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AN ASSESSMENT OF PHYSICOCHEMICAL AND MICROBIOLOGICAL CHARACTERISTICS OF WATER IN INSUKAMINI CATCHMENT WATER SOURCES AND THE SUITABILITY OF WATER FOR DOMESTIC USE

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ABSTRACT

Insukamini catchment depends on hand dug wells, sand water abstraction, dam, and borehole water sources for their domestic uses. On hand dug wells and sand water abstraction, people rely on natural filtration of bacteria and consider the water as safe, however the location and management of some of these water sources raise suspicion of possible contamination. The aim of this study was to assess drinking water quality in terms of selected physico-chemical and microbiological parameters, and people's perceptions on aesthetic parameters. Water samples were collected from five water sources, namely sand water abstraction, dam, hand dug well, borehole and municipal water. Three samples were collected from each water source to make 63 samples. Temperature, pH, electrical conductivity, and dissolved oxygen measured using HI 9143 dissolved oxygen meter, YSI pH 100, HI 9143 dissolved oxygen meter and HI 8633 conductivity meter respectively. On laboratory experiments total suspended solids measured using filter disk, total dissolved solids using gravimetric method (SA, 2008), total and feacal coliform were measured using spread plate method. All water sources had total coliform levels above the WHO standards for drinking water of 1000mg/L. For E. coli, borehole and municipal water sources complied with the WHO standard with the means of zero cfu/ 100ml. Low pH mean of 5.001 was found in borehole water and the other water sources were within the accepted range of 6.5 to 8.5. Municipal and dam point (A) water sources had highest levels of TDS, borehole, and dam point (C) had TSS levels above maximums allowable of 1000mg/L and 150mg/L respectively. Temperature, DO and EC of all water sources were within the WHO standards. Overall, all water sources were not complying with WHO standard for drinking water. People described municipal water source as best for drinking purpose, dam, sand water abstraction and hand dug well water sources described as soft and good for laundry and bathing as compared to borehole which was described as hard. The results indicated that water from the sources under study were not suitable for drinking purposes without treatment. The water should rather be used for other domestic uses such as laundry and bathing. However, municipal water should be boiled or use water purification tablets (chlorine tablets) before drinking. An integrated approach is therefore required to minimize and avoid water pollution within the catchment.

Keywords: *water resources, phisicochemical, microbiological, domestic use*

INTRODUCTION

Access to safe drinking water and sanitation is a global concern however developing countries like Zimbabwe have suffered from lack of access to safe drinking water and sanitation services (WH0, 2006). Water is a vital resource to support all forms of life on earth and it is not evenly distributed over the world by season or location (Dungumaro, 2007). Due to the scarcity of clean water, financial constraints and the variability of the water sources, rural communities alternatively use untreated water directly from the water sources such as rivers, dams, hand dug wells and sand water abstraction. This poses environmental and health hazards to the concerned communities. The government of Zimbabwe has directly and indirectly facilitated the construction of water reservoirs in communal areas and the large-scale commercial farming areas to achieve human rights to water (Senzanje and Chimbari, 2002; Sugunan, 1997). There are many legal frameworks in Zimbabwe that try to regulate water quality, and these include the Water Act (20:24). An Act to provide for the management, administration, and conservation of water resources in Zimbabwe, and Water Regulations (waste and effluent disposal S.I 274/2000) and The Zimbabwe National Water Authority Act (11/1998, 22/2001, 14/2002). The local authorities pass by-laws which ensure the compliance with water quality standards, and these include investigating and monitoring water pollution and to provide a legal compliance and enforcement structures.

In developing countries, large sections of the

population depend on raw water for drinking purposes these results in large number of waterborne disease outbreaks and death epidemics. Zimbabwe experiences several cholera outbreaks every year both in rural and urban areas (Al-Khatib *et al.,* 2003). Water pollution comes from domestic wastewater discharge, industrial and agricultural activities. Water sources are more polluted by non-point pollution during rainy season than in dry seasons due to leachates of agricultural chemicals from fields into water bodies, lack of appropriate sanitary infrastructure and lack of or little environmental awareness among the people especially in rural areas (Chapman, 1996).

OBJECTIVES

(1) To measure physico-chemical parameters (pH, temperature, dissolved oxygen, electrical conductivity, total dissolved solid and total suspended solids) and microbiological characteristics (Total and faecal coliform) of dam, sand water abstraction, borehole, hand dug well and municipal water

(2) To compare people's perceptions and laboratory results on water quality parameters (taste, odour, soap consumption and colour)

METHODOLOGY

The study was carried out in Insukamini catchment which has multiple water sources used by the community for domestic uses. The area of study is 46 km North –West of Gweru town, Midlands province and falls in Natural Region IV. The average rainfall is 650mm-800mm and mostly falls between November and April (Meteorological Services Department Handbook, 2011). The area has an average minimum temperature of 16˚C and an average maximum and temperatures of 24˚C. The soils in study area are predominantly sandy loams and the terrain is predominantly flat (Nyamapfene, (1992). The settlements assume a linear pattern along roads.

Samples were collected from seven sources of water [Insukamini dam on points were consumers collect water near dam wall, center-edge and bottom edge of the dam (point A,B,C) respectively, borehole in Insukamini irrigation scheme, hand dug well, municipality water and sand water abstraction], in the morning, afternoon and at sunset. Three samples were collected from each water source to make 63 samples.

Total and faecal coliform measured using Spread Plate method. Data collection on people's perceptions on color, taste, soap consumption and odour were done using structured questionnaires. A target population of 20 was sampled.

The differences in physiochemical and microbiological parameters among different water sources were tested using analysis of variance (ANOVA) procedure of GenStat 14.1 statistical package. An LSD independent t-test was used to compare the means of different parameters at $p < 0.05$.

RESULTS AND DISCUSSIONS

Physiochemical parameters

(1) Temperature

The borehole water source had the highest temperature, with a mean of 25.39° and that of hand dug well was lowest at 17.10° (Fig 4.1). The overall differences among the different water sources were significant at $p < 0.001$ (table 4.1), however there was no significant different between MNCP water and BH water. There was no significant difference between HDW and SWA, SWA and Dam point (A). Temperature from all water sources was low in the morning and increased in the afternoon then decreased at sun set. The temperature of seven sources of water under study area was within the WHO standard of 29°.

(2) pH

Hand dug well water source had the highest pH with a mean of 7.043 and borehole had the lowest with 5.001. The overall differences among the different water sources were significant at $p < 0.001$ though there was no significant difference between MNCP water source, Dam point(C), Dam point(B), SWA, Dam point (A), HDW but these varied significantly from BH water source (table 1). The pH of all water sources were below WHO standard of 6.5-8.5 or average of 7.5 except for BH water source,

Table 1: Mean water quality parameters from seven sources at Insukamini catchment

Water source	Temp (°C)	D.O (mg/L)	E.C (ms/cm)	pH	TDS (mg/L)	TSS (mg/L)	Total coli form (cfu/100ml)	E. coli (cfu/100ml)
Municipal	24.79^{e}	37.23^{d}	0.1889^{c}	6.168^{a}	300^{a}	7.22^{a}	409^{a}	0^{a}
Borehole	25.39^{e}	16.78^{b}	1.1000^{e}	5.001^{b}	1533^{d}	185.86^{e}	3760^{b}	0^{a}
SWA	17.88^{ab}	12.86^{a}	0.2333^{d}	7.003^{b}	1333^{cd}	51.33^{b}	6667^{c}	1161^{ab}
H.D.W	17.10^{a}	10.93^{a}	0.1556^{bc}	7.043^{b}	1078^{bc}	54.11^{b}	6744^{c}	56^{a}
Dam point(A)	18.70^{b}	61.18^{f}	0.1000^{a}	7.023^{b}	933^{b}	83.89^{d}	3556^{b}	511^{ab}
Dam point(B)	20.36^{c}	30.46^{c}	0.1222^{ab}	6.904^{b}	1333^{cd}	67.56^{c}	8200^{c}	1733^{b}
Dam point(C)	22.27^{d}	41.76^{e}	0.1222^{ab}	6.889^{b}	1467^{d}	183.89^{e}	11378^{d}	8489^{c}
S.e.d	0.929	0.3416	0.3780	0.3904	382.3	11.31	2930.1	1695
CV%	4.4	11.43	13.1	5.8	33.5	12.5	50.4	99.3
LSD	0.878	0.3228	0.03572	0.3690	361.3	10.69	2769.2	1602
F pr	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

(3) Total dissolved solids (TDS)

The high values recorded in this study were well within the critical values of 1000-2450mg/l, above which long term health problems might be anticipated (Kempster *et al*., 1997). Highest TDS levels in the borehole might have been caused by agricultural activities at borehole site and the corroding pipes, these factors supply ions into the ground water and cause elevated TDS (Amankona, 2011).

(4) Total suspended solids (TSS)

These results were an indication of the amount of erosion that took place near the water source. The greater the amount of total suspended solids (TSS), the murkier the water appears and the more the colour of water disturbed. Organic suspended solids, such as decomposing matter or sewage effluent contain high levels of microorganisms such as protozoa, bacteria, and viruses and these contribute to waterborne diseases like cryptosporidiosis, cholera and giardiasis, (Nduka *et al.,* 2008).

(5) Dissolved Oxygen (DO)

The high values of DO at Dam point(A) might be due to cool water of a mean temperature of 18.7°Celsius, which agreed with APHA (1995) who states that cool water had more DO than warm water. This could also be because of the aeration of water by wind which consequently increased the DO content in the water due to direct interface of the water source with the atmosphere where there is high dissolution of oxygen. Water disturbances during collection consequently increased the DO content of the water source. Low DO in HDW could be coming from underground through seepage and there is no interface with the atmosphere.

