on such potential crop to standardize the agronomic practices, cultivation and management aspects.

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RESEARCH ARTICLE

Perception of farmers about utility of soil health card

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ABSTRACT

The present research study was conducted in Shrigonda and Parner tahsils of Ahmednagar district of Maharashtra State. Five villages from each tahsils, thus, ten villages were selected on the basis of highest number of soil health card distribution, with sample size of 120 respondents which were selected randomly. The data were collected on perception of farmers about utility of soil health card. The findings regarding the perception of the respondent farmers about utility of soil health card revealed that a majority (62.50%) of the respondents had moderately favourable perception about utility of soil health card followed by highly favourable (20.00%) perception and low favourable (17.50%) perception about the utility of soil health card. The study further revealed that a majority of respondents were satisfied with the soil health card and wanted to continue with the soil health management. Therefore, Government has to make efforts to sensitize farmers need, importance and utility of soil health card and implementation of this scheme on large scale.

Key Words - Perception**,** Soil Health Card, Utilisation Pattern, Soil Health Card Scheme

INTRODUCTION

India is having diverse climatic condition highest areas under rich fertile soil and lots of potential to become one of the leading producers of various agricultural products in the world. The Government of India took several steps for its sustainable developments. Efforts have been made to improve soil fertility through soil health card scheme. Soil health card scheme launched by the Government of India has the provision of providing soil health cards to every farmer, once in three year for their land holding which shall contain current status about information of macro, micronutrients, secondary nutrients and physical parameters.

The card shall also be accompanied by advisory on corrective measures, a farmer should take to improve the soil health and increase productivity. It also allows for registration of collection of soil samples along with testing in approved laboratories.

Soil Health Card Scheme

Soil Health Card Scheme was started on 19th February, 2015 at Suratgarh in Shri-ganganagar district of Rajasthan State with the aim to make available soil health cards to all the farmers in the country for sustainable steps in crop productivity and without deterioration of soil health. The SHC was prepared in 14 local languages. Soil health card mobile app was launched on World Soil Day 5 th December 2017 in Jhajjar, Haryana. Soil health card scheme helps to farmers to report nutrient deficiency with fertilizer application practices. The

theme of the soil health card scheme- *'Swath Dharaa, Khet Harra'*, Healthy Earth, Green Earth. The Department of Agriculture, Cooperation and Farmer's Welfare is implementing this scheme under the Ministry of Agriculture.

Soil health card is a step-by-step process for guiding the farmers in determining soil health indicators and to develop soil health card. The results of regular farmer meetings enclose a user-friendly, do-it-yourself tool to measure soil health as well as mutually beneficial discussion among the farmers and technical experts. SHC is a printed report that gives the idea about the current status of nutrients in soil of farmers. It comprises the status of soil with detailed 12 parameters, specifically Nitrogen, Phosphorus, Potassium (Macro-nutrients), Sulphur (Secondary nutrient) and Micro nutrients Zinc (Zn), Iron (Fe), Copper (Cu), Manganese (Mn) and pH, EC (Electrical conductivity), O.C (Organic Carbon) are physical parameters. On the basis of soil health card reports it indicates fertilizer recommendations and appropriate improvement programme if requisite to the farm. Soil health card is a report of current soil fertility status and provides a recommendation on soil test report about use of fertilizers and amendments to be essential for crop, variety, on site specific area of application, necessary fertilizer or improvements etc. It provides the current status of the soil health. Use of SHC is one of the paths for attaining the sustainable agriculture production and productivity. Considering the importance of this scheme , the present investigation was undertaken with Specific objectives viz., to study the perception of farmers about utility of soil health card.

METHODOLOGY

The present investigation was conducted in Ahmednagar district of Maharashtra. On the basis of the highest number of soil health cards distributed, two tahsils namely, Shrigonda and Parner were selected for the present research study. Five villages were selected from each tahsil, thus, total ten villages were selected for the study on the basis of highest number of soil health cards distribution. From each village 12 farmers and thus, total 120 respondents selected for the study by random sampling method. The Ex-post facto research design was adopted. Perception of farmers about utility of soil health card was measured with help of a schedule prepared with assistance of experts. The statements of the schedule were developed, the points were taking into account from the soil sample taken to use of soil health card and total statements were about 20. The statements were asked to soil health card holders and response recorded in detailed on the five points continuums as **s**trongly agree, agree, undecided, disagree, strongly disagree which were assigned the score of 5,4,3,2 and 1 respectively. They were classified into the three categories by using Mean score and Standard deviation.

RESULTS AND DISCUSSION

Perception of farmers about utility of Soil Health Card

Perception is one of the personal interpretations of external events. It is process by which individuals organize and interpret their sensory impression in order to give meaning to their environment. Perception is the recognition and awareness of an object or event through the sense organs. The information regarding the perception of farmers about utility of soil health card was collected, tabulated and analyzed.

Table -1.Distribution of respondents according their level of perception about utility of Soil Health Card

Sl. No.	Perception(score)	Respondents (N=120)	
		Frequency	Per cent
1.	Low (up to 52)	21	17.50
2.	Medium (53 to 60)	75	62.50
3.	High (61 and above)	24	20.00
	Total	**120**	**100.00**
Mean = 56.63		**S.D = 4.16**	

The data in Table - 1 revealed that majority (62.50%) of respondents had medium level of perception about utility of soil health card, followed by 20.00 per cent soil health card holders who had high level of perception and 17.50 per cent soil health card holders had low level of perception about utility of soil health card.

From above result, it can be concluded that the majority of respondents belonged to medium level of perception about utility of soil health card. This finding is consistence with the findings of Mukati (2016) and Charel et. al. (2018).

Statement wise finding of perception of farmers about utility of soil health card

The information pertaining to the perception of farmers towards utility of soil health card is given in Table - 2 are discussed as under.

1. Soil Health Card can be obtained after the soil sample testing

The data in Table -2 indicated that the majority 61.67 per cent of the respondents had strongly agreed with statement that soil health card can be obtained after the soil sample testing, followed by 33.33 per cent of the soil health card holders had agreed and 5.00 per cent of the soil health card holders had undecided with the statement.

Table -2: Statement wise distribution of the respondents according to their perception

Sl. No.	Statement	SA	A	UD	DA	SD
1.	SHC can be obtained after the soil sample testing	74 (61.67)	40 (33.33)	06 (5.00)	0 (0.00)	0 (0.00)
2.	Soil fertility and productivity can be maintained with the help of SHC	64 (53.33)	47 (39.17)	09 (7.5)	0 (0.00)	0 (0.00)
3.	Farming can't be done in scientific ways by using SHC information	0 (0.00)	04 (3.33)	02 (1.67)	74 (61.67)	40 (33.33)
4.	SHC provides information about current fertility status of soil	45 (37.5)	66 (55.00)	04 (3.33)	03 (2.5)	02 (1.67)
5.	SHC is helpful in apply proper required nutrient dosage and reduce unnecessary use of fertilizers	44 (36.67)	66 (55.00)	08 (6.67)	2 (1.66)	0 (0.00)
6.	Organic carbon status of soil can be known with help of SHC information	40 (33.33)	72 (60.00)	06 (5.00)	02 (1.67)	0 (0.00)
7.	Proper and sufficient information about SHC is not given by Agriculture departments	0 (0.00)	0 (0.00)	11 (9.16)	74 (61.67)	35 (29.17)

Sl. No.	Statement	SA	A	UD	DA	SD
8.	SHC help to establish, coordination among farmers, extension worker and experts	38 (31.67)	69 (57.5)	13 (10.83)	0 (0.00)	0 (0.00)
9.	The quantity of available nutrients in soil can't be known with the help of SHC	0 (00.00)	10 (08.33)	21 (17.50)	54 (45.00)	35 (29.17)
10.	Deficient soils can be reclaimed by using suitable reclamation activities	47 (39.17)	67 (55.83)	06 (5.00)	0 (0.00)	0 (0.00)
11.	Acidity, alkalinity of the soils can be known with the help of SHC information	23 (19.17)	65 (54.17)	27 (22.5)	05 (4.16)	0 (0.00)
12.	SHC does give correct information about amount of fertilizer to be applied	16 (13.33)	52 (43.33)	45 (37.5)	7 (5.84)	0 (0.00)
13.	SHC report recommendations / instructions are difficult to understand and calculate dose of fertilizer	36 (30.00)	58 (48.33)	26 (21.67)	0 (0.00)	0 (0.00)
14.	Unnecessary expenditure can be reduced by using information given in S.H.C.	40 (33.33)	64 (53.34)	16 (13.33)	0 (0.00)	0 (0.00)
15.	SHC reports are worth for balance use of chemical fertilizer	46 (38.33)	62 (51.67)	12 (10.00)	0 (0.00)	0 (0.00)
16.	SHC report gives information about amount of nutrient present in soil and balanced use of fertilizers can be possible	42 (35.00)	69 (57.5)	09 (7.5)	0 (0.00)	0 (0.00)
17.	I think that SHC useful to reduce soil degradation and help to maintaining fertility and productivity of soil	31 (25.83)	76 (63.33)	02 (1.67)	11 (9.17)	0 (0.00)
18.	SHC provide information about N, P, K and help to how much apply the dose of fertilizer	37 (30.83)	78 (65.00)	03 (2.5)	02 (1.67)	0 (0.00)
19.	I think that SHC useful in crop planning	41 (34.17)	57 (47.5)	19 (15.83)	03 (2.5)	0 (0.00)
20.	SHC provide information about pH, EC., O.C of soil and on the basis, we can reclaim the soil	42 (35.00)	56 (46.67)	22 (18.33)	0 (0.00)	0 (0.00)

(SA = Strongly Agree, A = Agree, UD = Undecided, D = Disagree, SD = Strongly Disagree)

(Figures in parenthesis indicates percentage)

2. Soil fertility and productivity can be maintained with the help of Soil Health Card

The data presented in Table - 2 reported that more than half 53.33 per cent of the respondents had strongly agreed with statement that SHC help to maintain soil fertility and productivity, followed by 39.17 per cent of the soil health card holders had agreed and 7.50 per cent of the soil health card holders had undecided with the statement.

3. Farming cannot be done in scientific ways by using Soil Health Card information

The results regarding soil health card holders data in Table - 2 reported that 33.33 per cent of the respondents had strongly disagreed with the statement that farming cannot be done in scientific ways by using soil health card information and a majority i.e. 61.67 percent of the soil health card holders were disagreed with the said statement.

4. Soil Health Card provides information about current fertility status of the soil

The data in Table - 2 revealed that 37.50 per cent of the respondents had

strongly agreed with the statement that SHC provides information about current fertility status of soil, followed by 55.00 per cent of the soil health card holders had agreed and 3.33 per cent of the soil health card holders had undecided.

5. Soil Health Card is helpful in apply proper required nutrient dosage and reduce unnecessary use of fertilizers

The presented data in Table - 2 revealed that 36.67 per cent of the respondents had strongly agreed with statement that SHC it is helpful in apply proper required nutrient dosage and reduce the unnecessary use of fertilizers, followed by 55.00 per cent of the soil health card holders had agreed and only 6.67 per cent of the soil health card holders had undecided.

6. Organic carbon status of soil can be known with help of Soil Health Card information

The data in Table - 2 clearly revealed that 33.33 per cent of the respondents had strongly agreed with statement that organic carbon status of soil can be known with help of SHC information, followed by 60.00 per cent of the soil health card holders had agreed.

7. Proper and sufficient information about Soil Health Card is not given by Agril.Dept.

The data mentioned in Table - 2 revealed that 29.17 per cent of the respondents had strongly disagreed with statement that proper and sufficient information about SHC is not given by Agriculture departments, followed by 61.67 per cent of the soil health card holders had disagreed and 9.16 per cent of the soil health card holders had undecided.

8. Soil Health Card helps to establish, coordination among farmers, extension worker and experts

The data presented in Table - 2 reported that 31.67 per cent of the respondents had strongly agreed with statement that SHC help to establish, coordination among farmers, extension worker and experts, followed by 57.50 per cent of the respondent had agreed and 10.83 per cent of the soil health card holders had undecided with the statement.

9. The quantity of available nutrient in soil can't be known with the help of S. H.Card

The data depicted in Table -2 revealed that 29.17 per cent of the respondents had strongly disagreed with statement that quantity of available nutrient in soil can't be known with the help of SHC, followed by 45.00 per cent of the soil health card holders had disagreed while , 17.50 per cent of the respondents had undecided with the said statement.

10. Deficient soils can be reclaimed by using suitable reclamation activities

The data presented in Table - reported that 39.17 per cent of the respondents had strongly agreed with statement that deficient soils can be reclaimed by using suitable reclamation activities, followed by 55.83 per cent of the soil health card holders had agreed and only 5.00 per cent of the soil health card holders had undecided with the said statement.

11. Acidity, alkalinity of the soils can be known with the help of Soil Health Card information

The data presented in Table -2 revealed that 19.17 per cent of the respondents had strongly agreed with statement that Acidity, alkalinity of the soils can be known with the help of SHC information, followed by 54.17 per cent of the soil health card holders had agreed and 22.50 per cent of the soil health card holders had undecided with the said statement.

12. Soil Health Card gives information about amount of fertilizer to be applied

Further information in Table - 2 indicated that 13.33 per cent of the respondents had strongly agreed with statement that SHC gives information about amount of fertilizer to be applied, followed by 43.33 per cent of the soil health card holders had agreed, 37.50 per cent of the respondents had undecided and 5.83 per cent disagree with the statement.

13. Soil Health Card reports recommendation/instruction difficult to understand and calculate dose of fertilizer

The data presented in Table - 2 indicated 30.00 per cent of the respondents had strongly agreed with statement that SHC reports recommendation / instruction difficult to understand and calculate dose of fertilizer, followed by 48.30 per cent of the soil health card holders had agreed and 21.67 per cent of the respondents had undecided with the statement.

14. Unnecessary expenditures can be reduced by using information given in Soil Health Card

The data presented in Table - 2 revealed that 33.33 per cent of the respondents had strongly agreed with statement that unnecessary expenditures can be reduced by using information given in SHC, followed by 53.33 per cent of the soil health card holders had agreed and 13.33 per cent of the soil health card holders had undecided with the statement.

15. Soil Health Card reports is worth for balance use of chemical fertilizer

The data in Table -2 depicted that 38.33 per cent of the respondents had strongly agreed with statement that SHC reports is worth for balance use of chemical fertilizer, followed by 51.67 per cent of the soil health card holders had agreed and 10.00 per cent of the soil health card holders had undecided with the statement.

16. Soil Health Card reports gives information about amount of nutrient present in soil and balanced use of fertilizers can be possible

The information presented in Table 2 reported that 35.00 per cent of the respondents had strongly agreed with statement that SHC reports give information about amount of nutrient present in soil and balanced use of fertilizers can be possible, followed by 57.50 per cent of the soil health card holders had agreed and 7.50 per cent of the soil health card holders had undecided with the statement.

17. I think that Soil Health Card useful to reduce soil degradation and help to maintaining fertility and productivity of soil

The data mentioned in Table - 2 indicated 25.83 per cent of the respondents had strongly agreed with statement that I think that SHC useful to reduce soil degradation and help to maintaining fertility and productivity of soil, followed by 63.33 per cent of the soil health card holders had agreed and 9.17 per cent disagreed with the statement.

18. Soil Health Card provide information about N, P, K and help to apply the dose of fertilizer

The data presented in Table - 2 indicated that 30.83 per cent of the respondents had strongly agreed with statement that SHC provide information about N, P, K and help to apply the dose of fertilizer, followed by 65.00 per cent of the respondent had agreed and only 2.50 per cent of the soil health card holders had undecided with the statement.

19. I think that Soil Health Card useful in crop planning

The data in Table -2 revealed that 34.17 per cent of the respondents had strongly agreed with statement that I think that SHC useful in crop planning, followed

by 47.50 per cent of the respondent had agreed, 15.83 per cent of the soil health card holders had undecided and only 2.50 per cent disagree with the said statement.