(6) Electrical conductivity (EC)

The EC in the BH was the highest with a mean of 1.1ms/cm and that of Dam (UP) was the lowest at 0.1ms/cm (Table 4.1). The overall differences among the different water sources were significant at p <0.001. However, there was no significant difference between Dam point(B) and Dam point(C) but varied significantly from MNCP, BH, SWA, and Dam point(A) source. Dam point (A) varied significantly from Dam point (B) and Dam point(C). The electrical conductivity of all water sources was below WHO standard of 4ms/cm.

Microbiological parameters

(1) Total coliform

Total coli form in MNCP water was the lowest with a mean of 409cfu/100ml, and this could be attributed to the residual disinfection effect of chlorine and the ineffectiveness of chlorine as a disinfectant (Hassan *et al*., 2011). The highest levels of total coliform in the hand dug well, sand water abstraction and dam were due to anthropogenic activities like defecation by humans and animals, swimming, washing, dumping of household waste, soak pits and latrines in the vicinity that had extended their influence on water qualities. The microbial indicator levels of water sources under study with exception of municipal water sources make water not safe for drinking purposes (WHO, 2004).

(2) Feacal coliform/ *E.coli*

E-coli in the Dam point(C) were highest with a mean of 8489cfu/100ml and of BH and MNCP water sources were the lowest at 0cfu/100ml. The overall differences among the different water sources were significant at p <0.001 see Table 4.1. However, there was no significant difference between MNCP, BH and HDW; Dam point (A) and SWA water sources. On the other hand, there was a significant difference between Dam point(C) and other water sources. Dam point (B) also varied significantly from other sources. Dam point

(A) and SWA varied significantly from the rest of the water sources. *E-coli* levels were low in the morning and increase in the afternoon through sun set. Two water sources MNCP and BH were within WHO standard and the other sources were above.

People's perceptions

The results indicated that people could identify the quality of their water through taste, odour, colour and soap consumptions. The results obtained from people's perceptions were related to those from analyzed laboratory and field results. Although results of this study show that MNCP water source was the best source among other sources about 30% of the targeted population disliked it and preferred HDW and SWA. The main reasons were smell of chlorine and tastelessness of the water as compared to HDW and SWA that they described as cool and had a pleasing taste. About 70% of the consumers do not have access to municipal water and others cannot afford to pay high water bills charged by the municipality therefore they opt for hand dug well and sand water abstraction.

CONCLUSION

(1) The results indicated that water from the sources under study were not suitable for drinking purpose without treatment rather used for other domestic uses such as laundry and bathing.

(2) People described MNCP water source as best for drinking purpose.

(3) Dam, SWA and HDW water sources described as soft and good for laundry and bathing as compared to BH which was described as hard.

RECOMMENDATIONS

(1) Municipal water should be boiled or use water purification tablets (chlorine tablets) before drinking.

(2) Borehole casing should be changed to polyvinyl chloride (PVC) pipes which do not rust compared to the current iron pipes

(3) Open sources of water should be avoided for drinking purposes rather used for other domestic uses.

(4) Wells should be sited at higher elevations, away from latrines and have lids and kept dry and clean.

(5) NGOs and Government should facilitate in the building of protected water sources and advanced latrine toilets in rural areas

(6) Environmental Management Authority (EMA) and all stakeholders should take measures against water pollution activities, and this must be an integrated approach

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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SOCIO-ECONOMIC STATUS AND ADOPTION RATE OF KITCHEN GARDENING AMONG TRIBAL WOMEN

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ABSTRACT

Kitchen gardens have helped to improve the food and nutritional security of tribal women as well as their family members. The kitchen garden has acted as a trap to this natural resource for the benefit of mankind in tribal area. From the study we concluded that majority of the tribal women had medium adoption rate about kitchen gardening (54.17 per cent) followed by low adoption rate and high adoption rate i. e 20.83 per cent and 25 per cent, respectively. From the result it can be concluded that nearly half of the tribal women had medium adoption rate of kitchen gardening. We can suggest the kitchen gardening in the tribal region is an important for increasing the income, improving the intake of fresh fruit & vegetables and health's. It helps in raise the standard of living of the tribes. The main point of building up a kitchen garden is to safeguard formal beliefs and social character of joint families. Potential benefits such as income and enhanced rural employment through additional or off season production, enhanced food security, increased availability of food and better nutrition through food diversity. To popularize the kitchen gardening among the farming community in rural areas, KVK Vadodara conducted large number of training programmes for the farmers to educate them about the importance of kitchen gardening and distribution of vegetable seeds and seedling to farm women. After getting training many farmers established kitchen garden and started growing vegetables for their domestic requirement.

Keywords: *adoption rate, tribal women, kitchen gardening*

INTRODUCTION

Kitchen gardening is an important component for household food security contributes to household income and savings and improves the health and nutritional well-being of the family. Kitchen Gardening is commonly a family activity including women, men, children and elderly persons. Farmwomen are the backbone of Indian agriculture. Growing food has been an interminable saga of her life. It is a well recognized fact that more than 60 % of agricultural operations have been traditionally handled by women. Even cultural anthropological literature suggests that agriculture is invention of women. Rural woman are extensively involved in agricultural activities. The nature and extent of their involvement differs with the variations in agro-production systems. The mode of female participation in agricultural production varies with the land-owning status of farm household. Their roles range from managers to landless labourers. Women are doing almost all the agricultural work starting from sowing of seeds to harvesting and processing the agricultural produce. Kitchen Garden is one of the world's most ancient agricultural practices. Planting and maintaining a kitchen garden brings families together and kids naturally gravitate to gardening.

A kitchen garden is cost saving activity that can be enjoyed as a hobby. It acts as a source of relaxation during high stress period and reduction in illness and stress. Further, it is important to stay healthy to minimize health care expenses (Saran et al., 2020). Eating fresh vegetables and fruits in sufficient quantity will boost one's immune system which helps to stay healthy. Kitchen garden gives dual benefits of providing food and healthy life. Therefore, kitchen garden is like a doctor/ clinic/ medicine cabin wrapped in to one, expanding fresh vegetable intake, supplementing the diet with vegetables containing rich nutrient which increases immunity, cures illness and improves the quality of life. One way to offer a great potential for improving household food security and elevating micronutrient deficiencies is to grow vegetables in own kitchen garden at home and eat fresh vegetables and fruits. This will enhance food security by direct access to a diversity of fresh vegetables at fingertips.

OBJECTIVES

(1) To find out relationship between knowledge profile of

tribal women and their knowledge regarding kitchen gardening

(2) To assess the adoption rate of kitchen gardening among tribal women

METHODOLOGY

The present study was conducted in Chhotaudepur district of Gujarat State. This is located in the eastern part of the State of Gujarat. The boundary of Chhotaudepur district touches to Vadodara, Panchmahal, Dahod, Narmada and State of Madhya Pradesh and Maharashtra. The Chhotaudepur district is an important tribal pocket in the Gujarat state. Chhotaudepur district consist 6 taluka, out of these two taluka *Sankheda and Bodeli was* selected purposively. From Sankheda taluka two and from Bodeli taluka four villages were selected purposively for the study. Among each village 20 tribal farm women were selected randomly. Hence, total sample size was 120 tribal women. The data were collected through personal interview. The interview schedule was prepared by keeping the objectives of the study in mind. The necessary care was taken to collect the un- biased and correct data. The data were collected, tabulated and analyzed to find out the findings and drawing the conclusion. The statistical tools like frequency, percentage and rank were employed to analyze the data.

RESULTS AND DISCUSSION

Relationship between profile of tribal women and their knowledge regarding kitchen gardening

Table 1 shows that the 60.83 per cent tribal women is under in middle age group followed by 29.17 and 10.00 percent was in young and old age group respectively. In education 40.83 per cent was secondary level education, 35.83,14.17.8.33 and 0.83 was Higher secondary education, Only literate, Diploma education and Graduation and above respectively. 60.83 per cent tribal women were live within Nuclear family type. Majority (76.67 per cent) of the tribal women have the major occupation was agriculture after than 13.33, 9.17 and 0.83 have Business and others, Homemakers and Government job respectively. The table 1 also shows that 61.67 per cent tribal women have annual income was 2,00,000/- to 5,00,000 after than 32.50 and 5.83 percent tribal women was is under in Up to ₹ 2,00,000/- and Above ₹ 5,00,000/- respectively. Table 1 also revealed that 50.0 per cent tribal women's source of information Channels is KVK Scientist and 65.83 percent tribal women was joint with one organization for social participation.

Table: 1 Distribution of Personal Profile of tribal women

(n=120)

Sr. No.	Characteristics	Frequency	Percent
1	**Age**		
a	Young (Below 30 years)	35	29.17
b	Middle aged (30-50 years)	73	60.83
c	Old (above 50 years)	12	10.00
2	**Education**		
a	Only literate	17	14.17
b	Secondary education	49	40.83
c	Diploma education	10	8.33
d	Higher secondary education	43	35.83
e	Graduation and above	01	0.83
3	**Family type**		
a	Joint	47	39.17
b	Nuclear	73	60.83
4	**Occupation**		
a	Agriculture	92	76.67
b	Homemakers	11	9.17
c	Government job	01	0.83
d	Business and others	16	13.33
5	**Annual Income**		
a	Up to 2,00,000/-	39	32.50
b	2,00,000/- to 5,00,000/-	74	61.67
c	Above 5,00,000/-	07	5.83
6	**Source of Information Channels**		
A	**Personal cosmopolite Channels**		
a	Family members	19	15.83
b	Neighbors	21	17.50
c	Friends/relatives	13	10.83
d	KVK-Scientists	60	50.00
e	Farmers fair (Kisan Mela)	07	5.83
B	**impersonal cosmopolite channels**		
a	News paper	23	19.17
b	Television	37	30.83
c	Magazine	18	15.00
d	Internet	19	15.83
e	WhatsApp	14	11.67
f	Youth club / Mahilamandal	09	7.50
7	**Social Participation**		
a	One organization	79	65.83
b	More than one organization	25	20.83
c	Not participation	16	13.33

Table 2 : To find out relationship between profile of tribal women and their knowledge regarding kitchen gardening (n=120)

Sr. No.	Variables	Knowledge Correlation 'r' value
X_1	Age	-0.169
X_2	Education	0.189*
X_3	Occupation	-0.078
X_4	Income	0.006
X_5	Family type	0.130
X_6	Source of information channels	0.673**
X_7	Social participation	0.081

* Correlation is significant at the 0.05 level
** correlation is significant at the 0.01 level

The analysis of data showed that the relationship between knowledge profile of tribal women and their knowledge regarding kitchen gardening in Table 2. The data revealed that the source of information channels is positive and highly significant correlated with the knowledge about kitchen gardening it means those tribal women gained more knowledge from news paper, tv, social media and krishi mela shows the higher knowledge about kitchen gardening. Education showed positive significant correlation with the knowledge about kitchen gardening this might be reason that the tribal women had made a good knowledge about kitchen gardening who had a good education level and created the significant association between education and knowledge of tribal women. Income, family type and social participation were non-significant relation with knowledge. Age and occupation found negatively significant relation with knowledge level. The results are in line with the Sharma *et al*. (2013)

1 Adoption rate of kitchen gardening among tribal women

Table 3 : Adoption rate of kitchen gardening among tribal women (According to season)

(n=120)

Sr. No.	Category	No. of Tribal Women	Percent	Mean	SD
1	Low adoption rate (In mansoon season)	25	20.83	2.04	0.678
2	Medium adoption rate (In winter & mansoon season)	65	54.17		
3	High adoption rate (In Summer, winter & mansoon season)	30	25.00		

In present study adoption referred to the acceptance and practices some of the recommended practices of kitchen gardening by the tribal women. Adoption of the tribal women regarding kitchen gardening on the basis of observed adoption scores, the tribal women were classified into three categories namely, "Low adoption rate (In mansoon Season)", "Medium adoption rate (In winter &Mansoon Season)" and "High adoption rate (In Summer, winter &Mansoon Season)".The distribution of the tribal women according to their adoption rate of kitchen gardening given in Table 3. The results are in line with the Dhayal *et. al.* (2021).

The data revealed from Table 3 that majority of the tribal women had medium adoption rate about kitchen gardening (54.17 per cent) followed by low adoption rate and high adoption rate i. e 20.83 per cent and 25 per cent, respectively. The results are in line with the Poshiya *et. al.* (2019). From the result it can be concluded that nearly half of the tribal women had medium adoption rate of kitchen gardening.

Table 4 : Adoption rate of kitchen gardening among tribal women (According to scientific practices)
(n=120)

Sr. No.	Category	MPS	Rank
1	Seed rate	72.50	I
2	Plant protection measures	70.00	II
3	Improved variety	65.83	III
4	Sowing time	62.50	IV
5	Recommended spacing	58.33	V
6	Manure & fertilizers	56.67	VI
7	Weeding & hoeing	54.17	VII
8	Soil treatment	50.00	VIII
9	Irrigation management	43.33	IX
10	Seed treatment	36.67	X
11	Harvesting, storage and marketing	30.83	XI
	Over All MPS	54.62	

The data in table 4 indicates that to assess the adoption rate of kitchen gardening among tribal women like "Seed rate", "Plant Protection Measures", "Improved Variety", "Sowing time", "Recommended spacing", "Manure & fertilizers", "Weeding & hoeing", "Soil treatment", "Irrigation Management", "Seed treatment", "Harvesting, storage and marketing" were found to be 72.50, 70.00, 65.83, 62.50, 58.33, 56.67, 54.17, 50.00, 43.33, 36.67 and 30.83 percent and ranks were assigned I to XI, respectively. The results are in line with the Poshiya *et. al.* (2019) and Bhimani *et al.,* (2020).

The above table also reveals that out of the various recommended kitchen garden technologies tribal women of the Chhotaudepur district adopted seed rate on first priority following by Plant Protection Measures, improved variety, sowing time and weeding & hoeing. The overall average adoption of various recommended kitchen garden technologies among tribal women is (MPS 54.62)

CONCLUSION

The source of information channels is positive and highly significant correlated with the knowledge about kitchen gardening it means those tribal women gained more knowledge from news paper, tv, social media and krishi mela shows the higher knowledge about kitchen gardening. Education showed positive significant correlation with the knowledge about kitchen gardening this might be reason that the tribal women had made a good knowledge about kitchen gardening who had a good education level and created the significant association between education and knowledge of tribal women. Income, family type and social participation were non-significant relation with knowledge. Age and occupation found negatively significant relation with knowledge level. Kitchen gardens have helped to improve the food and nutritional security of tribal women as well as their family members. The kitchen garden has acted as a trap to this natural resource for the benefit of mankind in tribal area. From the study we concluded that 72.50 per cent of tribal women have adopt the seed rate in kitchen gardening, 70.0 per cent of tribal women adopt the good Plant Protection Measures so get the high production in small piece of land and maximize the profit. 65.83 per cent tribal women had adopted the Improved Variety. We can suggest the kitchen gardening in the tribal region is an important for increasing the income, improving the intake of fresh fruit & vegetables and health's. It helps in raise the standard of living of the tribes.

POLICY IMPLICATIONS

Kitchen gardens have helped to improve the food and nutritional security of tribal women as well as their family members. The kitchen garden has acted as a trap to this natural resource for the benefit of mankind in tribal area. From the study we concluded that 85 per cent of tribal women have medium to high knowledge level about kitchen gardening.We can suggest the kitchen gardening in the tribal region is an important for increasing the income, improving the intake of fresh fruit & vegetables and health's. It helps in raise the standard of living of the tribes.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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MIGRATION BEHAVIOUR OF TRIBAL FAMILIES OF DAHOD DISTRICT OF GUJARAT

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ABSTRACT

Migration is a part of the process of development as people search for better employment opportunities within and across countries. In Gujarat migration is not a new phenomenon, not just a post globalization phenomenon. The present study was conducted with an objective to study migration behavior of tribal families of Dahod district of Gujarat state. Interview schedule was prepared in light of the objectives and the data was collected through personal interview method. Ex-post facto design of social research and statistical tools like frequency, percentage and migration index were used for the present study. Majority of the head of the tribal families were middle aged group, illiterate, having medium size of family, belonged to joint family and possessed pakka house. Tribal families were migrate three times in a year and only one member made migration from the families with an average 121 to 180 days duration of migrates. Great majority of the tribal families were migrate from rural to urban and mostly within state due to lack of employment opportunities and low wages in tribal area. They availed the work opportunities at construction site and as a tenant farmer on a seasonal base with fixed proportion of share in production.

Keywords: *migration, tribal, employment, opportunity, pull and push factor*

INTRODUCTION

Migration is an important aspect of mankind from the beginning of human life. Now it is a common phenomenon all over the world as migrants had been migrating from one area to the other area to find their means of survival. Migration is an equilibrium process which reduces regional disparities at different stages of development and a process which is as old as human civilization.(Dineshappa, 2014). Migration is a part of the process of development as people search for better employment opportunities within and across countries Migration is the movement of people, either within a country or across international borders It includes all kinds of movements, irrespective of the drivers, duration and voluntary/involuntary nature. The decision to move can be undertaken on a voluntary basis (voluntary migrants), in conditions where individuals/families perceive that there are no other options to survive with dignity (distress economic migrants), or for engaging in remunerated activities (migrant workers).Some people can move from one place to another without any plans to return to the original home (permanent migration). Others could move for a short definite period (temporary migration), and in particular parts of the year (seasonal migration). In some cases, migrants can move from an origin and one or more destinations, both within and between countries, repeatedly overtime (circular migration). Migration due to marriage is very frequent among rural women. In India, two-thirds of all women have migrated for marriage, amounting to approximately 20 million women moving each year. This increase in migration is essentially due to regional differences in the population pressure on land, drought, and inequality of infrastructure, Industrial development, and modernization of agriculture. Field evidence shows that the major subsectors of three sectors namely agriculture, industry and services using migrant labour are textiles, construction, stone quarries and mines, brick-kilns, small scale industry (diamond cutting, leather accessories etc), crop transplanting and harvesting, sugarcane cutting, plantations, rickshaw pulling, food processing including fish and prawn processing, salt panning, domestic work, security services, sex work, small hotels and roadside restaurants/tea shops and street vending. We piece together available information on the numbers of workers involved and

India will be the most populous country by 2024. An analysis of Indian Population (1.3 billion) showed that it is a country of young people that largely lives in villages and there are more men (51 per cent) than women (49 per cent). About 69 per cent of population lives in villages and 31 per cent in urban areas (Bhagat, 2014 & Nawab, 2018). A large share of migrants originates from rural areas. The lack of employment opportunities in the rural areas and better employment prospects and infrastructure facilities in the urban areas motivate people to migrate to urban areas.

In the rural areas, sluggish agricultural growth and limited development of the rural non-farm sector raises the incidence of rural poverty, unemployment and underemployment. Given the fact that most of the high productivity activities are located in the urban areas people from rural areas move towards town or cities with a hope to grab diversified livelihood opportunities as the rural poor still consider migration as one of the significant as well as reliable livelihood coping strategy. Rural migration is the phenomenon that describes the movement of people from their villages to urban areas, usually in search of a better livelihood.