20. Soil Health Card provide information about pH, EC, O.C of soil and on the basis, we can reclaim the soil

The data presented in Table - 2 clearly revealed that 35.00 per cent of the respondents had strongly agreed with statement that SHC provide information about pH, EC, O.C. of soil and on the basis, we can apply fertilizers, followed by 46.67 per cent of the soil health card holders had agreed and 18.33 per cent of the soil health card holders had undecided .

CONCLUSION

The findings of the present study revealed that a majority of the soil health card holders had medium level of perception about utility of the soil health card followed by high level and low level of perception of soil health card holders about its utility. It was observed that the perception of most of the soil health card holders were consistent with soil health and soil health card. Further, most of the soil health card holders were satisfied with soil health card and wanted to continue with the soil health management. Therefore, the Government has to made efforts to sensitize farmers need, importance and utility of soil health card. Planning of cropping system as per soil type in specific rotation is necessary to suggest farmer and to increase the organic carbon in soil which are very low in Indian soils.

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RESEARCH ARTICLE

Attitude of agricultural technical diploma school students towards agro-entrepreneurship

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ABSTRACT

Agriculture is a traditional occupation of most of the rural people and also the fundamental livelihood of the majority of Indians. Entrepreneurship is recognized as an important ingredient of Economic Development in the country. Agro-entrepreneurs are people who realize versatile opportunities and channelize efforts in the proper direction. Now a days, the employment opportunities in the public sector for agricultural professionals are shrinking. The increasing level of unemployment among the agricultural technical school diploma holders and market forces made agro-entrepreneurship as one of the best options for the profession and providing employment for the students. Hence, it can be said that the students of today will be the agro-entrepreneurs of tomorrow in our country. To create self-employment opportunities for unemployed agricultural diploma holders, agro-entrepreneurship is widely regarded as an integral player.. Thus, this study was carried out primarily to understand the attitude of students towards agro-entrepreneurship. This study showed that majority of the students had a favorable attitude towards agricultural entrepreneurship.

Keywords: Agriculture, Attitude, Education, Agro-Entrepreneurship, Diploma, Student

INTRODUCTION

The University impart Agricultural Education from the post matriculation diploma course level for the students. i.e. Faculty of Lower Agricultural Education is the basic foundation course for the students of the rural or urban areas who are willing to grab knowledge about basic agriculture and Agro-entrepreneurship. Now a days, the employment opportunities in the public sector for agricultural professionals are shrinking. The increasing level of unemployment among the agricultural technical school diploma holders and market forces made agro entrepreneurship as one of the best options for the profession and providing employment for the students. Still, students hesitate to start agri ventures due to some constraints that may be of economic and social risk. Considering this fact, the present investigation was undertaken primarily to understand the attitude of newly admitted diploma students towards agri-entrepreneurship. This task was carried over at the 58 Agricultural Technical Schools located in the Vidarbha region of Maharashtra and under the administrative control of the Associate Dean, Faculty of Lower Agricultural Education, Dr. PDKV, Akola.

Objectives

1) To study the student profile admitted for agricultural technical diploma course
2) To rank the various agro-entrepreneurship activities based on students' perception

3) To study the attitude of the students towards agro-entrepreneurship

MATERIAL AND METHODS

An exploratory design of social research was used in the present investigation as the study emphasized on attitude of the students about Agro-Entrepreneurship. The present study was undertaken at 58 Agricultural schools, where total 6080 students were enrolled for the two year diploma course. Total 3240 students were participated in this survey from the schools. The data was collections were made with the help of well-structured interview schedule using online Google form. Before actual investigation for data collection the interview schedule was pre-tested, checked, tabulated and analysed by using a suitable statistical tools.

RESULT AND DISCUSSION

1. **Gender :** From the Table 1, it was found that there were more than three fourth of the students were male (78.10%) and female (21.90%). Generally, the risk-taking ability was more in males as compared to females.
2. **Age :** It was observed from Table 1 that more than half of students were found in the age group of 16 to 20 years (67.00%), followed by in the age group of 21 to 25 years (26.20%) and in the age group 26 to 30 years (6.80%). The students of age group 16 -20 years were actively involved in the farm activities. Usually, students of this age group are more enthusiastic and efficient in any work.
3. **Education :**It is clear from the data (Table 1) that, more than three fourth (75.60%) of the students had a higher secondary school level education. While it was 24.40 per cent of students educated up to secondary school level.
4. **Residence :** It is revealed from the data presented in the Table 1 that, majority of students (91.10%) had their residence in the rural area. While only 8.90 per cent of the total admitted students are coming from the urban area. Those who had more interest towards agro-entrepreneurship having the basic knowledge of agriculture.
5. **Year of Admission** : It could be seen Table 1 that around 51.70 per cent of students admitted in first year are interested in agro-entrepreneurship as compared to 48.30 per cent of students studying in second year.
6. **Land Holding :** It could be seen (Table 1) that, 47.60 per cent of admitted students were belongs to the category of small farmer's 36.70 per cent of marginal farmers and 10.40 per cent semi-medium farmer's category. Table further reveals that 4.80 per cent of rural youth were under medium farmer's category and only 0.50 per cent of them were of from big farmer's category. The size of land holding of the student's family would act as an important factor in influencing the attitude in agro-entrepreneurship.
7. **Annual Income :** An outlook from Table 1, the information on annual income of rural youth and the results indicated that 52.00 per cent of rural youth were having lower-middle (Rs. 100,001– Rs.200,000) level of annual income, followed by 39.90 per cent having low (Upto Rs. 100,000) , 6.50 per cent having upper-middle level(Rs. 200,001– Rs.300,000) of annual income and 1.00 and 0.60 per cent of students family had lower –high, upper-high level of annual income. The probable reason for the fnding trend is a number of earning members engaged in different occupations other

than agriculture also might have contributed to higher annual income.

8. **Family Occupation :** Table 1 revealed that, nearly more than half (62.40%) of students had their main family occupation as agriculture, followed by 19.70 per cent agriculture + labour, only 9.30 per cent rural youth fall under agriculture + allied occupation (Goat farming/ Poultry/ Apiculture /Sericulture, etc.). Similarly, only 5.00 per cent family having agriculture + business (Professional/Non-professional) and about 3.60 per cent students family occupation is agriculture+ services.

   Agriculture is the main occupation of the rural people and that all students were curious about agriculture. The justification behind the interest of the students in agriculture is that they belong to families with an agriculture background and it is also their traditional occupation.

9. **Sources of Information :** In study area, out of total 3240 students' respondents more than half of the respondents 53.00 per cent had high level of sources of information followed by medium level of information 38.00 per cent and 14.00 per cent found in low level sources of information category. It is concluded that, the usage of social media in students in India has grown up cent per cent in the past scenarios. (Table-1)

10. **Reason for Admission to diploma course :** It is evident from the Table 1 that, about 41.00 per cent of the students admitted for seeking government /private service jobs, followed by 29.80 per cent are for starting agro-entrepreneurship after completion of course, 14.00 per cent are interested in starting hi-tech farming, 9.20 percent are admitted to learn about advance technology in agriculture and only 6.00 per cent of students are admitted for one or more other reasons.

Table 1: Distribution of students according to their profile characteristics (n=3240)

S. N.	Category	Frequency (f)	Percentage (%)
I	**gender**		
1.	Male	2531	78.10
2.	Female	709	21.90
II	**Age**		
1.	16 to 20 Years	2170	67.00
2.	21 to 25 Years	849	26.20
3.	26 to 30 Years	221	6.80
III	**Education**		
1.	SSC (X^{th})	791	24.40
2.	HSC (XII^{th})	2449	75.60
IV	**Residence**		
1.	Rural	2951	91.10
2.	Urban	289	8.90
V	**Year of Admission**		
1.	First Year	1675	51.70
2.	Second Year	1565	48.30

S. N.	Category	Frequency (f)	Percentage (%)
VI	**Land Holding**		
1.	Marginal (up to 1.00 ha.)	1191	36.70
2.	Small (1.01 to 2.00 ha.)	1541	47.60
3.	Semi medium (2.01 to 4.00 ha.)	335	10.40
4.	Medium (4.01 to 10.00 ha.)	158	4.80
5.	Large (Above 10.00 ha.)	15	0.50
VII	**Annual Income**		
1.	Low (Upto Rs. 100,000)	1292	39.90
2.	Lower-Middle (Rs. 100,001– Rs.200,000)	1685	52.00
3.	Upper-Middle (Rs. 200,001– Rs.300,000)	210	6.50
4.	Lower -High (Rs. 300,001– Rs.400,000)	33	1.00
5.	Upper-High (above Rs. 400,001)	20	0.60
VIII	**Father Occupation**		
1.	Agriculture + Labour	638	19.70
2.	Agriculture (Farming)	2022	62.40
3.	Agriculture + Allied occupation	301	9.30
4.	Agriculture + Business	162	5.00
5.	Agriculture + Service	117	3.60
IX	**Sources of Information**		
1.	Low	454	14.
2.	Medium	1231	38
3.	High	1715	53
X	**Reason for Admission to diploma course**		
1.	Hi tech Farming	454	14.00
2.	Agro- Entrepreneurship	966	29.80
3.	Advance technology in agriculture	298	9.20
4.	Government /Private Service	1328	41.00
	Other	194	6.00

Table 2 : Ranking of various agro-entrepreneurship activities based on students' perception (n=3240)

S. N.	Agri-entrepreneurial activities	Frequency	Percentage	Rank
1.	Agro input shop	2077	64	1
2.	Organic Farming	1062	32.7	2
3.	Dairy farming	1022	31.5	3
4.	Goat Farming	859	26.5	4
5.	Fruit Production	855	26.4	5
6.	Agro trader	835	25.7	6
7.	Poultry farming	754	23.3	7
8.	Nursery	694	21.4	8
9.	Floriculture	654	20.2	9
10.	Fruit and Vegetable Processing	654	20.2	10
11.	Fish farming	275	8.5	11
12.	Sericulture	241	7.4	12
13.	Beekeeping	214	6.6	13
14.	Juice centre	207	6.4	14

A Perusal of the Table 2 revealed that the ranking of various agro-entrepreneurship activities by the respondents with special reference to agriculture. It could be evident from the table 2, agro input shop was the highly profitable and suitable activity as perceived by majority of the students (64%), hence it was the first ranked agri-entrepreneurial activity followed by organic Farming (32.70%) as the second ranked activity, dairy farming (31.50%), goat farming (26.50%), fruit production (26.40%), agro trader (25.70%), poultry farming (23.30%), nursery(21.40%), floriculture (20.20%), fruit and vegetable processing (20.20%), fish farming (8.50%), sericulture (7.40), beekeeping (6.60%) and juice centre (6.40%) with consecutive preferred agro-entrepreneurial activities by majority of the students respectively

II. Attitude of students towards Agro-Entrepreneurship

The attitude of the students towards agro-entrepreneurship was measured using agreement with 10 statements/indices on a 5-point Likert-type scale categorized as follows: 5 = Strongly Agree (SA), 4 = Agree (A), 3 = Undecided (UD), 2 = Disagree (DA), 1 = Strongly Disagree (SDA).

Table 3 : Distribution of the respondents according to attitude towards Agro-Entrepreneurship

S. N.	Attitude Statements	Responses (n=3240)				
		SA	A	UD	DA	SDA
1	Aspiration towards Agro- Entrepreneurship	58.10	38.10	1.00	2.30	0.50
2	Technical Knowledge important to start Agro- Entrepreneurship	37.00	53.70	2.10	6.60	0.60
3	High Scope for Agro- Entrepreneurship	54.00	43.50	1.00	1.30	0.20
4	Agro-Entrepreneurship is risky enterprises	16.00	39.30	5.40	37.10	2.20
5	Profitability in Agro- Entrepreneurship is high	52.30	44.00	1.10	2.30	0.30
6	High initial cost required for start Agro-Entrepreneurship	22.60	48.40	6.50	21.50	1.00
7	Technical Knowledge essential to start Agro- Entrepreneurship	48.10	46.40	1.30	4.00	0.20
8	Agro-Entrepreneurship is High profit business	40.70	46.10	5.70	7.20	0.30
9	Agro-Entrepreneurship provides employment to others	48.40	47.50	1.00	3.00	0.10
10	Take my own decision if engaged in Agro- Entrepreneurship	67.20	30.60	0.50	1.40	0.30

SA-Strongly Agree, A-Agree, UD-Undecided, D A-Disagree, SDA-Strongly Disagree

Table 4 : Distribution of the respondents according to their overall level of attitude towards agro- entrepreneurship

S. N	Level of attitude	Frequency	Percentage
1.	Less favorable	421	13.00
2.	Moderately favorable	1860	58.66
3.	Favorable	959	29.60

The attitude scale was administered to the students revealed that majority of the respondents had moderately favorable (58.66%) towards agro-entrepreneurship followed by favorable attitude (29.60%) and unfavorable attitude (13%) towards agro-entrepreneurship (Table 4) respectively. Hence, majority of the students have shown favorable to moderately favorable attitude towards agro-entrepreneurial activities with

special reference to the agriculture. The reason that could be students perceived the motives of agro-entrepreneurship. The all though majority of the respondents have shown positive intent towards agro-entrepreneurship, lack of technology, capital, capacity building and family support, lack of knowledge on the bankable loans for agri-business activities, lack of technical knowledge on the preparation of agri-business projects and the lacuna in the rapport of various stakeholders involved in the existing marketing system forced the farming community to suppress their innovative ideas in agri-entrepreneurial activities. Hence, the rainfed farmers couldn't tap the available resources and capitalize on the same in the way that they have shown the positive attitude towards agri-entrepreneurship.

CONCLUSION

This study highlights the points of matter like, the majority of admitted students are male (78.10%). They are in the age group of 16 to 20 years category (67.00%), residence of rural areas (91.10%) and having higher secondary education (75.60%). The main family occupation (62.40%) is agriculture having very small land holding ranges between 1.00 to 2.00 ha. (47.60%). They depend on their occupation for want of their food, feed, fruit, fiber and fuel (5F's) and earn income per annum in the range of Rs.100,001/- to Rs.2,00,000/- (52.00%). The students get information on education, diploma, agriculture by using mobile internet (58.60%). The students (64.30%) preferred this two years diploma course and admitted with intention of establishing or starting a new agro-input-service centre (Krishi Seva Kendra) in their areas for which an agriculture diploma certificate is a prerequisite. This result indicated that the overall attitude (58.66%) of admitted students towards Agro-Entrepreneurship is moderately favourable.

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RESEARCH ARTICLE

Impact of agricultural price policy on paddy in Vidarbha region

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ABSTRACT

The present study aimed to analyze the impact of Agricultural Price Policy on Paddy in Vidarbha region of Maharashtra. The Secondary data on Farm Harvest Prices (FHP) and Minimum Support Prices (MSP) of Paddy was collected from Directorate of Economics and statistics and Commission for Agricultural Cost and Prices for the period 2000-01 to 2019-20. The effectiveness of the price policy during the harvest periods was examined by the deviations of FHP from MSP and classified into positive and negative deviations (to examine whether market prices ruled higher or lower than the minimum support prices). Gap between FHP and MSP resulted that in mostly cases FHP is higher than MSP because higher demand due to more procurement for central part than supplies does not allow the market prices to fall below MSP. In recent years, market prices ruled higher than MSP. The impact of MSP on area is higher but there is non-significant impact of MSP on productivity of Paddy. The study revealed that there is significant variation in areas of Paddy due to previous year's minimum support prices of the Paddy but there is non-significant variation in productivity of Paddy.

Keyword : Farm Harvest Price, Minimum Support Price, Agricultural Price Policy

INTRODUCTION

Agricultural Price Policy (APP), was introduced by the government to protect the interest of the producers and consumers. The essentials of the establishment of agricultural price policy are to reduce the wide fluctuations in the prices of agricultural produce and production inputs, to maintain a stable price level of commercial crops, to encourage small farmers for making more investment on farms, to provide better incentives to the producers and to assure producer a minimum price for his produce

In recent years, the MSP policy has been criticized by both farmers and proponents of free trade. Farmers always demand a substantial hike in MSP, whereas proponents for free agricultural trade thinkers feel that, most of the times, MSP is not in line with the international prices as well as domestic demand and supply situation. This brings distortions and inefficiencies in the production patterns.