In Gujarat migration is not a new phenomenon, not just a post globalization phenomenon. The spectrum of migraton streteches from seasonal migration at one end to large number of gujaratis migrating out of country. However our concern here is on the internal migration made by the people in search of employment. Gujarat has 14.75per cent of tribal population. The most tribal populated districts of Gujarat Dangs, Tapi, Narmada, Dahod and Valsad where more than 50 per cent of the population is tribal population. In Dahod, the tribal population is 74.3 per cent. Most of the tribal families living in Dahod district manily depend on monsoon because of lack of irrigation facilities. So during the summer and winter season the rate of migration towards the urban area is often more.

With all this in view, the present investigation entitled "Migration behavior of tribal families of Dahod district of Gujarat" was undertaken with the following objectives.

OBJECTIVES

(1) To study the profile of tribal families

(2) To study the migration behavior of tribal families

(3) To study the factors responsible for migration among tribal families

(4) To study the employment opportunities obtained by tribal families through migration

METHODOLOGY

The present study was conducted in Dahod district, which has highest tribal population in the state of Gujarat. On the basis of highest tribal population, four talukas i. e. Devgadh Baria, Limkheda, Jhalod and Dahod of Dahod district were selected. Two villages from each taluka and ten respendents from each villages were selected. Thus, total eight villages and total eighty respondents were selected for the present study. Interview schedule was prepared in light of the objectives in consultation with extension experts. The data was collected through personal interview method by maitaining social distances with taken a precaution by wearing a mask and sanitized hand. Ex-post facto design of social research was used for the present investigation. In this study, migration behaviour has been operationalized as extent to which the existence of selected indicators is perceived by the respondents at given point of time.

Keeping the objectives in view, measurement of the migration behaviour of tribal families was done using frequency and percentage and then respondents were categorized accordingaly. Further, migration index was calculated to measures the extent of migration of tribal families, which mainly depends on two factors number of family members who migrates and duration for which they migrates. Accordingly, followiing formula was conceived to calculate the migration index. It should be noted here that only adult members were considered in total number of members in a family; chilrens were ignored.

$$\text{Migration Index (KI)} = \frac{\text{Average days of migration of total migrants in a family}}{365} \times \frac{\text{No of migrants}}{\text{Total no. of members in a family}} \times 100$$

The data presented in Table-1, revealed that majority of the head of the tribal families belonged to middle aged group (60.00 per cent) and less than one third (30.00 per cent) were illiterate. Exactlly one half (50.00 per cent) of the respondents having medium size of family i.e. in between 5 to 8 member and more one half (55.00 per cent) of the respondents belonged to joint family and possessed pakka house (55.25 per cent). Further, slightly less than two-third (63.33 per cent) of the respondents possessed marginal size of land holding and slightly more than half of the respondents had up to 2 animals. Slightly more than half of the tribal families had upto Rs.50000/- of annual income and no membership in any organization.

RESULTS AND DISCUSSION

Profile of the tribal families

Table 1 : Profile of the tribal families (n=80)

Sr. No.	Characteristics of the respondents	Number	Per cent
1	**Age**		
	Young (Upto 35 years)	16	20.00
	Middle (In between 36 to 50 years)	48	60.00
	Old (Above 50 years)	16	20.00
2	**Education level**		
	Illiterate	24	30.00
	Primary (1st to 7th std.)	22	27.50
	Secondary (8th to 10th std.)	19	23.75
	Higher secondary (11th to 12th std.)	12	15.00
	Graduation and above	03	03.75
3	**Size of family**		
	Small (upto 4 member)	24	30.00
	Medium (In Between 5-8 member)	40	50.00
	Large (above 8 member)	20	25.00
4	**Type of family**		
	Joint Family	44	55.00
	Nuclear Family	36	45.00
5	**Type of house**		
	Kachha house	29	36.25
	Pakka house	45	56.25
	Mix house	06	07.50
6	**Land holding**		
	Landless	06	07.5
	Marginal (up to 1.0 ha)	51	63.75
	Small (1.1 ha to 2.0 ha)	14	17.50
	Medium (2.1 ha to 4.0 ha)	09	11.25
	Large (above 4.1)	00	00.00
7	**Animal Possession**		
	No animals	21	26.25
	Up to 2 animals	43	53.75
	3 to 4	08	10.00
	5 to 6	06	07.50
	More than 6	02	02.50
8	**Annual Income**		
	Up to ₹ 50,000/- income	42	52.50
	₹ 50,001/- to 1,00,000/- income	30	37.50
	₹ 1,00,000/- to 1,50,000/- income	06	07.50
	₹ 1,50,000/- to 2,00,000/- income	02	02.50

Migration behaviour of tribal families

Table 2: Distribution of the respondents according to their migration behaviour (n=80)

Sr. No.	Component of migration behaviour	Frequency	Percent
A	**Number of members who migrate**		
1	One	36	45.00
2	Two	16	20.00
3	Three	28	35.00
B	**Frequency of migration in a year**		
1	One time	14	17.50
2	Two time	28	35.00
3	Three time	38	47.50
C	**Average days of migration of all the members of family**		
1	Up to 60 days	06	08.00
2	61 to 120 days	16	20.00
3	121 to 180 days	34	42.00
4	181 to 240 days	20	25.00
5	Above 240 days	04	05.00
D	**Place of migration**		
1	Within Taluka	05	06.25
2	Within Districts	17	21.25
3	Within State	58	72.50
E	**Types of migration**		
1	Rural to Rural	10	12.50
2	Rural to urban	70	87.50

Study on migration behaviour comprises of different components like number of members from family who migrates, frequency of migration in a year, place of migration, duration of migrationand type of migration.

It is obvious from the Table-2, indicate date in case of 45.00 per cent of tribal families, only one member made migration, followed by three (35.00 per cent) and two (20.00 per cent) family members from the families made migration. In regards with frequency of migration, that 47.50 per cent of the tribal families were migrate three times in a year and slightly more than two-fifth (42.00 per cent) of the tribal families average 121 to 180 days duration of migrates. Great majority of the tribal families (87.50 per cent) were migrate from rural to urban and mostly within state (72.50 per cent).

So far as duration of migration is concerned, slighlty more than two-fifth (42.00 per cent) of the tribal families, average days of migration of all the members were 121 to 180 (4 to 6 months) followed by 181 to 240 days (6 to 8 months) in case of 25.00 per cent of Tribal families. The tribal families with the least average migration period (up to 2 months) and the highest average migration period were few, i.e.6 (8.00 per cent) and 4 (5.00 per cent), respectively. This might be because of the fact that during the monsoon, they might be engaged in agriculture at their native, while for the rest of period, they might migrate to other places as per availability of work opportunities. Gaikwad, (2020) observed that half of the respondents had had temporary nature of migration.

In respect of place of migration, the data indicate that migration out of own district but within the state was observed in ase of majority (72.50 per cent) of tribal families. Agriculture production being low and the job opportunities vere rare in this part, the people migrate in search of job. As far as type of migration is concerned, rural to urban migration (87.50 per cent) was found to be dominant over rural migration (30.83 per cent). Agricultural operations even if are possible they do not yield much of returns due to higher costs and poor quality of land as well as the tribal people get more work opportunities at construction side or road construction in neatby district or even far districts. Due to this, large scale migration which has beeen taking place and migration within the state and rural to urban were observed more.

Extent of migration of tribal families

Study on extent of migration of tribal families mainly depends on two factors i.e., number of family members who migrate and duration for which they migrate. Based on this, migration index was worked out for each tribal families and on the basis of migration index score, respondents were arbitary categorized.

Table 3: Distribution of the respondents according to their migration (n=80)

Sr. No.	Component of migration behaviour	Frequency	Percent
1	Very Low (Up to 20)	24	30.00
2	Low (21 to 40)	46	57.50
3	Medium (41 to 60)	08	10.00
4	High (61 to 80)	02	02.50
5	Very High (81 to 100)	00	00.00

Study on extent of migration of tribal families mainly depends on two factors i.e., number of family members who migrate and duration for which they migrate. Based on this, migration index was worked out for each tribal families and on the basis of migration index score, respondents were arbitary categorized.

It is evident from the table that more than one half (57.50 per cent) of the tribal families had low extent of migration followed by 30.00 per cent and 10.00 per cent of them with very low and medium extent of migration, respectively. Only 03.33 per cent of them were found with high extent of migration, whereas none of them had very high extent of migration. This might be because of the fact that in majority cases of tribal families, the number of migrationg members was 1 or 2 which reduced the migration index score.

Factor responsible for migration among tribal families

The main causes of migration are almost the same across the globe and it can be divided into types like social, political, economic and so on. It is important to note that the push and pull factors have been identified as the major causes of the migration among tribal families As the name itself indicates, push factors push the tribal people from their native place to migrate, while pull factors are the attractins at the place to be migrated which pull or attract the tribal people towards the place.

Table 4: Factor responsible for migration among tribal families (n=80)

Sr. No.	Factor or reasons responsible	Frequency	Percentage	Rank
A	**Push factors**			
1	Lack of employment opportunities in tribal area	80	100.00	I
2	Low wages in tribal area	73	91.25	II
3	Lack of basic amenities	52	65.00	V
4	Drought / Famine/ Crop failure	32	40.00	VII
5	Poor Economic conditions	64	80.00	IV
6	Landlessness	06	07.50	XIII
B	**Pull factors**			
1	Better education	20	25.00	IX
2	Better health care services	08	10.00	XI
3	Availability of diverse work opportunities	66	82.50	III
4	More income than MANREGA	44	55.00	VI
5	Better scope for marriage	07	08.75	XII
6	Family welfare purposes	30	37.50	VIII
7	Better social status	10	12.50	x

It is evident from the data presented in Table-4, cent per cent of the tribal families (100.00 per cent) given respond to factor responsible for migration among tribal families was lack of employment opportunities in tribal area. The other major important push factors realized by the respondents tribal families for migration were low wages in tribal area (91.25 per cent), poor economic conditions (80.00 per cent) and lack of basic amenities (40.00 per cent). The major pull factors as realized by the respondents were availability of diverse work opportunities (82.50 per cent), more income than MANREGA (55.00 per cent) and family welfare purposes (37.50 per cent).

Employment opportunities obtained by tribal families through migration

Table 5: Employment opportunities obtained by tribal families through migration .

(n=80)

Sr. No.	Employment opportunities	Frequency	Percent
1	At construction site	64	80.00
2	As a factory labour	16	20.00
3	As a farm labour	09	11.25
4	At road construction	24	30.00
5	As a tenant farmers	36	45.00

As it is apparent from the Table-5, Majority (80.00 per cent) of the migrating members of the tribal families availed the work opportunuities at construction site and more than two-fifth (45.00 per cent) and less than one-third (30.00 per cent) of them reported to have availed the work opportunuity as a tenant farmer on a seasonal base with fixed proportion of share in production and at road construction, respectively.

COCLUSION

It could be concluded from the study majority of the head of the tribal families were middle aged group, illiterate, having medium size of family and belonged to joint family. Tribal families were migrate three times in a year with an average 121 to 180 days duration of migrates. Great majority of the tribal families were migrate from rural to urban and mostly within state due to lack of employment opportunities and low wages in tribal area. The state as well as the central government should frame such policies which could be provide them alternative opportunities like skill-based training and employment, educational institutions for children of migrate families to get primary education. Public policies targeting smallholder family farmers and promoting the adoption of sustainable agricultural practices. Diversification to off-farm activities, effective rural services and investments in value chains linked to sustainable agriculture. Seasonal employment schemes in agriculture and building the capacity of employers and migrant workers' associations to implement them.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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RELATIONSHIP BETWEEN THE CHARACTERISTICS OF THE WOMEN FIG MEMBERS AND THEIR GROUP DYNAMICS EFFECTIVENESS

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ABSTRACT

The women FIG is a self-managed, independent group of women farmers with a shared goal and interest. The members work together to achieve one common goal by pooling their existing resources, gaining better access to other resources and to share in the resulting benefits. The present study was carried out in Navsari district of Gujarat State, shows the relation between the selected personal, social and psychological characteristics of the women FIG members and their group dynamics effectiveness. Among the selected personal, social and psychological variables training received, market facility, social participation, extension contact, economic motivation, market orientation, innovativeness, achievement motivation, and attitude towards collectivism were exerted positive and significant relationship and age of FIGs members was found to be negatively and significantly correlated. Rest variables viz., education, occupation and annual income of FIGs members failed to show any significant relationship with their group dynamics effectiveness.

Keywords: *women FIG, group dynamics, members, relationship*

INTRODUCTION

A group can be defined as two or more individuals interacting and interdependent, who have come together to achieve particular objectives (Ajotikar et al., 2021). Members of the group relate to each other in some way are united by common ties, beliefs and perceptions in a relatively sustained and structural basis (Anon., 2020). Women Farmer Interest Groups (FIGs) are a new model of learning and innovation for women farmers despite the remarkable benefits that women farmers have gained by joining these groups, their sustainability is a major concern of extension bodies, relevant organizations and women farmers. Women farmers interest groups formed under "ATMA" are registered through Project Director of respective district. After registration, members of women FIG are eligible for benefits under the scheme. In ATMA, the FIGs and SHGs are formed by local Non-Governmental Organizations (NGOs) and then organized into producer groups by extension staff (Patel *et al.,* 2018). The decision making process is decentralized to the block level, with active participation of FIGs and SHGs in the approval of the BAP.

Now a days it becomes essential to learn and understand the nature and formation of groups, what conditions facilitate their growth, what factors drive them to action, how groups affect the behaviour, thinking, motivation and adjustments of its members and a whole lot of what may be termed as 'Group behaviour'. The study of this Group behaviour was explained by behaviourist and social scientists as the 'Group Dynamics'.The study of group dynamics can be useful in understanding individual's behaviour, attitudes, decision-making and opinions. Group dynamics is a system of behaviour and psychological processes occurring within a social group or between social groups. Group dynamics is a complex process involving sequence and thought of action of an individual in a group. Determination of group behavior is governed by various internal and external forces of the group as well as of the individual in the group. Group dynamics effectiveness differs when there is difference in personal, social and psychological traits of the group members.

OBJECTIVE

To know the relationship between the selected personal, social and psychological characteristics of the women FIG members and their group dynamics effectiveness

METHODOLOGY

The present study was carried out in Navsari district of Gujarat State. Navsari district comprises of six talukas out of which four talukas viz. Jalalpore, Gandevi, Navsari and Vansada having higher number of FIGs were selected. Two FIGs were selected randomly from each taluka, out of which 15 members from each FIG were selected randomly. Thus, total 120 FIGs members were selected randomly as respondents and list of the FIGs member was obtained from

project director ATMA, Navsari. This study was confined to ex-post facto research design as the independent variables were already operated in study area. In light of objectives, the interview schedule was prepared and women respondents were interviewed at their home and farm. The relationship between the personal, social and psychological characteristics of the members of women FIGs and their Group dynamics effectiveness was determined with the help of Karl Pearson's coefficient correlation (r).

RESULTS AND DISCUSSION

The results of analysis of relationship between selected characteristics of the women FIG members and their group dynamics effectiveness are presented in table 1.

Table 1: Relationship between selected characteristics of the respondents and their group dynamics effectiveness index (n=120)

Sr. No.	Characteristics	Correlation coefficient ('r' value)
X_1	Age	-0.190 *
X_2	Education	-0.098 NS
X_3	Occupation	-0.035 NS
X_4	Training received	0.423 **
X_5	Annual Income	-0.032 NS
X_6	Market facility	0.352 **
X_7	Social participation	0.213 *
X_8	Extension contact	0.445**
X_9	Economic motivation	0.324 **
X_{10}	Market orientation	0.331 **
X_{11}	Innovativeness	0.289 **
X_{12}	Achievement motivation	0.391 **
X_{13}	Attitude towards collectivism	0.449 **

* Significant at 0.05 per cent level of probability
** Significant at 0.01 per cent level of probability
NS Non significant

Age with group dynamics effectiveness

Age of the women FIGs members had negative and significant (r = - 0.190 *) relationship with their group dynamics effectiveness which implies that age of the FIGs members was important factor in determination of group dynamics effectiveness. It can be said that young FIGs members had high level of group dynamics effectiveness than old aged members as young members are dynamic, energetic, enthusiastic, result oriented, prompt and pragmatic decision maker, believer in managing resources with collective efforts for betterment of life which in turn reflected in to development of high level of group dynamics effectiveness. This finding is supported by Patel *et al*. (2016), Darji (2018) and Patil (2019) and Patil (2021).

Education with group dynamics effectiveness

Education of the women FIGs members had shown negative and non-significant correlation (r = - 0.098) with their group dynamics effectiveness. Thus, it could be concluded that with the increase or decrease in level of education of FIGs members, their group dynamics effectiveness remain same. Thus education level of FIGs members is a trivial factor in determination of their group dynamics effectiveness. This finding is in conformity with the finding reported by Darji (2018) and Patil (2019).

Occupation with group dynamics effectiveness

Occupation of the women FIGs members had negative and non-significant correlation (r = -0.035) with group dynamics effectiveness which implies that group dynamics effectiveness of the FIGs members was found to be uniform irrespective of their occupation. Hence, it can be said that FIGs members of different occupation, had similar level of group dynamics effectiveness and had no role in shaping their group dynamics effectiveness. This finding is in line with the findings reported by Haseena (2017) and Darji (2018).

Training received with group dynamics effectiveness

Training received by the women FIGs members had established positive and highly significant relationship (r = 0.423 **) with their group dynamics effectiveness. This result proves that training plays an important role in determining group dynamics effectiveness as training improves competency and helps in developing skills for doing better which increases the capacity building among the FIGs members. This result is supported by Haseena (2017) and Darji (2018).

Annual income with group dynamics effectiveness

Annual income of women FIGs members was negatively and non-significantly (r = -0.032) correlated with their group dynamics effectiveness. It can be concluded that annual income of women FIGs members had no influenced in determination of their group dynamics effectiveness. This finding is in line with result reported by Patel *et al.* (2016), Vandana (2017) and Darji (2018).

Market facilities with group dynamics effectiveness

Market facilities available with the FIGs members had established positive and significant relationship (r = 0.352**) with their group dynamics effectiveness. The results indicate that level group dynamics effectiveness was

observed non similar among the different categories of market facilities available with the FIGs members. This finding is in line with the findings of Purnima (2005) and Bhatt (2010).

Social participation and group dynamics effectiveness

Social participation of women FIGs members had positive and significant correlation (r = 0.213*) with their group dynamics effectiveness. It can be concluded that with respect to different level of social participation of the FIGs members, the group dynamics effectiveness is also not uniform and FIGs members having more or less social participation had no similarity with group dynamics effectiveness. Social participation of the FIGs members is an prominent factor for deciding group dynamics effectiveness. This finding is in line with the findings of Haseena bibi (2017) and Patil (2019).

Extension contact with group dynamics effectiveness

Extension contact of the women FIGs members had positive and significant relationship (r = 0.445 **) with their group dynamics effectiveness. It can be inferred that as with level of contact with extension personnel by the FIGs members increases, simultaneously their group dynamics effectiveness increases. This finding is in concurrence with the finding reported by Haseena (2017) and Darji (2018).