It is further contended that the MSP has outlived its utility and is being used more as a political tool than an economic instrument. It therefore becomes imperative to examine the effectiveness of MSP in different regions of the country as well as its contribution towards growth. The present study has investigated these issues for the Paddy crop, which is the most important cereal crop from both production and consumption points of view in the country.

METHODOLOGY

The study was undertaken to

examine the parity between cost and prices and district wise impact of MSP on area, production and productivity in Paddy.

Collection of data

The study was based on secondary data of cost of cultivation of Paddy collected from Agricultural Prices Costs Scheme under the Department of Agricultural Economics and Statistics, Dr. P.D.K.V. Akola. The yearly data of Farm harvest prices and Minimum Support Price were compiled for the period of 20 years (2000-01 to 2019-20). The period has been divided into three periods,

Period-I (2000-01 to 2009-10),
Period-II (2010-11 to 2019-20) and
Overall period (2000-01 to 2019-20).

Analytical tools and techniques

The data was collected from secondary sources subjected to appropriate analytical technique in order to arrive at a meaningful conclusion.

Parity between Cost and Prices

The study was based on the farm harvest prices and minimum support price of the major crops in Vidarbha. To study the effectiveness of the price policy during the harvest period of deviation of farm harvest prices from the MSP was worked out and divided into the negative and positive deviation to examine whether the market price ruled higher or lower over the MSP. Hence the absolute positive deviation (APD) or absolute negative deviation (AND) and mean absolute positive derivation (MAPD) or mean absolute negative deviation MAND) calculated. Also adjusted mean positive deviation (AMPD) and adjusted mean negative deviation (AMND) was worked out.

MAPD or MAND = $1/n\sum$ | FHPi – MSPi |

If, FHP > MSP = Positive deviation (PD)

FHP < MSP = Negative deviation (ND)

Where,

MAPD = Mean absolute positive deviation,

MAND = Mean absolute negative deviation,

FHP = Farm harvest price,

MSP= Minimum support price, and

n. = Frequency of positive or negative deviations.

These deviations were adjusted with MSP in order to examine the degree of their deviation from the MSP. The formulae used for the adjusted mean negative/positive deviation was as follows:

AMPD or AMND = $1/n\sum$(| FHPi – MSPi | / MSPi)*100

Where,

AMPD = Adjusted mean positive deviation, and

AMND = Adjusted mean negative deviation

The significance of gap between FHP and MSP of major crops was tested by two sample t-test

$$t = \frac{(\bar{x} - \bar{y}) - (u_x - u_y)}{s\sqrt{\frac{1}{n_x} + \frac{1}{n_y}}}$$

Where,

x = mean of FHP of size nx

ȳ = mean of MSP of size ny

sp2 = pooled variance

$$Sp^2 = \frac{(n_x - 1)s_x^2 + (n_y - 1)s_y^2}{(n_x - 1) + (n_y - 1)}$$

Impact of Minimum Support Prices

Study the impact of lagged Minimum Support Prices on the cost and prices of the major crops. Linear, logarithmic forms of equation has been fitted. The previous year Minimum Support Prices generally influence the producer farmer decision on a carrier location for the current year the linear equation has been used as linear regression equation.

1. Linear regression equation:

a. $A_t = a + b P_t - 1$

b. $P_t = a + b P_t - 1$

c. $Y_t = a + b P_t - 1$

2. Logarithmic regression equation:

a. $Log. A_t = log\ a + b P_t - 1$

b. $Log. P_t = log\ a + b P_t - 1$

c. $Log. Y_t = log\ a + b P_t - 1$

Where,

At = Area of major crops at (t^{th}) period,

P_t = Production of major crops at (t^{th}) period,

Y_t = Productivity of major crops at (t^{th}) period,

P_t -1 = Minimum Support Prices of major crops taken in per quintal.at $(t-1)^{th}$ period.

Linear type of function found a better fit than logarithmic function. Hence it is used.

RESULT AND DISCUSSION

Gap between Minimum Support Price and cost of production of Paddy

The gap between Minimum Support Prices and cost of production of Paddy of Vidarbha region are presented in the Table 1. The gap is calculated for the study period- I.e. 2000-01 to 2019-20.

Table 1 Gap between Minimum Support Price and cost of production of Paddy

YEAR	MSP	Cost of Production	gap
2000-01	540	612.13	-72.13
2001-02	560	456.74	103.26
2002-03	560	828.6	-268.6
2003-04	580	497.41	82.59
2004-05	590	596.01	-6.01
2005-06	600	643.91	-43.91
2006-07	610	603.64	6.36
2007-08	675	611.83	63.17
2008-09	880	864.91	15.09
2009-10	980	1002.7	-22.68
2010-11	1030	1261.2	-231.23
2011-12	1110	1367.9	-257.88
2012-13	1280	1446.5	-166.47
2013-14	1345	1951.1	-606.1
2014-15	1400	1909.8	-509.77
2015-16	1450	2549.9	-1099.9
2016-17	1510	1711.7	-201.74
2017-18	1590	3180.7	-1590.7
2018-19	1770	2821.3	-1051.3
2019-20	1835	2891.2	-1056.2

The results revealed that the gap between MSP and cost of production of Paddy in Vidarbha region recorded which ranged from -1099.9 to 103.26 (₹/Qtl). The highest gap was registered in year 2001-02 (103.26 (₹/Qtl)) followed by 2003-04 (82.59 (₹/Qtl)), 2007-08 (63.17 (₹/Qtl)), 2008-09 (15.09 (₹/Qtl)), 2006-07 (6.36 (₹/Qtl)). There were 14 negative difference (gap) and 6 positive difference (gap) which shows that cost of production was ruled higher than Minimum Support Price.

Table 2. Significance of gap between FHP and MSP of Paddy crop in major districts of Vidarbha region

S.N	Districts	Mean FHP	Mean MSPT	Value (t-cal.)	t table	D.f
1.	Bhandara	1141.50	1044.75	0.59	2.021	38
2.	Chandrapur	1305.13	1044.75	1.35	2.021	38
3.	Gadchiroli	1137.60	1044.75	0.55	2.021	38
4.	Gondia	1105.5010	44.75	0.38	2.021	38
5.	Nagpur	1204.2010	44.75	0.85	2.021	38

Note – $t_{cal} < _{tab}$ that means h_0 is accepted at (5%) level of significance and conclude that the gap between FHP and MSP do not differ significantly.

Deviations of FHPs from MSPs of Paddy in Major districts of Vidarbha region

To examine the effectiveness of MSP policy for Paddy crops in Major districts of Vidarbha region, difference between its FHP and MSP was calculated in different years and is given in Table 3. Chandrapur, Bhandara experienced positive deviations 14, times in 20 years during 2000-01 to 2019-20. This means that the average FHP was ruled higher than MSP in 14 times out of 20 years. The adjusted difference (positive) between MSP and FHP was low as 70 per cent of MSP and the negative difference was 30 per cent. Gondia and Nagpur experienced positive deviations 13, times in 20 years during 2000-01 to 2019-20. This means that the average FHP was ruled higher than MSP in 13 times out of 20 years. The adjusted difference (positive) between MSP and FHP was low as 65 per cent of MSP and the negative difference was 35 per cent. Gadchiroli district experienced positive deviations 11, times in 20 years during 2000-01 to 2019-20. This means that the average FHP was ruled higher than MSP in 11 times out of 20 years. The adjusted difference (positive) between MSP and FHP was low as 55 per cent of MSP and the negative difference was 45 per cent.

Table 3. Deviation of FHP vis-a-vis MSP of Paddy crops in major districts of Vidarbha region

PADDY	NEGATIVE DEVIATION					POSITIVE DEVIATION				
Districts	Frequ	MAND	RANG	AMND	%	Frequ	MAPDR	ANGA	MPD	%
Bhandara	6.00	-123.83	(-41)-(-324)	-17.75	30	14.00	191.29	25-544	16.03	70
Chandrapur	6.00	-81.33	(-40)-(-153)	-14.23	30	14.00	406.8	25-797	32.61	70
Gadchiroli	9.00	-100.11	(-25)-(-280)	-13.87	45	11.00	250.7	35-449	19.15	55
Gondia	7.00	-82.43	(-64)-(-121)	-14.06	35	13.00	226.1	57-299	10.67	65
Nagpur	7.00	-142.00	(-39)-(-428)	-20.37	35	13.00	321.77	28-769	26.12	65

Note: *Zero deviations (FHP=MSP) were considered positive deviations indicating success of the MSP policy

Average= Average = Average of the difference of FHP from MSP (+ve or –ve) and

% = Percentage of average positive or negative deviations over MSP

Impact of Minimum Support Prices (MSPs) on major crops in Vidarbha region during 2000-01 to 2019-20

To study the impact of lagged Minimum Support Prices (MSPs) on the area, production and productivity, linear and logarithmic form of equations have been fitted. As linear type of Model had found a better fit than logarithmic function, the former had been presented here. The previous year MSPs had been used here since these prices generally influence the farmer's decision on acreage allocation for the current year.

Impact of MSP on area of Paddy in Vidarbha region

The numerical values of the linear function for Paddy indicates that R^2 is significant at 1 per cent level and supports the results that variation in areas of Paddy is explained by the explanatory variable, i.e., previous year's Minimum Support Prices of the Paddy. Table 4 revealed that 15 per cent variation in area of Bhandara district , 3 per cent variation in area of Chandrapur district , 47 per cent variation in area of Gadchiroli district , 33 per cent variation in area of Gondia district, 94 per cent variation in area of Nagpur district, is explained by independent variable i.e. lagged MSP.

Table 4. Impact of MSP on Area of Paddy in Vidarbha region

S. N.	Districts	R^2	S.E.	Linear Regression Equation
1.	Bhandara	0.15	118.29	y = 1596 + 0.11x
2.	Chandrapur	0.03	141.03	y = 1475 - 0.06x
3.	Gadchiroli	0.47	52.08	y = 1379.4 - 0.11x
4.	Gondia	0.33	135.35	y = 1936.1 - 0.22x
5.	Nagpur	0.94	49.77	y = 176.5 - 0.49x

y = area, x =MSP

The elasticity for these variables is significant at 1 per cent level in case of area of Paddy. The value of elasticity has found as 0.11, -0.06, 0.11, -0.22, -0.49 per cent indicating thereby that previous year price influences current year's area of major Paddy growing districts (like, Bhandara, Chandrapur, Gadchiroli, Gondia, Nagpur).

Impact of MSP on production of Paddy in Vidarbha region

The numerical values of the linear lag function for Paddy indicates that R^2 is significant at 1 per cent level and supports the results that variation in production of Paddy is explained by the explanatory variable, i.e., previous year's minimum support prices of the Paddy. Table 5. revealed that 28 per cent variation in production of Bhandara district , 0.3 per cent variation in production of Chandrapur district , 33 per cent variation in production of Gadchiroli district , and 35 per cent variation in production of Gondia district, 79 per cent variation in production of Nagpur district is explained by independent variable i.e. lagged MSP.

Table 5. Impact of MSP on production of Paddy in Vidarbha region

S. N.	Districts	R^2	S.E.	Linear Regression Equation
1.	Bhandara	0.28	652.85	y = 1588.8 + 0.96x
2.	Chandrapur	0.003	599.12	y = 1618.15 + 0.08x
3.	Gadchiroli	0.33	508.34	y = 1054.4 + 0.83x
4.	Gondia	0.35	668.01	y = 1449.3 + 1.1x
5.	Nagpur	0.79	227.27	y = 79.9 + 1.04x

y = production, x =MSP

The elasticity for these variables is significant at 1 per cent level in case of production of Paddy. The value of elasticity has found as 0.96, 0.08, 0.83, 1.1, 1.04 per cent indicating thereby that previous year price influences current year's production of major Paddy growing districts (like, Bhandara, Buldhana, Chandrapur, Gadchiroli, Gondia, Nagpur).

Impact of MSP on productivity of Paddy in Vidarbha region

The numerical values of the linear lag function for Paddy indicates that R^2 is significant at 1 per cent level and supports the results that variation in productivity of Paddy is explained by the explanatory variable, i.e. previous year's MSPs of the Paddy. Table 6. revealed that 25 per cent variation in productivity of Bhandara district , 0.8 per cent variation in productivity of Chandrapur district , 25 per cent variation in productivity of Gadchiroli district , 54 per cent variation in productivity of Gondia district,

Table 6. Impact of MSP on productivity of Paddy in Vidarbha region

S. N.	Districts	R^2	S.E.	Linear Regression Equation
1.	Bhandara	0.25	356.94	y = 992.3 + 0.48x
2.	Chandrapur	0.008	385.61	y = 1126 + 0.08x
3.	Gadchiroli	0.25	334.82	y = 801.51 + 0.45x
4.	Gondia	0.54	357.89	y = 621.2 + 0.90x
5.	Nagpur	0.35	278.04	y = 905.06 + 0.47x

y = productivity, x =MSP

35 per cent variation in productivity of Nagpur district is explained by independent variable, i.e. lagged MSP. The elasticity for these variables is significant at 1 per cent level in case of productivity of Paddy. The value of elasticity has found as 0.48, 0.08, 0.45, 0.90, 0.47per cent indicating thereby that previous year price influences current year's productivity of major Paddy growing districts (like Bhandara, Chandrapur, Gadchiroli, Nagpur).

CONCLUSION

The gap between MSP and cost of production of Paddy in Vidarbha region recorded which ranged from -1099.9 to 103.26 (₹/Qtl). The highest gap was registered in year 2001-02 (103.26 (₹/Qtl))

The district wise average gap between FHP and MSP of Paddy ranged from 60.08 to 260.4 (₹/Qtl). The highest gap was registered in Chandrapur district (260.4 (₹/Qtl)) and lowest in Gondia (60.08 (₹/Qtl)).

Paddy experienced positive deviations as well as negative deviations. Chandrapur, Buldhana experienced highest positive deviations and lowest negative deviation i.e. 14 and 6. In which Chandrapur district experienced positive deviation i.e. MAPD is 406.82 (₹/Qtl) and AMPD is 32.61 (₹/Qtl) and negative deviation i.e. MAND is -81.33 (₹/Qtl) and AMND is -14.23 (₹/Qtl) and Bhandara district experienced positive deviation i.e. MAPD is 191.29 (₹/Qtl) and AMPD is 16.03 (₹/Qtl) and negative deviation i.e. MAND is -123.83 (₹/Qtl) and AMND is -17.75 (₹/Qtl). In 20 years during 2000-01 to 2019-20. This means that the average FHP was equal to or ruled higher than MSP in 10 times and lower than MSP in one time out of 20 years. This indicated that the government intervention was very strong and did not allow the FHPs to move away from MSP in a significant

manner despite large marketed surplus.

The linear regression equation analysis showed that The district wise impact of MSP on the area of Paddy is explained by the explanatory variable, i.e., previous year's Minimum Support Prices of the Paddy. The result revealed that 15 per cent variation in area of Bhandara district, 3 per cent variation in area of Chandrapur district, 47 per cent variation in area of Gadchiroli district, 33 per cent variation in area of Gondia district, 94 per cent variation in area of Nagpur district. The significant value of elasticity indicating thereby that previous year price influences current year's area.

The linear regression equation analysis showed that The district wise impact of MSP on the production of Paddy is explained by the explanatory variable, i.e., previous year's Minimum Support Prices of the Paddy. The result revealed that 28 per cent variation in production of Bhandara district, 0.3 per cent variation in production of Chandrapur district, 33 per cent variation in production of Gadchiroli district, and 35 per cent variation in production of Gondia district, 79 per cent variation in production of Nagpur district is explained by independent variable i.e. lagged MSP. The significant value of elasticity indicating thereby that previous year price influences current year's production.