Economic motivation and group dynamics effectiveness

Economic motivation of the women FIGs members had positive and highly significant relationship (r = 0.324 **) with their group dynamics effectiveness. It can be summarized that economic motivation is the basic character upon which other motives and drives are built. When one develops higher level of economic motivation and wants to achieve it, he would strive hard and get internalize himself about different aspects of profit maximization. Operating motive of earning higher income is a mental virus which naturally activates the individual in the direction of rational decision making to performed better task in organizational way by team work which in turn contributing in significant influence in group dynamics effectiveness. Similar trends were observed by Ganguly (2005) *et al.*, Purnima (2005), Bhatt (2010) and Haseena (2017).

Market orientation with group dynamics effectiveness

Market orientation of women FIGs members had established significant correlation (r = 0.331 **) with their level of group dynamics effectiveness. It can be said that level of group dynamics effectiveness was observed comparatively higher among the members of FIGs having higher levels of market orientation and vice versa. Thus it can be said that market orientation of the FIGs members play important role in improving their level of group dynamics effectiveness. The same findings were reported by Bhatt (2010) and Darji (2018).

Innovativeness with group dynamics effectiveness

Innovativeness had positive and highly significant (r = 0.276 **) correlation their group dynamics effectiveness. Thus, members having higher innovativeness had taken keen interest to seek changes for better functioning of women FIGs and to introduce each change into his own operations as and when found practicable and feasible than members of FIGs having low level of innovativeness as innovativeness is a socio-psychological orientation of an individual to be linked or closely associated with change, adopting innovative ideas and practices. To epitomize the result it can be said that Innovativeness is an important determinant for group dynamics effectiveness. This result is in line with Haseena (2017) and Darji (2018).

Achievement motivation with group dynamics effectiveness

Achievement motivation had exerted positive and highly significant (r = 0.391 **) correlation with their group dynamics effectiveness which implies that group dynamics effectiveness is higher among those members having higher achievement motivation. This might be due to the fact that higher valued members of FIGs had greater drives to excel effective group functioning related dimensions to reach a sense of personal accomplishment. It can be stated that achievement motivation of members of FIGs play key role in deciding the group dynamics effectiveness. This result is in line with Purnima (2005), Bhatt (2010) and Darji (2018).

Attitude towards collectivism with group dynamics effectiveness

Attitude towards collectivism of women FIGs members had positive and significant (r = 0.449 **) correlation with their group dynamics effectiveness which implies that positive disposition towards collectivism lead them to exploits available resources in rational manners for higher economic gain which ultimately resulted in to development of other group dynamics characteristics like task performance, team building approaches, group cohesiveness group democracy etc. This finding is in concurrence with the finding reported by Bhatt (2010) and Darji (2018).

CONCLUSION

It could be concluded from above results that amongst the thirteen selected variables of the of FIGs members in the study, nine variables had established positive and one had negative and significantly correlation with their group dynamics effectiveness. Those independent variables that had exerted positive and significant relationship were training received, market facility, social participation, extension contact, economic motivation, market orientation, innovativeness, achievement motivation, and attitude

towards collectivism and age of FIGs members was found to be negatively and significantly correlated. Rest variables *viz.,* education, occupation and annual income of FIGs members failed to show any significant relationship with their group dynamics effectiveness.

POLICY IMPLICATION

(1) Farmers interest group dynamics can be studied on other agriculture, horticulture and other enterprises. The findings may be utilized to create FIG model for development in potential agriculture and horticulture pocket in the country.

(2) The factors of group dynamics effectiveness contributing significantly can be isolated and effectively manipulated to take up action research pursuits to bring about planned development strategies.

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CONFLICT OF INTEREST

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ADOPTION OF POTATO CULTIVATION TECHNOLOGY BY THE POTATO GROWERS UNDER CONTRACT FARMING

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ABSTRACT

M*ost of the farm operators being small and marginal farmers in India, there are problems in getting quality raw material for processing, marketing, and distribution, especially in perishable high value crops but contract farming which was restricted, largely, to seed production earlier, spread to perishable produce and has now become the dominant and growing mode of raw material production and procurement co-ordination among the processors and fresh produce market and exporters. Potato is very important perishable high value crop in North Gujarat Agro-climatic zone of Gujarat state with the cultivating area of 97,204 hector in six districts of North Gujarat (Anon.2014-15). Therefore, the present investigation was conducted in the North Gujarat Agro climatic Zone of Gujarat state. Two districts viz., Banaskantha and Sabarkantha occupy the highest area under potato cultivation in North Gujarat and hence, were selected purposively for study. Ten potato growers were randomly selected from twenty villages. In all, 200 contracting potato growers were selected for the study. Important motivated factors farmers toward contract farming were; assured price, price stability, no tension of marketing, technical advice to control pests and diseases, no cash payment for seed. Majority (78.00%) of the potato growers had medium to high level of adoption regarding potato cultivation technology. With respect to practice wise adoption, maximum farmers adopted the practices viz., improved varieties, plant protection, irrigation, seed treatment, fertilizers management and land preparation in case of potato cultivation. The independent variables viz., education, mass media exposure and level of knowledge, age, land holding, occupation, annual income, cropping sequence, and risk orientation had positive and significant correlation with the adoption of potato cultivation technology by the potato growers.*

Keywords: *extent of adoption, potato cultivation technology, contract farming*

INTRODUCTION

Most of the farm operators being small and marginal farmers in India, there are problems in getting quality raw material for processing, marketing, and distribution, especially in perishable high value crops (Saran et al., 2020). The processing and marketing firms faced issues of high cost, lack of adequate availability, poor quality and timeliness. On the other hand, there are gluts in market for such producers and farmers realized low or un- remunerative prices. After the opening up to the Indian economy and entry of many domestic and multinational players in to agribusiness sector, contract farming which was restricted, largely, to seed production earlier, spread to perishable produce and has now become the dominant and growing mode of raw material production and procurement co-ordination among the processors and fresh produce market and exporters.

Potato is very important perishable high value crop in North Gujarat Agro-climatic zone of Gujarat state with the cultivating area of 97,204 hector in six districts of North Gujarat (Anon., 2014-15). Therefore, the present investigation was undertaken with following objectives.

OBJECTIVES

(1) To identify factors motivating farmers for contract farming in potato cultivation

(2) To assess the extent of adoption of potato cultivation technology by potato growers under contract farming

(3) To ascertain relationship between selected personal, socio-economic, situational, communication and psychological characteristics of the potato growers and their extent of adoption of potato cultivation technology

METHODOLOGY

The present study was conducted in the North Gujarat Agro climatic Zone of Gujarat state. Two districts *viz.,* Banaskantha and Sabarkantha occupy the highest area under potato cultivation in North Gujarat and hence, were selected purposively for study. Among all the talukas of

Banaskantha and Sabarkantha districts, four talukas viz., Disa, and Dantiwada of Banaskantha district and Idar and Vadali talukas of Sabarkantha district occupy highest area under potato cultivation comparing other talukas. Therefore, these four talukas were selected purposively. After the selection of talukas from both the districts, a list of potato growing villages of respective talukas under contract farming was obtained from the contracting firms. From the list, five villages from each selected taluka were purposively selected for the study on the basis of higher potato growing area under contract farming. Thus, total number of selected villages was twenty. A list of the potato growers of each selected villages were obtained from the contract farming firms. Ten potato growers were randomly selected from each village. In all, 200 contracting potato growers were selected for the study.

RESULTS AND DISCUSSION

Factors motivating the farmers toward contract farming

Motivational factors referred to the factors which motivated farmers to cultivate potato under contract condition. Factors motivating farmers are generally oriented towards maximization of the profits and have better contact with technical advisor of contracting firms to seek special knowledge of new innovations resulting in adoption. The data are presented in Table 1.

Table 1: Rank orders of motivational factors of the farmers toward contract farming

(n= 200)

Sr. No.	Motivational factors	No.	Per cent	Rank
1	Price stability	172	86.00	II
2	Assured price	177	88.50	I
3	Technical advice to control pests and diseases	165	82.50	IV
4	Delivery from farm (minimize transportation cost)	160	80.00	VI
5	Recognition at national level	86	43.00	VIII
6	No storage requirement	156	78.00	VII
7	No tension of marketing	169	84.50	III
8	No cash payment for seed	162	81.00	V

As seen from the table 1 important factors motivated farmers toward contract farming were; assured price (88.50%), price stability (86.00%), no tension of marketing (84.50%), technical advice to control pests and diseases (82.50%), no cash payment for seed (81.00%), delivery from farm (minimize transportation cost) (80.00%),no storage requirement (78.00%). The only motivational factor mentioned by less than half of the respondents was, recognition at national level (43.00%).

From the above result, it can be concluded that important motivated factors farmers toward contract farming were; assured price, price stability, no tension of marketing, technical advice to control pests and diseases, no cash payment for seed.

The probable reason for such type of findings may be that these factors are attracting respondents to adopt potato cultivation under contract farming. The finding is line with the finding of swinnen (2006) Damor (2021) and Bhabhor, and Makwana (2021).

Extent of adoption of potato cultivation technology by the contracting farmers

Adoption is a decision making mental process to continue use of an innovation. In this study, adoption mean acceptance of full use of potato cultivation technology under contract farming. It is rigidly stated that the adoption of recommended package of practices is an instrument for making agriculture a better and more profitable enterprise. Considering this fact, an attempt had been made to find out the extent of adoption of potato cultivation technology by the contracting farmers. On the basis of adoption score obtained by the potato growers, the adoption quotient was calculated for individual respondents with the help of formula developed by Sengupta (1967). The respondents were then, classified into three categories on the basis of $\pm$ S.D. from the mean (X). The classification of respondents is presented in Table 2.

Table 2: Distribution of potato growers according to their adoption of potato cultivation technology

(n=200)

Sr. No.	Extent of adoption	Number	Percent
1	Low (below 65.62 per cent)	43	21.50
2	Medium (between 65.62 to 82.14 per cent)	**109**	**54.50**
3	High (above 82.14 per cent)	48	24.00

Mean=73.88 S.D.= 08.26

It is clear from table 2 that 54.50 per cent of potato growers had medium level of overall adoption regarding potato cultivation technology followed by 24.00 per cent and 21.50 per cent of the respondents who had high and low extent of overall adoption, respectively.

Thus, it can be concluded that majority (78.00%) of the potato growers had medium to high level of adoption regarding potato cultivation technology. The probable reason might be that price assurance was the biggest attraction for the farmers for growing more profitable high-value cash crop under contract farming and gaining recognition among the farming community.This finding is in the line with the finding reported by Mane (2013), Melkunde (2013) and Poshiya et al., (2020).

Practice wise adoption level of potato growers about potato cultivation technology

Practice wise adoption was also measured. To assess the practices wise adoption mean adoption index was calculated for each practice. The data regarding practice wise adoption of the potato growers is depicted in Table 3.

Table 3: Practice wise mean adoption index of potato cultivation technology among the potato growers (n=200)

Sr. No	Recommended practices	Total maximum score	Total obtained score	Obtained mean adoption index	Rank
1	Land preparation	600	480	80.00	VI
2	Improved varieties	1000	885	88.50	I
3	Seed treatment	400	340	85.00	IV
4	Sowing	800	630	78.75	VII
5	Spacing	200	126	63.00	X
6	Fertilizers management	1000	830	83.00	V
7	Earthing up and weeding	800	590	73.75	VIII
8	Irrigation	1000	855	85.50	III
9	Plant protection	1200	1040	86.66	II
10	Crop rotation	600	340	56.66	XI
11	Harvesting	200	135	67.50	IX
12	Grading	400	190	47.50	XIII
13	Storage	1000	490	49.00	XII

Table 3 state that among the different potato cultivation practices, maximum farmers adopted the practices *viz.,* improved varieties (88.50%) and plant protection (86.66%) and were ranked first and second, respectively. The practices *viz.,* irrigation (85.50%), seed treatment (85.00%), fertilizer management (83.00%), land preparation (80.00%), sowing (78.75%), earthing up and weeding (73.75%), harvesting (67.50%), spacing (63.00%) and crop rotation (56.66%) were ranked third, fourth, fifth, sixth and seventh, eighth, ninth, tenth and eleventh, respectively. Whereas, the practices *viz.,* storage (49.00%), and grading (47.50%) was adopted by less than half of the respondents.

Hence, it can be concluded that maximum farmers adopted the practices *viz.,* improved varieties, plant protection, irrigation, seed treatment, fertilizers management and land preparation in case of potato cultivation.

Association between selected personal, socio-economic, situational, communication and psychological characteristics of the farmers and their extent of adoption of potato cultivation technology

The adoption or acceptance of recommended agricultural technology is a complex process involving sequence and thought of actions. The action of individual farmer is governed by personal, socio-economic, situational, communication and psychological variables. Thus, the coefficient of correlation was worked out to know the association between selected characteristics of potato growers with their extent of adoption of potato cultivation technology. The results in this regard are presented in Table 4.

The independent variables viz. education, mass media exposure and the level of knowledge had positive and highly significant correlation with the adoption potato cultivation technology by the potato growers at 0.01 level

Table 4: Association between the characteristics of potato growers and their adoption of potato cultivation technology under contract farming
(n = 200)

Sr. No.	Independent Variables	Correlation Coefficient (r value)
X_1	Age	0.2200*
X_2	Education	0.4598**
X_3	Farming experience	-0.1032
X_4	Size of family	-0.3622**
X_5	Social participation	0.1217
X_6	Land holding	0.2484*
X_7	Occupation	0.2662*
X_8	Annual income	0.1968*
X_9	Cropping sequence	0.1637*
X_{10}	Yield gap	-0.1370
X_{11}	Mass media exposure	0.3868**
X_{12}	Risk orientation	0.1749*
X_{13}	Knowledge	0.8065**

****0.01 level of significance and * 0.05 level of significance**

of significance. While, age, land holding, occupation, annual income, cropping sequence and risk orientation had positive and significant correlation with the adoption potato cultivation technology by the potato growers at 0.05 level of significance. Only size of family could establish negatively significant correlation with the adoption of potato cultivation technology by the farmers. Remaining variables *viz.,* farming experience, social participation and yield gap could not established any significant correlation with the adoption potato cultivation technology by the potato growers.

CONCLUSION

Important factors of motivated farmers toward contract farming were; assured price (88.50%), price stability (86.00%), no tension of marketing (84.50%), technical advice to control pests and diseases (82.50%), no cash payment for seed (81.00%), delivery from farm (minimize transportation cost) (80.00%) and no storage requirement (78.00%). Majority (78.00%) of the potato growers had medium to high level of adoption regarding potato cultivation technology. With respect to practice wise adoption, maximum farmers adopted the practices *viz.,* improved varieties (88.50%) and plant protection (86.66%) which were ranked first and second, respectively. The practices *viz.,* irrigation (85.50%), seed treatment (85.00%), fertilizer management (83.00%), land preparation (80.00%), sowing (78.75%), earthing up & weeding (73.75%), harvesting (67.50%), spacing (63.00%) and crop rotation (56.66%) were ranked third, fourth, fifth, sixth and seventh, eighth, ninth, tenth and eleventh, respectively. Whereas, the practices *viz.,* storage (49.00%), and grading (47.50%) were adopted by less than half of the respondents. The independent variables *viz.,* education, mass media exposure and level of knowledge had positive and highly significant correlation with respondents' adoption of potato cultivation technology at 0.01 level of significance. While age, land holding, occupation, annual income, cropping sequence, and risk orientation had positive and significant correlation with the adoption of potato cultivation technology by the potato growers at 0.05 level of significance. Only size of family could establish negatively significant correlation with respondents' adoption of potato cultivation technology. Remaining variables *viz.,* farming experience, social participation and yield gap could not established any significant correlation with adoption of potato cultivation technology by the potato growers.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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THE ROLE OF FARM TELEVISION ON THE PSYCHOLOGICAL TRAITS OF THE FARMERS

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ABSTRACT

This present study was conducted in Ahmedabad district of Gujarat, with a sample size of 120 television viewing farmers. The ex-post facto research design was used for the research study. The result revealed that the independent variable farm television viewing behaviour of farmers had positive and significant co- relation with psychological traits viz. basic general knowledge about agriculture and animal husbandry, achievement motivation, symbolic behavioural adoption for improving farming, risk orientation, scientific orientation, economic motivation, market orientation, attitude towards IPM, neem based bio-pesticides, bio-fertilizers, mixed farming and kisan credit card and cosmopoliteness had failed to show significant co-relation with television viewing behaviour of farmers.

Keywords: *farm television viewing behaviour, attitude, role*

INTRODUCTION

The role of agriculture in the economic development of India can never be under evaluated because about 58.00 per cent of people depend upon agriculture in India for their subsistence (Kusmakara, 1987). Agricultural showing 19.90 per cent shares in real GDP in 2020-21. Recognizing this importance of the day, number of production oriented research and extension programme have been launched from time to time to rise agricultural production. There is necessary to providing relevant information of agricultural technology from research station to the cultivators. Television is a standardize source of information for creating awareness about the innovations. It is one of the most adaptable audio-visual aids ever developed and its ability to reach illiterate farmers. Television due to its mass nature, promises to gratify the informational and entertainment needs of the masses in general and farmers in particular. Effectual assess of information through farm telecast required some inner and external motives coupled with favourable behaviour towards farm telecasting must be present amongst the farmers. There are lot of studies on televiewing behaviour of farmers but there is dearth of studies on role of farm television on the psychological traits of the farmers. Keeping this in view present study has been made in this investigation to know role of farm television on the psychological traits of the farmers.

OBJECTIVE

To study the role of farm television on the psychological traits of the farmers

METHODOLOGY

The present study was carried out in Ahmedabad district of Gujarat State. Ahmedabad district consists of total ten talukas including Ahmedabad city, out of which four talukas were selected randomly. Three villages from each taluka were selected randomly and thus twelve villages were selected. Ten farm television viewers were selected randomly from each selected villages and thus, total 120 farm television viewers were selected to serve as the respondents for the study. On the basis of extensive review of literature and discussions with the experts, some important psychological traits have been selected in present study. Based on the Karl Pearson's coefficient correlation the relationship was assessed and analyze the data to draw the meaningful conclusion. The statistical tools used were percentage, arbitrary method and Pearson's co-efficient correlation.

RESULTS AND DISCUSSION

The role of farm television on the psychological traits of the farmers

One of the major aspects of the present study was to identify the role of farm television on psychological traits of the farmers. These factors were identified by testing the relationship between farm television viewing behaviour and their psychological traits. Hence, considering the importance of these characteristics and review of past research studies, attempt has been made in this research to ascertain the relationship if any, between the farm television viewing

behaviour of farmers and their psychological traits.

Table 1: Relationship between the role of farm television on psychological traits of the farmers (n = 120)

Sr. No.	Dependent variables	Correlation-Coefficient
X_1	Basic general knowledge about agriculture and animal husbandry	0.655**
X_2	Achievement Motivation	0.602**
X_3	Symbolic behavioural adoption for improving farming	0.207*
X_4	Risk orientation	0.304**
X_5	Scientific Orientation	0.372**
X_6	Economic Motivation	0.530**
X_7	Market Orientation	0.534**
X_8	Cosmopoliteness	0.101NS
X_9	Attitude towards IPM	0.223*
X_{10}	Attitude towards neem-based biopesticide	0.325**
X_{11}	Attitude towards mixed farming	0.379**
X_{12}	Attitude towards bio-ferilizers	0.202*
X_{13}	Attitude towards KCC	0.206*

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

Farm televiewing behaviour and basic general knowledge

The data presented in the Table-1 that farm television viewing behaviour had positive and highly significant correlation ($r = 0.655^{**}$) with basic general knowledge about agriculture and animal husbandry. It can be concluded that farmers having high farm television viewing behaviour might have had obtained more knowledge through different agriculture related programmes on television. This finding is in line with the findings reported by Chauhan (1994).