The linear regression equation analysis showed that The district wise impact of MSP on the productivity of Paddy is explained by the explanatory variable, i.e., previous year's minimum support prices of the Paddy. The result revealed that 25 per cent variation in productivity of Bhandara district, 0.8 per cent variation in productivity of Chandrapur district, 25 per cent variation in productivity of Gadchiroli district, 54 per cent variation in productivity of Gondia district, 35 per cent variation in productivity of Nagpur district. The significant value of elasticity indicating thereby that previous year price influences current year's productivity.

1. The gap analysis in which deviations of FHPs from MSPs of Paddy crops results in maximum positive deviations (FHP ruled higher than MSP) in All 5 districts of Vidarbha region where majority of the Paddy were grown during 2000-01 to2019-20.
2. The increase in MSP over the previous year brought additional area under selected crops, but the impact was nominal.
3. From the results it was concluded that impact of MSP on area is higher but there is lower impact of MSP on productivity of paddy.

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RESEARCH ARTICLE

Constraints in production and marketing of green chilli.

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ABSTRACT

Chilli is considered as one of the commercial spices crop. It is most widely used universal spice, named as wonder spice. Different varieties are cultivated for various uses like vegetable, pickles, spice and condiments. In daily life, chillies are the most important ingredient in many different cuisines around the world as it adds pungency, taste, flavour and colour to the dishes. Indian chilli is considered to be world famous for two important commercial qualities namely, its colour and pungency levels.

The present study of production and marketing of green chilli in Akola district .The study was based on the primary data collected for the *kharif* season, 90 green chilli growers were collected from three tahsils and different functionaries involved in green chilli procurement, producer, wholesalers, and retailer were selected for collecting information. Green chilli is most important vegetable crop grown in Akot, Patur and Barshitakli tahsil of Akola district. Although, it is cultivated on small scale, it contributes sizable share in total earning of the farmer. However, yields and profits from green chilli crop are uncertain.

The gross cropped area was the highest in large group (6.46 hectare) followed by medium (4.09 hectare) and small group (1.93 hectare) of green chilli growers. The cropping pattern of green chilli growers was dominated by soybean, cotton and green chilli in *kharif* season where as wheat, gram in *rabi* season. In *kharif* season the contribution of area under green chilli was 16.06 per cent by small, 12.71 per cent by medium and 11.61 per cent by large size of green chilli growers.

The gross returns from green chilli was Rs.4,05,287.02 Rs.4,05,602.08 and Rs. 4,32,685.18 for small, medium and large group of green chilli growers respectively. At overall level, the gross returns was Rs.4,11,771.35. Whereas per hectare total cost of cultivation of green chilli was the highest in the large group at cost "C_3" (Rs.2,24,340.17) followed by medium group (Rs. 2,07,494.86) and small group (Rs. 2,05,941.63).

INTRODUCTION

Vegetables are one of the important aspect of the horticulture and agricultural sector of India in general. Various factors have led to the rise in the area under production of vegetables in India. India is the world's largest producer, consumer and exporter of chillies. India is the world leader in chilli production followed by China, Thailand, Ethiopia and Indonesia. Indian chilli is considered to be world famous for two important commercial qualities of color and pungency levels. Indian chilli is mainly exported to Asian countries like China, Sri Lanka, Malaysia, Bangladesh, Singapore, Thailand, UAE, etc.

Chilli is considered as one of the commercial spices crop. It is most widely used universal spice, named as wonder spice. Different varieties are cultivated for

various uses like vegetable, pickles, spice and condiments. In daily life, chillies are the most important ingredient in many different cuisines around the world as it adds pungency, taste, flavour and colour to the dishes. Indian chilli is considered to be world famous for two important commercial qualities namely, its colour and pungency levels. There are more than 400 different varieties of chillies found all over the world. It is also called as hot pepper, cayenne pepper, sweet pepper, bell pepper, etc.

Maharashtra ranks third in terms of green chilli production in India with an area 30,182 hectares with production 3,43,687 metric tonnes and productivity 11.38 metric tonnes per hectare in the year 2019-20. Nagpur was the largest producer of green chilli in Maharshtra and contributed about 23.04 per cent to the total production followed by Pune (16.14 per cent), Palghar (10.03 per cent), Nandurbar (9.75 per cent) and Nashik (5.28 per cent) (HAPIS, Ministry of Agriculture, Govt. of India, 2019-20).

In the year 2019-20, Vidarbha's contribution in green chilli production in terms of area and production was 42.89 per cent (12,946 hectares) and 33.27 per cent (1,14,372 metric tonnes), respectively to total area and production of Maharashtra state.

Akola district covers area of 342 hectares with production of 2871 metric tonnes and productivity 8.39 metric tonnes per hectare. (HAPIS, Ministry of Agriculture, Govt. of India, 2019-20).

Chilli is one of the most important cash crop grown which requires special type of soil, climate, irrigation facilities, intercultural operations, plant protection measures and also intensive supervision. It is common belief among the farmers that chilli crop earns higher income than any other crops. Though, the chilli crop cultivated on small area, as compared to other crops, it contributes sizeable share in the total earning of the cultivators. But, the yields, finally the profits from chilli crop are very uncertain, because it is a very sensitive crop and neglect of any particular operation or change in climatic condition may cause severe loss of yield and ultimately loss to the cultivators.

The market for chillies is affected by seasonal price fluctuations, overall production in the country, world demand, and stocks available in cold storages and hedging among the various varieties of chilli. Currently, chilli is produced throughout India, making our country the most dominating player in the world market. A price fluctuations is an important phenomenon commonly observed in market. Hence, it is necessary for a producer to become alert about market information. It will help him to obtain satisfa ctory returns to his produce.

The aim of marketing is that the production should realize a suitable net returns from the produce. Improvement of marketing condition unable the farmer to secure a share of a consumer's rupee of almost importance.

Market accelerating the rate of economic development but still there are some defects in agricultural marketing. Hence, production cannot help produce to any level till he does not get suitable market for the produce. However, they can be benefited through proper and efficient production and marketing. In the extent to above discussion the present study entitled "Economics of production and marketing of green chilli in Akola district" is planned with the following specific objectives.

Objectives

1) To study the socio-economic characteristics of green chilli growers.
2) To study the marketing of green chilli.
3) To identify the constraints faced by

farmers in production and marketing of green chilli.

METHODOLOGY

Selection of area

The present study was undertaken in Akola district of Vidarbha region. The district was selected purposively. The data pertained for the year 2020-21 of *kharif* season.

Selection of tahsils

Out of seven tahsils in Akola district, three tahsils were selected for the study, since there is concentration of green chilli area in Akot, Patur and Barshitakli tahsils.

Selection of villages

List of vegetable growing villages were obtained from Taluka Agriculture Office of the selected tahsils and three villages from each tahsil were selected randomly. Ten farmers from each village were selected for study. Total ninety of chilli growers were selected for the study.

Selection of sample

The list of green chilli growers was obtained from the office of Panchayat Samiti (Talathi), Krishiseva Kendra and Seed Shops of the Akola and respective tahsil headquarters. From each tahsil three villages were selected purposively i.e. total nine villages were selected. From Akot tahsil selected villages were Umra, Soanbardi, Akolkhed. From Patur tahsil selected villages were Tulanga, Channi, Deolgaon and from Barshitakli tahsil Sindkhed, Patkhed, Mahagaon were selected. From each village ten farmers were selected randomly. Overall ninety green chilli cultivators were selected for the present study. For the study of marketing of green chilli 10 wholesalers and 10 retailers were selected from Akola APMC market.

RESULTS

5.1.1 Socio-economic characteristics of selected green chilli growers

The socio-economic parameters of the growers influenced the production, income and marketing activities of the agro-produce on the growers farm. The size of holding, age group, educational status, family type, land use pattern and cropping pattern are the major socio-economic factors need to be studied for studying economics of production and marketing of green chilli. These factors are explained below.

Table 5.1. : Distribution of growers according to size of land holding

Sr. No.	Size of holding	Selected growers (Nos.)	Average size of holding (ha)
1.	Small (Up to 2 ha)	39 (43.34)	1.31
2.	Medium (2.01 to 4.00 ha)	30 (33.33)	2.81
3.	Large (4.01 & above)	21 (23.33)	4.52
4.	Overall	90 (100.00)	2.57

(Figures in parentheses indicate the percentages to total)

From the Table 5.1 it is revealed that number of the selected growers was 90, out of which 39 growers belongs to small holding, 30 growers belongs to medium and 21 growers to large size of holding with average size of holding 1.31 hectares, 2.81 hectares and 4.52 hectares, respectively. The average size of holding of green chilli growers was 2.57 hectares.

5.1.2 Age of selected green chilli growers

The data in Table 5.2, indicated that majority (47.78 %) of the green chilli

growers belonged to the middle age group i.e. 36 years to 50 years, whereas, 32.22 per cent growers belonged to young age group i.e. upto 35 years. Remaining 20.00 per cent growers belonged to old age group i.e. above 50 years.

Regarding small size group, majority (46.15 %) of the growers were belonged to middle age group i.e. 36 years to 50 years of age group, followed by young age group i.e. upto 35 years to extent of 38.46 per cent. Remaining 15.39 per cent of small size group of green chilli growers were in old age category i.e. above 50 years.

In medium size group, majority (46.67 %) of the growers were belonged to middle age group i.e. 36 years to 50 years of age group, followed by young age group i.e. upto 35 years to extent of 36.66 per cent. Remaining 16.67 per cent of medium size group of green chilli growers were in old age category i.e. above 50 years.

Table 5.2. : Distribution of green chilli growers according to age

Sr. No.	Age categories (years)	Small	Medium	Large	Overall
1.	Young (upto 35)	15.00 (38.46)	11.00 (36.66)	3.00 (14.29)	29.00 (32.22)
2.	Middle (36 to 50)	18.00 (46.15)	14.00 (46.67)	11.00 (52.38)	43.00 (47.78)
3.	Old age (above 50)	6.00 (15.39)	5.00 (16.67)	7.00 (33.33)	18.00 (20.00)
4.	Total	39.00 (100.00)	30.00 (100.00)	21.00 (100.00)	90.00 (100.00)

(Figures in parentheses indicate the percentages to total)

In large size group, majority (52.38%) of the growers were belonged to middle age group i.e. 36 years to 50 years of age group, followed by old age group i.e. above 50 years to extent of 33.33 per cent. Remaining 14.29 per cent of small size group growers were in young age category i.e. upto 35 years.

5.1.3 Family type of selected green chilli growers

Table 5.3 revealed that the overall size group was the highest of (61.11 %) joint family type. Among the different groups percentage of nuclear family was observed highest in small size group i.e. 46.15 per cent followed by medium size group i.e. 40.00 per cent and large size group i.e. 23.81 per cent. The percentage of joint family was observed highest in large size group i.e. 76.19 per cent followed by medium size group 60.00 per cent and small size group 53.85 per cent.

Table 5.3. : Distribution of green chilli growers according to family type

Sr. No.	Family Type	Small	Medium	Large	Overall
1.	Nuclear family (upto 4)	18.00 (46.15)	12.00 (40.00)	5.00 (23.81)	35.00 (38.89)
2.	Joint family (above 4)	21.00 (53.85)	18.00 (60.00)	16.00 (76.19)	55.00 (61.11)
3.	Total	39 (100.00)	30.00 (100.00)	21.00 (100.00)	90.00 (100.00)

(Figures in parentheses indicate the percentages to total)

5.1.4. Educational status of selected green chilli growers

Education is an important factor in understanding important and available technology and its adoption. It is also one of the important aspect which affect the standard of living of growers. The educational status of selected green chilli growers is presented in Table 5.4.

It is observed from the Table 5.4 that the overall illiteracy percentage was 5.55 per cent. Among the different groups

percentage of illiteracy was observed highest in the medium size group i.e. 6.67 per cent followed by small size group i.e. 5.13 per cent and large size group i.e. 4.76 per cent. The percentage of primary education was observed highest in small size group i.e. 15.38 per cent followed by large size group 9.52 per cent and medium size group 6.67 per cent.

Table 5.4. : Educational status of selected green chilli growers

Sr. No.	Educational Status	Small	Medium	Large	Overall
1.	Illiterate	2 (5.13)	2 (6.67)	1 (4.76)	5 (5.55)
2.	Primary School	6 (15.38)	2 (6.67)	2 (9.52)	10 (11.11)
3.	Middle School	7 (17.95)	4 (13.33)	3 (14.29)	14 (15.56)
4.	High School1	3 (33.34)	11 (36.67)	4 (19.05)	28 (31.11)
5.	Higher Secondary	6 (15.38)	7 (23.33)	6 (28.57)	19 (21.11)
6.	Graduation and above	5 (12.82)	4 (13.33)	5 (23.81)	14 (15.56)
7.	Total	39 (100)	30 (100)	21 (100)	90 (100)

(Figures in parentheses indicate the percentages to total)

The percentage of high school education was observed highest in medium size group i.e. 36.67 per cent followed by small size group i.e. 33.34 per cent and large size group i.e. 19.05 per cent. The percentage of higher secondary education was observed highest in large size group i.e. 28.57 per cent followed by medium size group i.e. 23.33 per cent and small size group i.e. 15.38 per cent. The number of growers having graduate and above was the highest in large size group i.e. 23.81 per cent followed by medium size group i.e. 13.33 per cent and small size group i.e. 12.82 per cent.

It is observed from the Table that the educational pattern in the era of the information technology, at overall level the highest percentage of educational level of the green chilli growers was in high school level 31.11 per cent and followed by higher secondary level i.e. 21.11 per cent. At overall level illiterate growers was 5.55 per cent.

5.1.5 Land utilization pattern of selected green chilli growers

Land utilization indicates the area of land actually utilized in different purpose like crop production, irrigated, unirrigated etc. The information about land utilization pattern of the selected green chilli cultivators is presented in Table 5.5.

Table 5.5. : Land utilization pattern of selected green chilli growers (Ha.)

Sr. No.	Particulars	Small	Medium	Large	Overall
1.	Total land holding	1.31 (100.00)	2.81 (100.00)	4.52 (100.00)	2.57 (100.00)
2.	Fallow land	0.01 (0.76)	0.03 (1.07)	0.09 (1.99)	0.04 (1.56)
3.	Net cultivated area	1.30 (99.24)	2.78 (98.93)	4.43 (98.01)	2.53 (98.44)
4.	Area sown more than once	0.63 (48.09)	1.31 (46.62)	2.03 (44.91)	1.17 (45.53)
5.	Irrigated area	1.09 (83.21)	2.10 (74.73)	3.14 (69.47)	1.90 (73.93)
6.	Gross cropped area	1.93	4.09	6.46	3.70
7.	Cropping intensity (%)	148.46	147.12	145.82	146.25

(Figures in parentheses indicate the percentages to total land holding)

It can be revealed from the Table 5.5 that the total land holding held by small, medium and large size group were 1.31 hectares, 2.81 hectares and 4.52 hectares, respectively and the overall average of the three groups were 2.57 hectares.

The average fallow land was 0.01 hectares (0.76%) in small, 0.03 hectares (1.07%) in medium and in large size group 0.09 hectares (1.99%) of land holding and at overall level it was 0.04 hectares (1.56%). The net cultivated area for small size group was 1.30 hectares (99.24%) of the total land holding, in medium size group 2.78 hectares (98.93%) and that of in large size group it was 4.43 hectares (98.01%) and at overall level it was 2.53 hectares i.e. (98.44%) of the total land holding area.

In case of small, medium and large size group, area sown more than once was 0.63 hectares (48.09 %), 1.31 hectares (46.62%) and 2.03 hectares (44.91%), respectively and overall average was worked out to 1.17 hectares (45.53%).

The gross cropped area of small, medium and large size group was 1.93 hectares, 4.09 hectares and 6.46 hectares, respectively and at overall level it was 3.70 hectares. The cropping intensity of small, medium and large size group was 148.46 per cent, 147.12 per cent and 145.82 per cent, respectively and at overall level it was 146.25 per cent.

5.1.6 Cropping pattern of selected green chilli growers

Cropping pattern of selected green chilli growers is said to be the result of past experience of farming, the type of soil available, irrigation resources and the pattern of distribution of rainfall in cultivation of different crops. The percentage area allocated to different crops with reference to gross cropped area by the selected green chilli growers has been present in Table 5.6.

The Table 5.6 revealed that the per cent share of area under *kharif* crop was higher in medium growers 65.28 per cent followed by small growers 64.77 per cent and large growers 63.31 per cent. The per cent share of area under *rabi* crop was the highest in small growers i.e. 30.05 per cent followed by large growers 28.79 per cent and medium growers i.e. 28.61 per cent.

Table 5.6. : Cropping pattern of selected green chilli growers (Area in ha.)

Sr. No.	Particulars	Small	Medium	Large	Overall
I	**kharif**				
1.	Soybean	0.43 (22.28)	1.05 (25.67)	1.43 (22.14)	0.87 (23.51)
2.	Cotton	0.41 (21.24)	0.92 (22.49)	1.34 (20.74)	0.80 (21.62)
3.	Tur	0.10 (5.18)	0.18 (4.40)	0.57 (8.82)	0.23 (6.22)
4.	Chilli	0.31 (16.06)	0.52 (12.71)	0.75 (11.61)	0.48 (12.97)
	Total	1.25 (64.77)	2.67 (65.28)	4.09 (63.31)	2.39 (64.32)
II	**Rabi**				
1.	Gram	0.21 (10.88)	0.44 (10.76)	0.62 (9.60)	0.38 (10.27)
2.	Wheat	0.26 (13.47)	0.49 (11.98)	0.97 (15.02)	0.50 (13.51)
3.	Onion	0.11 (5.70)	0.24 (5.87)	0.27 (4.18)	0.19 (5.14)
	Total	0.58 (30.05)	1.17 (28.61)	1.86 (28.79)	1.07 (28.93)
III	**Summer**				
1.	Groundnut	0.05 (2.59)	0.14 (3.42)	0.17 (2.63)	0.11 (2.97)
	Total	0.05 (2.59)	0.14 (3.42)	0.17 (2.63)	0.11 (2.97)

Sr. No.	Particulars	Small	Medium	Large	Overall
IV	**Horticultural**				
1.	Orange	0.04 (2.07)	0.08 (1.96)	0.24 (3.72)	0.10 (2.70)
2.	Banana	0.01 (0.52)	0.03 (0.73)	0.10 (1.55)	0.04 (1.08)
	Total	0.05 (2.59)	0.11 (2.69)	0.34 (5.26)	0.14 (3.78)
V	**Goss cropped area (GCA)**	1.93	4.09	6.46	3.70

(Figures in parentheses indicate the percentages to gross cropped)

The per cent share of area under summer crop was the highest in medium growers i.e. 3.42 per cent followed by large growers 2.63 per cent and small growers i.e. 2.59 per cent.

It is revealed from the Table that at overall level soybean, cotton and green chilli was the major crop of *kharif* season indicating the relatively higher area 23.51 per cent, 21.62 per cent and 12.97 per cent of the gross cropped area, respectively. The overall area under tur was 0.23 hectare i.e. 6.22 per cent.

In *rabi* season wheat and gram was the dominating crops. The percentage share of wheat was the highest in large growers i.e. 15.02 per cent followed by small growers 13.47 per cent and medium growers 11.98 per cent. The per cent share of gram crop was the highest in small growers i.e. 10.88 per cent followed by medium growers 10.76 per cent and large growers 9.60 per cent. The per cent share of onion was the highest in medium growers i.e. 5.87 per cent followed by small growers 5.70 per cent and large growers 4.18 per cent. At overall level area under wheat, gram and onion was 13.51 per cent, 10.27 per cent and 5.14 per cent, respectively.

In summer season, groundnut crop was grown. Per cent share of groundnut was the highest in medium growers i.e. 3.42 per cent followed by large growers i.e. 2.63 per cent and small growers 2.59 per cent.

In horticultural crops, orange and banana was dominating crops. Per cent share of orange was the highest in large growers i.e. 3.72 per cent followed by small growers i.e. 2.07 per cent and medium growers 1.96 per cent. Per cent share of banana was the highest in large growers (1.55 per cent) followed by medium growers (0.73 per cent) and small growers (0.52 per cent).

The overall area under *kharif* crop was 2.39 hectares i.e. 64.32 per cent, area under *rabi* crop was 1.07 hectares i.e. 28.93 per cent and area under summer crop was 0.11 hectares i.e. 2.97 per cent.

The gross cropped area of the small, medium and large growers were 1.93 hectares, 4.09 and 6.46 hectares, respectively. In which the area under green chilli cultivation in small, medium and large size group was 16.06 per cent, 12.71 per cent and 11.61 per cent, respectively. This Table indicated that the selected growers adapted diversified cropping pattern.

5.4 Marketing of green chilli

Marketing channels are the root through which produce move from producer to consumer. Following important channels were identified and distribution have been observed while studying the marketing of vegetables under study area. The process of production is not completed till the product reaches into the hands of final consumer. As such various aspects pertaining to marketing of green chilli viz., channels of distribution, price spread, producers share in consumer's rupees etc. have been studied.

5.4.1 Marketing channels of green chilli

Following marketing channel of distribution have been observed while marketing of green chilli.

Channel I : Producer – Consumer
Channel II : Producer – Retailer – Consumer
Channel III : Producer – Wholesaler – Retailer – Consumer

Table 5.14. Quantity of green chilli sold through different channels

Sr. No.	Channels	No. of growers	Quantity sold (Qt.)
1.	Channel I (Producer-Consumer)	15 (16.66)	408.00 (5.48)
2.	Channel II (Sale through Retailer)	31 (34.44)	1865.00 (25.06)
3.	Channel III (Sale through Wholesaler)	44 (48.88)	5168.00 (69.45)
	Total	**90 (100)**	**7441.00 (100.00)**

Table 5.14 revealed that channel III (Producer – wholesaler – Retailer – consumer), was the major channel of distribution and overall 44 (48.88 per cent) growers sold their produce by this channel, followed by channel II (34.44) per cent and channel I (16.66) per cent.

In channel I i.e. (producer – consumer) quantity sold was less i.e. 5.48 per cent and this channel was mainly followed by small growers. In channel III i.e. (producer– wholesaler – Retailer– consumer) quantity sold was 5168.00 quintals i.e. 69.45 per cent. The producer's share in consumer rupee is maximum when less intermediataries are included. It was observed that channel III i.e. (producer – wholesaler – retailer - consumer) is the major channel of distribution.

5.15 Marketing cost of green chilli

It is revealed from Table 5.15 that the per quintal marketing cost incurred by the green chilli growers was found highest in channel III (Rs. 164.09) followed by channel II (Rs. 84.19) and channel I (Rs. 81.93). The total marketing cost incurred by green chilli growers in channel I was Rs. 81.93. Marketing cost incurred by green chilli growers and retailer in channel II was Rs. 84.19 and Rs. 52.97 and in channel III marketing cost incurred by green chilli growers, wholesaler and retailer was Rs. 164.09, Rs. 25.05, Rs. 53.07, respectively.

Table 5.15. : Marketing cost of green chilli (Rs/Qtl)

Sr. No.	Particulars	Channel I	Channel II	Channel III
A	**Marketing cost incurred by Producer**			
1.	Cost of bag	10.00	10.00	10.00
2.	Packing	3.60	3.68	3.77
3.	Loading charges	9.73	10.19	10.23
4.	Transportation charges	36.93	38.06	38.64
5.	Weighing Charges	2.33	2.68	2.68
6.	Hamali	9.53	9.71	9.73
7.	Dalali @ 10%	-	-	79.09
8.	Unloading charges	9.80	9.87	9.95
	Sub-total	81.93	84.19	164.09
	Selling Price of Producer	2846.67	2704.84	2610.23
B	**Marketing cost incurred by Wholesaler**			
	Purchase price of wholesaler			2610.23
1.	Weighing charges	-	-	2.55
2.	Hamali	-	-	9.41
3.	Cess fund	-	-	13.09

Sr. No.	Particulars	Channel I	Channel II	Channel III
	Sub-total			25.05
	Selling price of Wholesaler	-	-	2959.09
	Marketing margin	-	-	323.81
C	**Marketing cost incurred by Retailer**			
	Purchase price of retailer		2704.84	2959.09
1.	Cost of bag	-	10.00	10.00
2.	Transportation charges	-	30.48	30.57
3.	Hamali	-	9.81	9.82
4.	Weighing charges	-	2.68	2.68
	Sub-total		52.97	53.07
	Selling Price of retailer	-	3190.32	3429.55
	Marketing margin	-	432.52	417.39
	Purchase price of consumer	2846.67	3190.32	3429.55
	Total marketing cost	60.33	137.16	242.21

5.4.3 Price spread in marketing of green chilli

The details about the price spread, producer's share in consumer's rupee were estimated in Table 5.16.

Table 5.16. : Price spread in marketing of green chilli (Rs./qt.)

Sr. No.	Particulars	Total Price (Rs./qtl.)		
		Channel-I	Channel-II	Channel-III
1.	Net price received by growers	2764.73 (97.12)	2620.65 (82.14)	2446.14 (71.33)
2.	Total marketing cost	81.93 (2.88)	137.16 (4.30)	242.21(7.06)
3.	Total market margin	-	432.52 (13.56)	741.20 (21.61)
4.	Selling price of retailer / purchase price of consumer	2846.67 (100.00)	3190.32 (100.00)	3429.55(100.00)

(Figures in parentheses indicates the percentage to price paid by consumer)

Table 5.16 showed the net price received by the green chilli growers or the producers share in consumer rupee was the highest i.e. 97.12 per cent in channel I followed by channel II (82.14 per cent) and channel III (71.33 per cent) while the total marketing cost in channel I was 2.88 per cent followed by channel II (4.30 per cent) and channel III (7.06 per cent). The price paid or purchase price of the consumer in channel I was Rs. 2846.67 per quintal in which producers share was 97.12 per cent. The price paid by the consumer in channel II was Rs. 3190.32 per quintal in which producers share was 82.14 per cent. The price paid by the consumer in channel III was Rs. 3429.55 per quintal in which producers share was 71.33 per cent. Highest market margin was observed in channel III i.e. 21.61 per cent. It was found that comparatively channel-I found more profitable than channel II and channel III in green chilli marketing.

Constraints in production and marketing of green chilli

All the selected green chilli growers were interviewed for the problems they are facing while taking production and marketing of green chilli. The information regarding the important problems faced by the green chilli growers is presented in Table 5.17.

Table 5.17. : Constraints in production and marketing of green chilli

Sr. No.	Particulars	Size of holding			
		Small	Medium	Large	Overall
A)	**Constraints in production of green chilli**				
1.	High cost of inputs	35.00 (89.74)	27.00 (90.00)	16.00 (76.19)	78.00 (86.67)
2.	Unfavourable climate	29.00 (74.36)	17.00 (56.67)	9.00 (42.86)	55.00 (61.11)
3	Non availability of labours	31.00 (79.49)	25.00 (83.33)	16.00 (76.19)	72.00 (80.00)
4	Lack of technical knowledge about pest and diseases and its control	29.00 (74.36)	16.00 (53.33)	11.00 (52.38)	56.00 (62.22)
5	Electricity problem	23.00 (58.97)	11.00 (36.67)	8.00 (38.10)	42.00 (46.67)
B)	**Constraints in marketing of green chilli**				
6	Inadequate storage facilities	30.00 (76.92)	26.00 (86.67)	14.00 (66.67)	70.00 (77.78)
7	Uncertainty of prices	35.00 (89.74)	24.00 (80.00)	18.00 (85.71)	77.00 (85.56)
8	Transportation	36.00 (92.31)	23.00 (76.67)	14.00 (66.67)	73.00 (81.11)
9	High commission charges	28.00 (71.79)	21.00 (70.00)	17.00 (80.95)	66.00 (73.33)
	Total	**39 (100)**	**30 (100)**	**21 (100)**	**90 (100)**

(Figures in parentheses indicates the percentages to total)

Table 5.17 revealed that important constraints faced by green chilli growers while production were high cost of inputs, unfavourable climate, non availability of labours, lack of technical knowledge about pest and diseases and it's control and electricity problem. The overall percentage share of high cost of inputs, unfavourable climate, non availability of labours, lack of technical knowledge about pest and diseases and it's control and electricity problem was 86.67 per cent, 61.11 per cent, 80.00 per cent, 62.22 per cent and 46.67 per cent, respectively.

The problem faced by green chilli growers while marketing were, inadequate storage facilities, uncertainty of prices, transportation and high commission charges. Overall percentages of inadequate storage facilities, uncertainty of prices, transportation and high commission charges were 77.78 per cent, 85.56 per cent, 81.11 per cent and 73.33 per cent, respectively.

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RESEARCH ARTICLE

Participatory rural appraisal of Tiwsa villege

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ABSTRACT

Participatory Rural Appraisal is considered one of the popular and effective approaches to gather information in rural areas The present study "Participatory rural appraisal of Tiwsa village" was undertaken in village Tiwsa in Panchayat Samiti, Akola district in Maharashtra State. A sample of all 292 households were selected from village sample of Tiwsa in Panchayat Samiti Akola. An exploratory research design way used in the present study. The data from the households were collected with the help of interview schedule and PRA methods. In study, it relates to personal socio economic and situational characteristics of households. Findings reveal that the majority of population were 36 to 50 years of age. Most of the households had secondary and higher level School of education. Most of the household were having small land of holding and annual income between Rs. 50,001 to 1,00,000. Most of the population belonging to schedule caste (SC) category in village. Source of information available as a formal and informal type of sources.67.37 percent had use medium level sources of information. 55.61 percent of the households had low social participation. Most of the households were engaged in agriculture occupation. Majority of the households had no source of irrigation. Most of the households possessed medium wealth.

In study, social map, soil map, water resource map, agro ecological map, crop mapping, technology map, trend analysis of employment of farmers and farm women, trend analysis of pest and diseases, transect of village, venn diagram of village Tiwsa were considered. The problems with respect to agriculture health and sanitization marketing transportation and social economic aspects were identified. The action plan is proposed for 2023-24 on the basis of selected major problems. It made by considering resource availability at the villages and area. Pertaining to collaborative and co-operative efforts with participation of the villager.

Key Word: PRA, Socioeconomic status , social map ,soil map, problem

INTRODUCTION

India has most organized and sustainable social system in the world. However India is still a developing country after 75 years of independence with ¼ world population. India is struggling hard to improve its rank position among the list of developing nations of world and there are between 600,000 and one million villages in India and 65.07 per cent of people live in those villages. For most of the developmental activities central point has

been village, poor person and women. PRA is an attitude and a method which helps the outsiders to quickly understand village systems from the villager's point of view. This attitude and methods has emerged from a growing realization that development workers who do not know much about much diverse village situation. PRA is an improved technique over the traditional social science research and may serve as alternative tool for rural analysis while social science research has its own role in rural investigation. PRA is an innovation and improvement over all the traditional survey methods (Singh, 2001). Social survey is the fact finding process. As village is the basic unit of rural society which is undergoing changes, the need of today is to undertake socio-economic survey of village communities to represent the different parts of the country. So as to understand the existing conditions and to plan what needs to be done in future. The socio-economic survey are helpful in planning further development of community and to improve the welfare and rural people. (Zambre 1975). So, PRA is required For: Cutting down time consuming long methods of survey which yield results after Considerable time. Advocating that people themselves are "solution agents" for their needs and problems. Dispensing with normal "professional" biasness and alienation of resource poor farmers. Sustained change and the need for accurate and timely information. The PRA method is cost effective, accurate and less time consuming. The findings of the present study would identify and priorities the development problems of the farmers about agriculture and alight aspects by resource method and socio-economic survey of farmers in village Tiwsa and prepare action plan for solving the selected priority problems.

Objective of the study

1. To undertake socioeconomic survey of Tiwsa village
2. To undertake resource mapping of Tiwsa village
3. To identify and priorities the development problems of the village about agricultural and allied aspects
4. To prepare action plan for solving the selected priority problem

METHODOLOGY

The present study entitled "Participatory Rural Appraisal of Tiwsa Village "was undertaken in Tiwsa village, taluka Akola, district Akola which adopted by Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, in the state of Maharashtra. The research was based on the agro-ecological study. The geographical area covered by village Tiwsa account's to 887 hectares during 2020-21, out of which 585.45 hectares area is under cultivation. Barren and uncultivated land is 9.53 hectares. Area under forest is 240.85 hectares; area under permanent pasture and grazing land is 30.8 hectares. Area under fallow land is 20.37 hectares. The soil type of Tiwsa village comes under heavy to light. The village comes under Vidharbha zone. The maximum temperature ranges between 19 °C to 45°C. While minimum temperature is 19°C in winter season. The mean annual rainfall of village Tiwsa is 846.5mm. The major kharif crops in village Tiwsa are cotton, soybean and pigeon pea. A few acreage is under green gram and black gram. In rabi season wheat is an important crop. Gram is taken in small area. In summer groundnut and green gram are major crops. Lemon, custard apple, guava and pomegranate are the orchard grown in the village. Tiwsa is 25 km away from Akola city. All type of transportation is available here because state highway is passing through the village. For conducting the

present study diagnostic and descriptive research design of social research has been used.

This being a population study, all the 292 households have been studied. An interview schedule consisting of various questions connected with objectives of study was developed for collecting primary information of village. The schedule was prepared in local language. The data was collected by personal interview of respondents at home or at farm on the various aspects related to the objectives of the study. In all, 292 households were contacted and required information obtained from them. The key informants, meeting with villagers and observation by researcher provided information about village. Secondary data was collected from Talathi and Gram Panchayat record. PRA methodology includes social mapping, wealth ranking, livelihood analysis, agro ecological mapping, transect walk, timeline, trend analysis, seasonal calendar, venn diagram etc. The data was analyzed and interpreted on the basis of percentage and mean. The problems regarding agricultural development, social development health and sanitation etc. were identified. The problems were then prioritized and action plan is suggested.

RESULTS AND DISCUSSION

Table 1 : Distribution of the respondents according to socio-economic and situational characteristics of villagers

Sl. No.	Characteristics	Category	Respondents	
			Frequency	Percentage
1.	**Age (years)**			
		Young (Upto 35)	419	34.45
		Middle (36 to 50)	613	50.52
		Old (51 and above)	184	15.13
		Total	**1216**	**100**
2.	**Education**			
		Illiterate	300	27.37
		Primary	135	12.32
		Middle	133	12.13
		Secondary	230	20.99
		Higher	176	16.05
		College	122	11.14
		Total	**1096**	**100**
3.	**Caste**			
		OBC	350	28.78
		SC	400	32.89
		ST	180	14.81
		VJ/NT	225	18.51
		Other	61	5.01
		Total	**1216**	**100**
4.	**Occupation**			
		Agriculture	104	35.61
		Agriculture + Labour	79	27.06

Sl. No.	Characteristics	Category	Respondents	
			Frequency	Percentage
		Labour	96	32.88
		Agriculture + Service	4	1.37
		Service	6	2.05
		Business	3	1.03
		Total	**292**	**100**
5.	**Land holding**			
		Landless	105	35.95
		Marginal	2	0.69
		Small	103	35.28
		Semi medium	60	20.55
		Medium	20	6.84
		Large	2	0.69
		Total	**292**	**100**
6.	**Sources of irrigation**			
		Well8027.39		
		No irrigation21272.61		
		Total292100		
7.	**Sources of information**			
		Low	25	13.37
		Medium	126	67.37
		High	36	19.26
		Total	**187**	**100**
8.	**Social participation**			
		Low	36	19.25
		Medium	104	55.61
		High	47	25.14
		Total	**187**	**100**
9.	**Sources of loan**			
		Cooperative society	490780	71.20
		Nationalized bank	27390	3.97
		Private bank	12000	1.74
		Relatives	60950	8.84
		Others	98120	14.25
		Total	**689240**	**100**
10.	**Annual income**			
		Upto 50,0005	61	9.17
		50,001 to 1,00,00010	23	4.93
		1,00,001 to 1,50,000	74	25.34
		1,50,001 and above	60	20.56
		Total	**292**	**100**
11.	**Annual expenditure**			
		Food	1003000	21.54
		Housing	160450	3.44
		Education	150800	3.23

Sl. No.	Characteristics	Category	Respondents	
			Frequency	Percentage
		Clothing	39900	0.85
		Health	149800	3.21
		Travelling	266700	5.72
		Lighting	246000	5.28
		Religious functions	451500	9.69
		Agriculture + others	2187000	46.98
		Total	**4655150**	**100**
12.	**Wealth ranking**			
		Low	52	27.80
		Medium	101	54.01
		High	34	18.19
		Total	**187**	**100**

The age wise distribution of the respondents presented in Table 1 shows that more than half of the total populations (50.52%) were upto 36 to 50 years of age. Respondents 20.99 percent and 16.05 percent who were educated upto secondary school and higher school level respectively. In case of caste category, 32.89 percent population belongs to schedule caste (SC) category followed by 28.78 percent OBC category. The 35.61 percent households were engage in agriculture as the occupation. The land holding portion of small households was 35.28 percent and semi medium households were 20.55 percent. Only 27.39 percent of the households possessed had well as a source of irrigation. The majority of the respondents (67.37%) were medium in respect of use of information sources. The 55.61 percent respondents had medium level of social participation. Most of the households (71.20%) borrowed loans from cooperative society. Relatively higher portion of the households 34.93 percent of households were found in the income group from Rs. 50,001 to 1,00,000. Family consumption expenditure on agriculture + other has largest share constituting 46.98 percent. It is observed that majority of the households (54.01%) were in medium wealth category.

Identification and prioritization of development problems of village Tiwsa

1. Non availability of veterinary clinic and A.I. center
2. Low productivity of crops
3. Non availability of storage facilities
4. Non availability of pure drinking water
5. Inadequate facilities of protective irrigation for field crops
6. Non availability of English medium school in village
7. Lack of technical knowledge about agriculture
8. Non availability of farm ponds
9. Lack of drainage system for waste water disposal
10. Labour problems during peak season
11. High labour charges and travelling cost during peak season
12. High cost of production
13. Low yield and productivity of crops and livestock

14. Small land holdings/fragmented land holdings
15. Problems of attack of wild animals to crop
16. Non availability of market for sale of agriculture produce
17. No agro based industry in village
18. Non availability of inputs in village

- **Action plan for solving the selected priority problems**

Action plan to get high income from Agriculture

Sr. No.	Intervention methods	Solution overcome the problem	Activities to be undertaken	Technical guidance	Start Time	End time	Farmers role	Agencies to involvement	No. of farmers to be benefited
1	Low livestock availability	Develop subsidiary occupation	Milk production (buffalo, cow)	Veterinary officer	July	Dec	Self involvement	Farmer, labour Bank	
			Goat farming	Veterinary officer	July	Dec	Self involvement	Farmers, labour Bank	
			Poultry	Veterinary officer	July	Dec	Self involvement	Farmers labour Bank	
2	High expenditure on chemical and fertilizers	Inadequate pest management	Adoption of neem oil extract crycopa, NaNPV	Ag.AsstExt. worker, KVK	July	Dec	Self involvement in use of management practices	Ag. Asst. Ext, agency KVK, NGO	
			Biological control	Ag.Asst. Ext. Agency KVK	July	Dec	Self involvement in use of management practices	Ag. Asst. Ext. Agency KVK, NGO	
3	Inadequate irrigation facilities for protective irrigation	Develop irrigation facilities	Construction of Wells	Ag. Asst. KVK	Dec	Feb	Self involvement	Ag. Asst. Bank	
			Make tube wells	Ag. Asst. KVK	June	Dec	Self involvement	Ag. Asst. Bank	
			Farm pond	Ag. Ext. officer Gramsevak KVK	June	Dec	Self involvement	Farmers labour	
4	Improved yield production	Adoption of Recommended package of practices	Crop rotation	Ag. Asst. KVK	June 2023	Dec 2023	Self involvement	Farmers extension agency NGO	
			Intercrop ping	Ag. Asst. KVK	June 2023	Dec 2023	Self involvement	Farmers extension agency NGO	
			Sowing across the slope	Ag. Asst. Extension workers	June 2023	Dec 2023	Self involvement	Farmers extension agency NGO	
			Use of organic fertilizer	Ag. Asst Ext Agency	June 2023	Dec 2023	Self involvement	Farmers extension agency NGO	
		Extension activity	Arrange demonstrations on farmers field	Ag. Asst. Extension agency KVK	July 2023	Nov 2023	Participation and learning with enthusiasm	Ag. Asst. Ext. Worker KVK NGO	
			Method demonstrations on farmers field	Ag. Asst. Ext. Agency KVK	July 2023	Nov 2023	Participation and learning with enthusiasm	Ag. Asst. Ext. Worker KVK	

			Seed trial plot on farmers field	Ag. Asst. Ext agency KVK	July 2023	Nov 2023	Self involvement	Farmers extension agency NGO	
5	No agro based industry	Develop agro based activity	Develop shetakari Bachat gat	Ag. Asst. Gramsevak	June 2023	Dec 2023	Self involvement	Farmers grampanc hayat	
			Dal / Mill	Ag. Asst	Oct 2023	Nov 2023	Self involvement	Farmers Bank	

CONCLUSION

The findings of the present study are summarized below

1. Regarding the age group, it was found that 50.52 percent respondents of 36 to 50 age group. 34.45 and 15.13 percent of total population upto 35 and 51 and above age group respectively.
2. Regarding the education, literacy percentage was 72.63 according to standard of education. 20.99 and 12.13 percent were reached upto secondary and middle school level.
3. Regarding land holdings, 35.28 and 20.55 percent land holdings small and semi medium respectively. 6.84 percent medium land holdings.
4. It was found that 34.93 percent households possessed 50,000 to 1,00,000 annual income. 19.17 percent was upto 50,000.
5. In case of Caste category, majority of the population belongs to schedule caste (SC) which is 32.89 percent of the total population.
6. In the village, 35.61 percent households were dependent on agriculture occupation.
7. Social participation was 32.20 and 8.89 percent of households was medium and high respectively.
8. Regarding source of irrigation, 27.39 percent households possessed well as source of irrigation.

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RESEARCH ARTICLE

Impact of Dr. PDKV Released Variety JAKI-9218 of chickpea on the growers

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Abstract

The research study was purposively conducted in Akola district of Vidarbha region. The impact of Chickpea variety JAKI-9218 has been studied in terms of change in knowledge, change in adoption, change in productivity, change in area under Chickpea var. JAKI-9218 and change in income. It was also found that there was change in knowledge, adoption, productivity, area under Chickpea variety JAKI-9218 and income to the tune of 62.81, 49.98, 72.36, 31.69 and 86.23 per cent, respectively after cultivation of Chickpea variety JAKI-9218 over before cultivation of Chickpea variety JAKI-9218. Thus, it was found that, there was a total impact of (60.61 %) on Chickpea growers of variety JAKI-9218.

Keywords : Impact,Chickpea,JAKI-9218. Change in area under JAKI-9218 variety

INTRODUCTION

Chickpea (*Cicer arietinum*) commonly known as Chana or Bengal Gram Chickpea is considered the third most important pulse in the world, being widely grown in many subtropical and warm-temperate regions. Chickpea belongs to family Leguminoceae (Fabaceae). Chickpea contains 21.1 per cent protein, 61.5 per cent carbohydrates, 4.5 per cent fat. Chickpea is considered to have medicinal effects and it is used for blood purification. Having a capacity to stand in drought conditions, this crop does not have the requirement being fed with nitrogen fertilizers.

India ranks first in area and production of Chickpea in World contributing nearly 2/3rd area and production of Chickpea in the world i.e., 67% share in global production (FAOSTAT2019).In India 2020-21 Chickpea area 9.99 million ha and production of 11.91 million tonnes (Anonymous 2020-21). Maharashtra state ranks second in area and production of Chickpea in India after Madhya Pradesh. In Maharashtra, Amravati district leads in Chickpea production, with a share of 8%, followed by Akola (7%),Ahmednagar (7%). (District-wise average production share calculation has been done for 10 years i.e., 2005-2014-DES, MoA).

In the varietal front the Pulses Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola has made significant progress by releasing different Chickpea varieties for Maharashtra. The unit has released remarkable varieties of Chickpea viz., JAKI 9218, PKV Kabuli-2, PKV Kabuli-4, PDKV-KANCHAN, PDKV- KANAK, PKV-HARITA etc. Chickpea variety JAKI-9218 was released in 2007. The variety is tolerant to wilt disease and resistant to lodging and shattering.Seeds are generally bold seeded in appearance and having size of 20-27 g. It is suitable in both rainfed and irrigated

condition. It is high yielding variety and semi- spreading type. It gives 18-20 qt/ha yield and crop duration is of 105-110 days.

MATERIALS AND METHODS

In present study, exploratory design of social research was used. The study was carried out in Akola district of Vidarbha region of Maharashtra state. The list of villages growing Chickpea were taken from office of the Taluka Agriculture Office, Akola having last three years data of Chickpea growers in Akola district. The villages were selected on the basis of high acreage of Chickpea growers villages in Akola district as per list and from such villages the farmers growing JAKI-9218 from last three years were selected as respondents on random basis for collection of data. The data was collected from the selected villages from 150 Chickpea growers.

RESULTS AND DISCUSSION

The data with regards to the level of change in knowledge possessed by the Chickpea growers variety JAKI-9218 have been furnished in table 1.

Table 1 : Distribution of Chickpea growers according to their change in knowledge level about recommended cultivation practices.

Sl. No.	Category	Before (n=150)		After(n=150)	
		Frequency	Percent	Frequency	Percent
1.	Low (up to 33.33)	14	09.33	04	02.66
2.	Medium (33.34 to 66.66)	133	88.67	25	16.67
3.	High (above 66.66)	03	02.00	121	80.67
	Total	**150**	**100.00**	**150**	**100.00**

From Table-1 it is observed that, before cultivation of Chickpea variety JAKI-9218, 88.67 per cent of the respondents were found in medium level of knowledge from the Chickpea crop. However, after cultivation of Chickpea variety JAKI-9218, 80.67 per cent respondents were found in the high-level category having index range (above 66.66).

The data with regards to the level of change in adoption possessed by the Chickpea growers variety JAKI-9218 have been furnished in Table-2.

Table 2 : Distribution of Chickpea growers according to their change in adoption level about recommended cultivation practices.

Sl. No.	Category	Before (n=150)		After(n=150)	
		Frequency	Percent	Frequency	Percent
1.	Low (up to 33.33)	12	08.00	05	03.33
2.	Medium (33.34 to 66.66)	133	88.67	20	13.34
3.	High (above 66.66)	05	03.33	125	83.33
	Total	**150**	**100.00**	**150**	**100.00**

From Table-2 it can be showed that, before cultivation of Chickpea variety JAKI-9218, the respondents were found in medium level of adoption i.e., 88.67 per cent. However, after cultivation of Chickpea variety JAKI-9218, 83.33 per cent respondents were found in the high-level category having index range (above 66.66).

Table 3 : Distribution of Chickpea growers according to their change in productivity of Chickpea crop before and after cultivation of JAKI-9218 variety

Sl. No.	Category	Before (n=150)		After(n=150)	
		Frequency	Percent	Frequency	Percent
1.	Low (up to12.00 qt/ha)	34	22.67	02	01.33
2.	Medium (12.01qt/ha to 24.00 qt/ha)	113	75.33	118	78.67
3.	High (above 24.00 qt/ha)	03	02.00	30	20.00
	Total	**150**	**100.00**	**150**	**100.00**

It is evident from Table-3 that, before cultivation of Chickpea variety JAKI-9218, all the respondents were found in medium level of productivity from the Chickpea crop i.e., 12.01 qt/ha to 24.00 qt/ha. However, after cultivation of Chickpea variety JAKI-9218, 78.67 per cent respondents were found in the medium-level category having range from 12.01 qt/ha to 24.00 qt/ha.

Table 4 : Distribution of Chickpea growers according to their change in area under chickpea variety JAKI-9218 before and after cultivation of JAKI-9218 variety

Sl. No.	Category	Before (n=150)		After(n=150)	
		Frequency	Percent	Frequency	Percent
1.	Low (up to 1.00 ha)	66	44.00	43	28.67
2.	Medium (1.01 ha to 2.00 ha)	59	39.33	66	44.00
3.	High (above 2.00 ha)	25	16.67	44	29.33
	Total	**150**	**100.00**	**150**	**100.00**

It is evident from Table-4 that, before cultivation of Chickpea variety JAKI-9218 44.00 per cent of the respondents were found in low level of area under Chickpea variety JAKI-9218 i.e., 1.01 ha to 2.00 ha. However, after cultivation of Chickpea variety JAKI-9218, 44.00 per cent respondents were found in the medium-level of area under Chickpea variety JAKI-9218.

Table 5 : Distribution of the Chickpea growers according to change in income from Chickpea crop before and after cultivation of JAKI-9218 variety

Sl. No.	Category	Before (n=150)		After(n=150)	
		Frequency	Percent	Frequency	Percent
1.	Low (up to 1.00 ha)	66	44.00	43	28.67
2.	Medium (1.01 ha to 2.00 ha)	59	39.33	66	44.00
3.	High (above 2.00 ha)	25	16.67	44	29.33
	Total	**150**	**100.00**	**150**	**100.00**

It is evident from Table-5 that, 56.00 per cent of the Chickpea growers were found in the income category up to Rs.50000/- before cultivation of JAKI-9218 variety and 90.67 per cent having income up to Rs. 50001 to 100000/- and 07.33 per cent were found in the income category above Rs 100001/- after cultivation of JAKI-9218 variety.

Table 6 : Overall Impact of JAKI-9218 variety on the Chickpea growers

Sr. No.	Impact Dimension	Mean score		Per cent Change
		Before	After	
1.	Change in Knowledge	47.76	77.76	62.81
2.	Change in Adoption	48.78	73.17	49.98
3.	Change in Productivity	11.61	20.01	72.36
4.	Change in Area under Chickpea var JAKI-9218	01.43	01.88	31.69
5.	Change in Income	5146	995849	86.23
	Overall Mean Impact			**60.61**

A cursory look at Table-6 revealed that, mean score of change in knowledge (77.76), change in adoption (73.17), change in productivity (20.01), change in area under Chickpea var JAKI-9218 (01.88) and change in income (Rs.95849) on the Chickpea growers after cultivation of JAKI-9218 variety is higher than the mean score of change in knowledge (47.76), change in adoption (48.78), change in productivity (11.61), change in area under Chickpea var JAKI-9218 (01.43) and change in income (Rs.51469) before cultivation of Chickpea variety JAKI-9218.

It was found that, there was change in knowledge, adoption, productivity, area under Chickpea variety JAKI-9218 and income to the tune of 62.81, 49.98, 72.36, 31.69 and 86.23 per cent, respectively after cultivation of Chickpea variety JAKI-9218 over that before cultivation of Chickpea variety JAKI-9218. The overall mean impact of JAKI-9218 variety on the Chickpea growers was 60.61 per cent as a whole.

To test the variability of means of knowledge, adoption, productivity, area under Chickpea variety JAKI-9218 and income of Chickpea growers before and after cultivation of Chickpea variety JAKI-9218. The data were subjected to 'z' test and the result obtained have been presented in Table-7.

Table 7 : Testing the significance difference of the means.

Sr. No.	Dimensions of Impact	Mean score		'Z value'
		Before	After	
1.	Change in Knowledge	47.76	77.76	22.86**
2.	Change in Adoption	48.78	73.17	22.46**
3.	Change in Productivity	11.61	18.79	32.06**
4.	Change in Area under Chickpea var JAKI-9218	01.43	01.88	03.44**
5.	Change in Income	51469	95849	34.50**

A difference between the mean score before and after cultivation of Chickpea variety JAKI-9218 by the Chickpea growers is not conclusive proof of its superiority. Hence, the ratio between observed differences were computed as indicated by 'Z' values. The 'z' values of knowledge (22.86), adoption (22.46), productivity (32.06), area under Chickpea variety JAKI-9218 (03.44) and income (34.50) were found positive and highly significantly at 0.01 level of probability.

It could, therefore, be inferred from Table-7 that the after cultivation of Chickpea variety JAKI-9218 by the Chickpea growers they differ significantly in terms of knowledge, adoption, productivity, area under Chickpea variety

JAKI-9218 and income and had a positively significant impact on the Chickpea growers.

CONCLUSION

The findings of the research study concluded that, there was change in knowledge, adoption, productivity, area under Chickpea variety JAKI-9218 and income to the tune of 62.81, 49.98, 72.36, 31.69 and 86.23 per cent, respectively after cultivation of Chickpea variety JAKI-9218 over that before cultivation of Chickpea variety JAKI-9218. The overall mean impact of JAKI-9218 variety on the Chickpea growers was 60.61 per cent as a whole. It was also concluded that, after cultivation of Chickpea variety JAKI-9218 by the Chickpea growers they differ significantly in terms of knowledge, adoption, productivity, area under Chickpea variety JAKI-9218 and income and had a positively significant impact on the Chickpea growers.

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RESEARCH ARTICLE

Reading behaviour of subscribers of a farm magazine

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ABSTRACT

Vigiyanak Pashu Palan (VPP) is the monthly magazine published by GADVASU, Ludhiana in Punjabi since 2007. Because of lack of any study regarding reading behaviour of subscribers of this magazine, the present investigation was taken up to analyse reading interests and habits of subscribers of VPP. The data was collected through well-structured interview schedules from 200 subscribers selected randomly from the list of subscribers updated in January, 2020. It was mainly the subscriber (59.5%) himself who used to read the magazine. Majority (39.5 %) liked to read the magazine at home (72.0 %) in the afternoon (39.5 %) for half to one hour (67.0 %) and found the articles relevant (> 90 %) to their enterprise. Majority (74.0 %) of them used to stock old issues and they did share (72.0 %) the information with others. Around 80 per cent of the farmer found no disliking feature in any issue of the magazine and Charts, tables and illustrations were the most striking features. In conclusion, VPP is a very good source of newer information. Authors may be advised to include more tables, charts or photographs in their articles to make them more attractive and readable.

Key Words: Farm magazine, subscribers, reading behaviour and Vigiyanak Pashu Palan

INTRODUCTION

Farm periodicals play an important role in dissemination of the information, skills and newer technologies to the masses in the state. Many universities or institutes have their own magazines published in vernacular languages and are meant for farming community residing in their jurisdiction area. Punjab Agricultural University, Ludhiana publishes *Changi Kheti* in Punjabi, Indian Veterinary Research Institute, Izatnagar publishes *Sanchetna* and *Pashu Chikitsa Vigyan* in Hindi, Tamil Nadu Veterinary and Animal Science University, Chennai publishes *Kalnadai Kathir* and *Meenvalak Kathir* in Tamil while GB Pant University of Agriculture and Technology publishes *Kisan Bharti* in Hindi.

VIGIYANAK PASHU PALAN (VPP) is a monthly magazine published in Punjabi language by Guru Angad Dev Veterinary and Animal Sciences University. Its publication started in the month of September, 2007. The usefulness of these magazines is reflected in the reading behaviour of its subscribers (Chavda and Dave, 1993). The present investigation was taken up to determine reading interests and habits of subscribers of VPP.

METHODOLOGY

The data was collected through a well-structured interview schedule. The

later had questions pertaining to reading interests and habits of the readers. Most of the questions were of closed-end type. A few open-ended questions were also included in the schedule to judge the attitude of subscribers towards VPP.

After thoroughly reviewing the schedule by Advisory Committee members and other teachers of the department in terms of validity, content, drafting of questions and clarity of thought, the final schedule was prepared. The questions that would have quantitative values as answers were also tested by split half method on 20 members of Punjab Livestock Farmers Association when they visited the university campus for their routine monthly seminar.

The audience for this study was the subscribers of VPP magazine of calendar year 2020 and the month of January was taken as the reference month. A total of 5321 copies had been posted to the subscribers during the reference month of January, 2020. Institutional subscribers, sponsored subscribers and non-farmer subscribers were excluded from this list. This was done because of the fact that the most important stakeholders are the livestock farmers only and there was all likelihood that they read this magazine at one or the other time. After exclusion of this particular set of subscribers, the remaining list constituted the sampling frame. It had 3855 units. Each unit was assigned a serial number. Every effort was made to avoid duplication of addressees.

Out of the population of 3855 subscribers and expected proportion with 5 per cent absolute precision and 95 per cent confidence level, a sample size of 351 was mandatory. From the sampling frame, a total of 351 subscribers were selected randomly by using random number tables. However, the information could be collected from 200 respondents only. The other respondents were either not approachable or not willing to get interviewed or were not present at home at the time of visit. A few others had even left the business of livestock farming. So, the response rate was 56.98 per cent only. The sample size could not be restored to 351 because of time and financial constraints.

The data were collected during period of March, 2022 - June, 2022 through personal interviews or telephonic conversations and the responses were recorded by the interviewer herself on the schedule.

In a few situations, the respondent couldn't able to provide responses to all the questions. In that situation, the schedules were ignored and newer subscribers in the serial list were approached. However, responses from 200 subscribers were collected and filled-in schedules were carefully tagged in an Index File in sequence in which the interviews were conducted till further use.

All the data was first converted into numerical form, then, entered into a Master-Sheet by using Microsoft-Excel programme. The data was, then, analysed by using SPSS (Statistical Package for Social Sciences) version 16.0. The variables were depicted in the form of mean ± standard deviation. The proportion of respondents was depicted as percentages. Significance of proportion of respondents for different variables was tested with ^{2} test and the significance was fixed at 5 per cent level.

RESULTS AND DISCUSSION

Reading habits of respondents with respect to VPP magazine have been mentioned in Table 1 and have been explained under various heads.

Table 1. Reading habits of respondents

Variable	Levels	No of subscribers	Percentage	Cumulative Percentage
Maximum No of family members who read VPP	1	119	59.55	9.5
	2	55	27.58	7.0
	3	19	9.59	6.5
	4	7	3.51	00
Reading site	At Home	114	57.0	
	At Farm	86	43.0	
Moment of the day for reading VPP	Before Noon	60	30.0	
	After Noon	79	39.5	
	During Night	61	30.5	
Time spent for reading VPP	15 min	40	13.5	13.5
	30 min	78	27.5	41.0
	60 min	55	39.0	80.0
	120 min	27	20.0	100
Need to read the article second time	Yes	105	52.5	
	No	95	47.5	
Amount of issue read at one time	Less than ¼	56	28.0	28.0
	About ¼ -1/2	59	29.5	57.5
	About ½-3/4	42	21.0	78.5
	More than ¾	43	21.5	100
Relevance of articles	Not relevant	18	9.0	
	Sometimes relevant	91	45.5	
	Always relevant	91	45.5	
Single- or Multiple- topic issue	Single-topic	104	52.0	
	Multiple-topic	96	48.0	
Interest in Ads	Yes	92	46.0	
	No	108	54.0	
Sharing of information	Yes	144	72.0	
	No	56	28.0	
Stocking old issues of VPP	Yes	148	74.0	
	No	52	26.0	
Most disliking feature of VPP	No disliking Feature	161	80.5	
	Chart and table	17	8.5	
	Languages	11	5.5	
	Picture/Photo	3	1.5	
	Text	8	4.0	
Most liking feature of VPP	Charts and Tables	60	30	
	Language	48	24	
	Pictures/Photos	55	27.5	
	Text	37	18.5	
Expectations from VPP	No response	27	13.5	
	Regularity in delivery	69	34.5	
	Availability in digital mode	52	26.0	
	Regularity and digital mode	52	26.0	

[1]Primary and secondary readership

It was mainly the subscriber (59.5%) himself who used to read the magazine. The farmer who subscribes the magazine gets motivation to do so from many sources. Since, it is the subscriber who gets motivated; he/she is the one who likes to read it. The number of persons other than the subscriber who used to read VPP magazine is quite low. These secondary readers mostly existed in the family itself. Only one secondary reader was there in 27.5 per cent of families. Just 13 per cent families registered three or more secondary readers.

Vigiyanak Pashu Palan is not a magazine of general interest; rather, it contains specific information related to livestock farming and its allied subjects. It could be the reason of low number of secondary readers of VPP magazine.

Reading place

More than half of the respondents (57 %) read VPP magazine and other related technical literature at home. Singh and Singh (2014) also found more than half of the respondent livestock farmers (52.14%) reading newspaper at home.

When the farmer is busy doing something and remains engaged at the farm for some or the other activity, he never thinks of doing any other activity other than the activity at hand. He gets free time only when he is at home. This is the most plausible explanation for getting very high number of farmers reading farm literature at home.

Time (moment) of the day for reading VPP

Most of the subscribers (39.5 %) liked to read the magazine in the afternoon. Equally good number of subscribers got time to read VPP before noon or during night hours. Livestock farmer usually get free time either in the afternoon just post meridian or during night just before going to bed. Farmers in mixed farming enterprises remain engaged throughout daytime and they get a chance to relax during night hours only. The secondary reader may get opportunity to read the magazine at any time during whole day.

Time spent for reading the magazine at one go

The farmers read any kind of technical literature only when they get free time. That is why majority of them (67.0 %) devoted only half to one hour for reading VPP articles at a stretch. Chavda and Dave (1993) also observed that 55 percent of farmers devoting around one hour for reading farm magazine every week and 85 per cent of respondents read these magazines according to their convenience of time. Similar results were also reported by Hanumanaikar et al (2011b) and Singh et al., (2017).

Around half of the respondents (52.5 %) had to read articles of their interest twice or more times. This usually depends on the grasping power of the individual. Higher the educational level, higher will be the comprehension power of the individual. The previous knowledge (practical experience in particular) acquired through any means also help the reader grasp the idea or essence hidden in the article more easily. The farmers who have subscribed VPP magazine multiple times needed to read the articles once only.

Volume of each issue read

More than half of the respondents (57.5 %) used to read about quarter to half of each issue of VPP magazine at one go. Whichever issue contains higher number of articles related to a particular enterprise; the farmers associated with that enterprise would read greater part of that issue. Since, VPP covers significantly higher number of articles on dairy farming and dairy farmers are, but, natural to read that portion of each issue which accounted for almost half of the selected population reading at least quarter

or even half of each issue. Farmers associated with other enterprises like poultry, piggery or goatry are also rearing cattle or buffaloes as homestead. Such farmers accounted for those who read more than half part of each issue. Patel and Patel (1991) reported almost equal proportion of respondents reading the magazine either fully or partially. There was only five per cent respondents who used to read just headings and titles.

Relevance of articles published in VPP

More than 90 per cent farmers found articles published in VPP relevant to their enterprise though with varying degree. Similar results were also reported by Hanumanaikar et al. (2011a).

VPP magazine usually publishes articles on management aspects of livestock farming. On most of the occasions, the management facts directly relate to the farmers. The farmers who read them for the first time appreciate them at the first go.

Single-topic issues vs multi-topic issues

Majority of the respondents (52.0 %) liked to have issue of VPP on specific subjects or specific species. The farmer who advocated single-topic issues usually did farming of one type only i.e. either dairy farming or poultry or piggery or sheep/goat farming (Table 2). The other farmers (48.0 %) wanted that each issue should contain information on diverse topics. This would continue to engross each type of farmer. It is also the policy of the editorial board to include diverse articles belonging to different subjects on almost all domestic species in each issue of the magazine. This makes all newer readers belonging to different enterprises to subscribe this magazine.

Table 2. Distribution of respondents according to different enterprises

Enterprises	No of respondents (n = 200)	Percentage
Dairy Farming	91	45.5
Poultry Farming	36	18.0
Pig Farming	33	16.5
Sheep/Goat Farming	38	19.0
Agricultural Farming	2	1

Interest in advertisements published in VPP

More than half of the respondents (54 %) had no interest in advertisements published in the VPP magazine while 46 per cent used to take note of those advertisements. They also shared the information contained in those advertisements with other persons. Similar results were reported by Hanumanaikar et al., (2011a).

In VPP magazine, most of the time, advertisements related to branded cattle feed or pharmaceutical products are published. Since, good number of subscribers used to prepare their own customised feeds and seek veterinary help from professionals of State Animal Husbandry Department or State Veterinary University, that could be the reason for poor response towards advertisements.

Sharing of information with others

The habit of sharing anything is in the blood of Punjabi farmers. That is why majority (72 %) of farmers did share knowledge and information of interest with others. Similar results were quoted by Chavda and Dave (1993).

Stocking of old issues

Almost two thirds (74 %) of respondents exhibited habit of stocking old issues of VPP. Their viewpoint was to keep them safe for future use. It also helped them to share information with other villagers or fellow farmers since major chunk of them (72 %) had tendency to share newer information contained in different issues of

VPP with anybody. Hanumanaikar et al., (2011b) also reported as high as 63.33 per cent farmers in the habit of re-reading the old issues.

Chavda and Dave (1993) reported just seven per cent of farmers keeping records of information for future use while Patel and Patel (1991) found one-fourth of respondents in the habit of noting down important information. The differences could be because of different study areas.

Perception about contents of each issue

Around 80 per cent of the farmer found no disliking feature in any issue of VPP magazine. Just 5.5 per cent of the respondents didn't like the language of the articles as they failed to understand certain technical words and still four per cent of them disliked its text format. It is a genuine and generalized demand of respondents as well as mandate of any extension activity that the language of communication must be simple and understandable. If one is unable to communicate the idea with his subjects, then, the sole aim of extension gets defeated. In Vigiyanak Pashu Palan, majority of the articles are written by extension personnel or subject matter specialists, however a few specific articles are invited to be written by a particular teacher or a researcher. In that case, the article may contain a few jargons. However, the number of such articles is quite low in each issue of the magazine.

Striking feature of VPP

Charts, tables and illustrations were the most striking feature of this magazine liked by the farmer. It is the common belief that inclusion of good quality pictures in the text of an article can make it more attractive. The message can become clearer and it can be retained in the memory of the reader for longer periods (Hanumanaikar et al., 2011a).

Subscription of another magazine

Out of 200 respondents, there was only one farmer who had subscribed another magazine (*Modern Kheti*) also. Otherwise, rest of the farmers had subscription of VPP only.

In contrast to our results, Chavda and Dave (1993) found half of the respondents having more than one subscription in Junagadh district of Gujarat. Different population and very limited study area could be the reason of variable results.

Expectations of farmers from VPP

When asked about their expectations from VPP, majority (34.5%) had responded by asking the authors about the regularity in the delivery of the magazine. Around 26 per cent of respondents demanded VPP in digital mode. Still another 26 per cent laid emphasis on digital mode of VPP as well as regularity in the delivery of the magazine. Since, Vigiyanak Pashu Palan has been registered as a print magazine (periodical) vide registration number (PUN/PUN/2007/40363) dated 19/1/2007, it can't be published in digital mode. However, GADVASU has started another magazine named “Pashu Palan Sunehe” in digital mode. It is a bimonthly magazine available on university's website www.gadvasu.in. There were only 13.5 per cent respondents who had no further expectations from VPP magazine.

CONCLUSION

Vigiyanak Pashu Palan magazine proved to be a very good source of technical information relevant to livestock farming. The farmers of the state have accepted it. An advice for authors of the articles published in this magazine also emerged. They should include more charts, figures and illustrations to make the articles more attractive and readable.

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RESEARCH ARTICLE

Constraints faced by the MGNREGA beneficiaries in Nalanda district of Bihar

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ABSTRACT

Population wise Bihar is third populated state in India. In the state more than 85% of population stays in rural area and the state is the least urbanized state of the country and have a low source of income which leads to increase in poverty. National Rural Employment Guarantee Act 2005 (or, NREGA, later renamed as the "Mahatma Gandhi National Rural Employment Guarantee Act", MGNREGA), is an Indian labour law and social security measure that aims to guarantee the 'right to work'. The present study aims to analyse the knowledge and attitude level of MGNREGA respondents. The study was conducted in Nalanda district of Bihar which was selected purposively as the MGNREGA scheme is currently running in the district. Hilsa block was selected by purposive sampling for the study as the block has the largest number of MGNREGA beneficiaries. Total six villages were selected for the study by purposively considering the fact that these villages have greater number of MGNREGA beneficiaries. A total of 120 respondents were taken randomly. The data were collected by pre- structured interview schedule and appropriate statistical analysis was done to find out the meaningful results. The finding of the study reveals that the major constraints faced by the MGNREGA beneficiaries were local residents only are eligible to work (70.83%), low wage rate (65.84%), delay in payment of wages (62.50%), same wage rate for both men and women (56.67%), continuous work is not provided (51.66%), delay in issue of job card (47.50), 100 days of employment not given (41.66%), same wage rate for all kinds of work (40.84%) and person is not engaged at work site to look after children (35.84%).

Keywords: MGNREGA scheme, Conatraints, Beneficiaries, Suggestions

INTRODUCTION

According to the 2021 census report, India crossed the one billon population mark and now stands at1.2 billon. It is however sad that even after 74 years of Independence the world's largest number of poor reside in India. India is home to almost 1/3rd of the world's population and it is estimated that 28 per cent of the total population of the country live Below Poverty Line (BPL) of which 75 per cent are said to be in the rural areas. This is a matter of serious concern. In view of this fact poverty eradication has been one of the major objectives of the development planning process **(Census 2021)**.

Bihar is among the big states in India. Population wise it is third populated state in India. In the state more than 85% of population stays in rural area and the state is the least urbanized state of the country. The state is primarily a rural economy and 75% of main workers depend on agriculture for their livelihoods **(Banerjee 2009).** The state has 41.4 per cent BPL population. Almost 43 per cent of the total households are landless and another 39 per cent has less than 2.5 acre of land. Land distribution is

highly skewed with almost 66 per cent of house hold owning only 20% of the total cultivable land. This percentage is gradually increasing as land is getting divided among the households. A survey conducted in 2005 reveals that while landless or those owning less than an acre of land increased from 67 per cent to 73 per cent, were as those owning more than 5 acres has also declined from 13 to 5.5 per cent **(Sharma 2005)**.

In absolute terms but rate has reduced in recent years. Bihar is among the states which has highest migration. Lack of opportunity is the fundamental reason for the migration in Bihar. Migration in Bihar cannot be understood by the prevailing factors like periodic floods and drought, law and order or caste operation. Migration in Bihar is considered as structural. In spite of having higher economic growth rate in recent years due to continued increase in population and the backlog of unemployed among people in the state migration has increased however the rate of migration has slowed down **(DLR 2009).**

Mahatma Gandhi's idea to develop the Indian Society was based on his understanding of the society and hence based on the village system. Talking about the importance of village, he wrote in 1936, “I would say if the village perishes, India will perish too. The decentralized village economy should provide full employment to all on the basis of voluntary cooperation and work for achieving self-sufficiency in its basic requirement of food, clothing and shelter. In short, it can be said that rural reconstruction, according to Gandhi should not merely concerned with raising the standard of living of village folk, though that was important **(Ganguly, 1990).**

The National Rural Employment Guarantee Act was notified on 7th September 2005 and came into force on 2nd February 2006. The aim of the NREGA was to enhance the livelihood security of people in rural areas by guaranteeing 100 days of wage employment in a financial year to a rural household whose members volunteer to do unskilled manual work. The NREGA is a national law funded largely by the Central Government and implemented in all states of the country, creating a justifiable 'right to work' platform for all households in rural India. As per the law, employment is to be provided by local government when work is demanded by any worker or group of workers registered under the NREGA. It has now been renamed as the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) on 2nd October, 2009. The scheme also provides protection to all those involved in social auditing. State Governments on their part should ensure that the scheme runs properly and transparently so that it fully benefits the rural poor. NREGA has reduced rural - urban migration, improved food security, generated employment with dignity, brought about the economic empowerment of women, created sustainable community assets and raised the standard of living of beneficiaries.

RESEARCH METHODOLOGY

Ex-post facto research design was adopted for the present study. The present study was conducted in Nalanda district of Bihar. Out of 20 blocks in Nalanda district, Hilsa block was selected by purposive sampling for the present study based on the assumption that the block has the largest number of peoples are working under MGNREGA in this block. From the selected block, six villages were selected purposively considering the fact that these villages have a greater number of MGNREGA beneficiaries. A total number of 120 respondents were selected randomly from the 6 villages of the selected block.

The information was elicited from the respondents with the help of structured

interview schedule, pen, paper and camera was also used during data collection. The primary data was collected with the help of face-to-face interview techniques with the help of interview schedule with especially objectives for the study. Secondary data was collected from books, journals, research papers and other materials related to study. The entire data further transformed into score for tabulation and subjected to appropriate statistical methods like Arithmetic Mean, standard deviation, Percentage analysis and correlation co-efficient.

RESULT AND DISCUSSION

Table 1 : Distribution of MGNREGA beneficiaries based on the constraints faced by them

Sr. No.	Constraints experienced by the MGNREGA beneficiaries	Frequency	Percentage
1.	Local residents only are eligible to work	85	70.83
2.	Low wage rate	79	65.84
3.	Delay in payment of wages	75	62.50
4.	Same wage rate for both men and women	68	56.67
5.	Continuous work is not provided	62	51.66
6.	Delay in issue of job card	57	47.50
7.	100 days of employment not given	50	41.66
8.	Same wage rate for all kinds of work	49	40.84
9.	Person is not engaged at work site to look after children	43	35.84

The data presented in the table 1 revealed that the major constraints faced by the MGNREGA beneficiaries were local residents only are eligible to work (70.83%), low wage rate (65.84%), delay in payment of wages (62.50%), same wage rate for both men and women (56.67%), continuous work is not provided (51.66%), delay in issue of job card (47.50), 100 days of employment not given (41.66%), same wage rate for all kinds of work (40.84%) and person is not engaged at work site to look after children (35.84%). These findings are in the line with the findings of **Argade (2010)** and **Prattoy *et al.* (2011).**

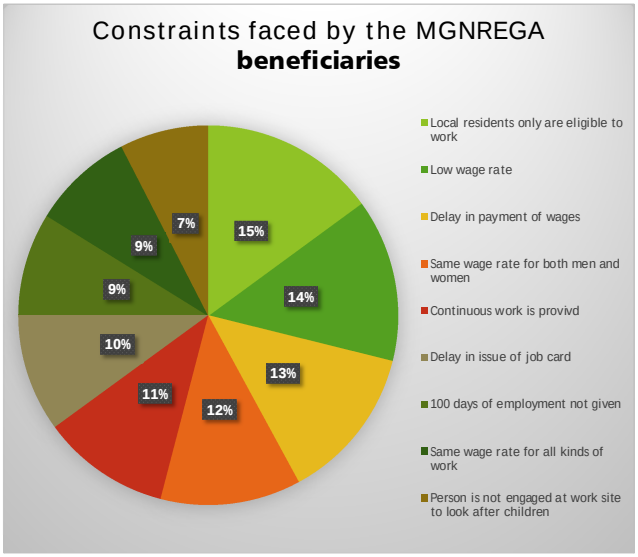

Fig. 1. Distribution of MGNREGA beneficiaries based on the constraints faced by them

Table 2 : Distribution of MGNREGA beneficiaries based on suggestions given by them to overcome the constraints

Sr. No.	Suggestions given by the MGNREGA beneficiaries	Frequency	Percentage
1.	Detail information should be given regarding the job under the act.	94	78.33
2.	Primary necessities such as drinking water, first aid, medical facilities etc should be provided timely and adequately at work place.	92	76.66
3.	Number of working days should be increased	87	72.70
4.	Timely payment of wage	81	67.50
5.	Per-day wage rate should be increased for the workers under MGNREGA	78	65.00
6.	Unbiasness towards beneficiaries while allotting work.	64	53.33
7.	Employment should be made available as when need of the beneficiaries.	53	44.16

It is elucidated from table 2 that majority of the MGNREGA beneficiaries stated that, detail information should be given regarding the job under the act (78.33%), Primary necessities such as drinking water, first aid, medical facilities etc should be provided timely and adequately at work place (76.66%), Number of working days should be increased (72.50%), Timely payments of wages (67.50%), Per-day wage rate should be increased for the workers under MGNREGA (65.00%), Unbiasness towards beneficiaries while allotting work (53.33%), Employment should be made available as when need of the beneficiaries (44.16%). The above findings are in the accordance with the findings of **Uma Prasher (2014).**

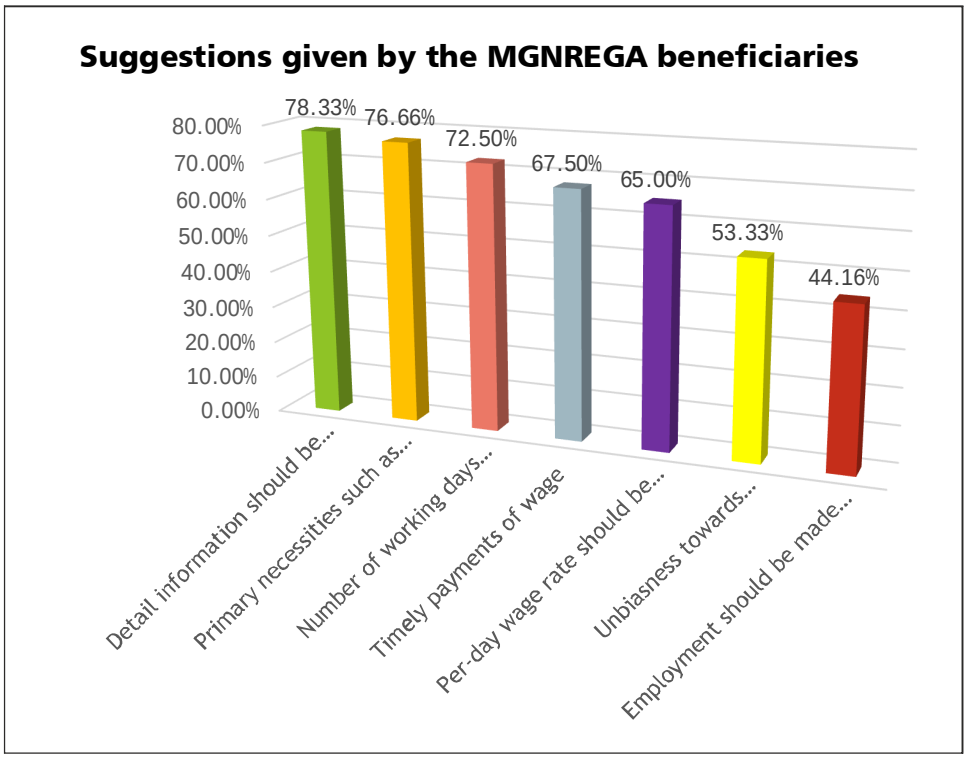

Fig. 2. Distribution of MGNREGA beneficiaries based on suggestions given by them to overcome the constraints

. CoNCLUSION

It is concluded that majority of the MGNREGA beneficiaries expressed major constraints faced by them such as, local residents only are eligible to work, low wage rate, delay in payment of wages, same wage rate for both men and women, continuous work is not provided, delay in issue of job card, 100 days of employment not given, same wage rate for all kinds of work and person is not engaged at work site to look after children. Hence, the government should provide awareness and should conduct demonstrations regarding the above said problems.

Suggestions given by the majority of the MGNREGA beneficiaries that, detail information should be given regarding the job under the act, Primary necessities such as drinking water, first aid, medical facilities etc should be provided timely and adequately at work place, Number of working days should be increased, Timely payments of wages, Per-day wage rate should be increased for the workers under MGNREGA, Unbiasness towards beneficiaries while allotting work, Employment should be made available as when need of the beneficiaries.

Hence, the government should provide awareness and should conduct demonstrations regarding the above said problems and implement all the suggestions given by the MGNREGA beneficiaries.

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