Farm televiewing behaviour and achievement motivation

The data presented in the Table-1 that farm television viewing behaviour had positive and highly significant correlation (r = 0.602**) with achievement motivation. To epitomize the result, it can be stated that achievement motivation of farmers can be manipulated by farm telecast and farm telecast play a significant role for promoting achievement motivation as due to exposure of success stories of different farmers, farm televiewers himself motivate to achieve higher might be the possible explanation of the above finding. This finding is in line with the findings reported by Pithiya (2019).

Farm televiewing behaviour and symbolic behavioural adoption for improving farming

The data presented in the table-1 that there was positive and highly significant correlation (r = 0.207*) between farm television viewing behaviour had and symbolic adoption behaviour. It can be concluded that farmers with favourable farm television viewing behaviour had better knowledge might they were mentally prepared to adopted improved farming in better way. There was a significant influence of farm television on symbolic adoption behaviour of improved agricultural technologies This finding is in line with the findings reported by Rao *(1994).*

Farm televiewing behaviour and risk orientation

The data presented in the Table-1 that farm television viewing behaviour had established positive and significant correlation (r = 0.304**) with risk orientation. It can be concluded that farm television had made significant contribution for convection of farmers to take calculated risk for higher profitability form farming. This finding is more or less similar to the findings reported by Chouhan, (2009).

Farm televiewing behaviour and scientific orientation

The data presented in the Table-1 that farm television viewing behaviour had established positive and highly significant correlation (r = 0.372**) with Scientific orientation. It can be concluded that farm telecast had series of programme which shares technical know- how based on scientific testing and interaction with scientist through farm television and build credibility of information related to develop orientation towards science. This finding is in line with the findings reported by Chauhan (1994).

Farm televiewing behaviour and economic motivation

The data presented in the Table-1 that farm television viewing behaviour had positive and highly significant correlation (r = 0.530**) with economic motivation. It can be concluded that farmers with higher farm television viewing behaviour might have been motivate to improve economic activities through different farm television programmes. This

finding is more or less similar to the findings reported by Malgaya, (2016).

Farm televiewing behaviour and Market orientation

The data presented in the Table-1 that farm television viewing behaviour had positive and highly significant correlation (r = 0.534**) with market orientation. It can be concluded that farmers with farm televiewing behaviour might have had obtained market related information through farm television programmes. Thus, farm television play significant role for enhancing market orientation. This finding is in line with the findings reported by Wagle (1996).

Farm televiewing behaviour and cosmopoliteness

The data presented in the Table-1 that farm television viewing behaviour had positive and non significant correlation (r = 0.101NS) with cosmopoliteness. It can be concluded that irrespective of farm television viewing behaviour the level of cosmopiliteness is alike and farm television viewers behaviour is trivial factor for deciding cosmopoliteness. This finding is in line with the findings reported by Shinde (2016).

Farm televiewing behaviour and attitude towards IPM

The data presented in the Table-1 that farm television viewing behaviour had positive and significant correlation (r = 0.223*) with attitude towards IPM. It can be concluded that broadcasting of specific programmes on television channels on IPM for controlling pest, modified the disposition of farmers towards IPM as it is an integrated approach to controlling pest without disturbing ecology and it minimized the environmental risk. This finding is in line with the findings reported by Patel and Chauhan (2004).

Farm televiewing behaviour and attitude towards neem based biopesticides

The data presented in the Table-1 that farm television viewing behaviour had positive and highly significant correlation (r = 0.325**) with attitude towards neem based bio-pesticides and their farm television viewing behaviour. Through television awareness is credited among the farmers about hazards use of pesticides on environment and human health and hence farm televiewers has realized about importance of bio-pesticides and which lead to for positive disposition towards bio-pesticides.

Farm televiewing behaviour and attitude towards mixed farming

The data presented in the Table-1 that farm television viewing behaviour had positive and highly significant correlation (r = 0.379**) with attitude towards mixed farming. It can be concluded that television programme like calf farming, how to do honeybee farming, mixed farming- A model for viable and sustainable agriculture, integrated fish farming, agriculture with animal husbandry etc. Which plays a significant role in influencing farmers attitude towards mixed farming. This finding is in line with the findings reported by Onima (2014).

Farm televiewing behaviour and attitude towards bio-fertilizers

The data presented in the Table-1 that farm television viewing behaviour had positive and significant correlation (r = 0.202*) with attitude towards bio-fertilizers. It can be concluded that the farmers were aware about harmful effect of continuous use of chemical fertilizers that degraded their soil and also adversely effects on environment had make them to use bio fertilizer. This might be due to bio-fertilizer is eco friendly, cheaper than chemical fertilizers and improves the quality of products. Realized the fact farmers were more disposed to bio fertilizer resulted into favourable to moderate attitude among farmers having favourable behaviour. This finding is in line with the findings reported by Bachubhai (2014) and Jyothi et al., (2020).

Farm televiewing behaviour and attitude towards kisan credit card

The data presented in the Table-1 that farm television viewing behaviour had positive and significant correlation (r = 0.206*) with attitude towards KCC and their farm television viewing behaviour. It can be concluded that credit on hand is an important instrument to buy agri-input and kisan credit card is hassle free card and lower rate of interest which is popular among the farmers having favourable farm televiewing behaviour and television play important role for better inclination towards different programme of agricultural finance including kisan credit card.

CONCLUSION

The result concluded that farm television viewing behaviour of farmers had positive and significant co- relation with psychological traits *viz.* basic general knowledge about agriculture and animal husbandry, achievement motivation, Symbolic behavioural adoption for improving farming, risk orientation, scientific orientation, economic motivation, market orientation, attitude towards IPM, neem based bio-pesticides, bio-pesticides, mixed farming and kisan credit card. Whereas, farm television viewing behaviour of farmers had positive and non significant co- relation with cosmopoliteness.

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PERCEPTION OF AGRICULTURAL GRADUATES TOWARDS AGRICULTURE AS A PROFESSION

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ABSTRACT

The present scenario of rising unemployment among the agricultural graduates must be replaced by taking up agriculture as their profession and also to increase the production and productivity in agriculture. Thus, a study was conducted in all the four State Agricultural Universities of Gujarat, to know the perception of agricultural graduates towards agriculture as a profession and to find out the characteristics that influence their perception. One college from each university was selected randomly. From each selected college thirty agricultural graduates were selected randomly. Thus, the total sample size was 120 agricultural graduates. The study was conducted using a questionnaire in the form of a google form. The study revealed that most of the agricultural graduates had medium level of perception towards agriculture as a profession. Age, academic performance, parental occupation, size of land holding, annual income, mass media exposure, achievement motivation, economic motivation, risk orientation and self-confidence had a positive and highly significant relationship; place of residence and agricultural business anxiety had a positive and significant relationship and family type and family size had a positive and non-significant relationship with the perception of agricultural graduates towards agriculture as a profession.

Keywords: *perception, agricultural graduates, agriculture, profession*

INTRODUCTION

Agriculture is the engine of growth for most developing countries and agricultural development is one of the most effective ways to alleviate hunger and poverty (Amungwa and Baye, 2014). Skilled agricultural human resources are the most important means of improvement in agriculture sector whose development is undertaken by various agricultural universities by training and educating the students by teaching them various activities in a scientific manner and thereby enhance the production and productivity. However, the current scenario of technology revolution and specialization coming in, the employment opportunities of agricultural graduates have greatly reduced (Vinaya *et al.,* 2019). Further, the number of students entering the field of agriculture has been increasing. In such case, agricultural graduates should be willing to take up agriculture as a profession (Shafi *et al,* 2021). But the issue of 'farm readiness', *i.e.,* the interest among agricultural graduates in taking up farming as an occupation after their graduation, continues to be a major question. This is largely because most people still regard agriculture as non-professional and less profitable career option for a young graduate and returning to farming after university would be regarded as failure (Okiror and Otabong, 2015). Therefore, the present study was intended to measure the perception of agricultural graduates towards agriculture as a profession and the characteristics that influence their perception as a step towards bringing out the 'farm readiness' among the students.

OBJECTIVES

(1) To measure the perception of agricultural graduates towards agriculture as a profession

(2) To ascertain relationship between characteristics of agricultural graduates with the perception of agricultural graduates towards agriculture as a profession

METHODOLOGY

The present study was carried out in Gujarat state. For drawing the sample for the study multistage random sampling technique was used. The study was conducted in all the four State Agricultural Universities of Gujarat state *viz.,* Anand Agricultural University (AAU), Navsari Agricultural University (NAU), Junagadh Agricultural University (JAU) and Sardarkrushinagar Dantiwada Agricultural University (SDAU). One agricultural college under each State Agricultural University was selected randomly for the study. Thus, the four agricultural colleges that were selected randomly were College of Agriculture, Vaso, AAU; College of Agriculture, Waghai, NAU; College of Agriculture, Junagadh, JAU and C. P. College of Agriculture, Dantiwada,

SDAU. A total of 120 fresh graduates, *i.e.,* only those who have graduated in the past two years from their respective colleges, were selected randomly for the study. Thirty respondents were selected randomly from each agricultural college. Thus, a total of 120 respondents were selected for the study. Ex-post facto research design was used for the study. The data was collected using a pre-structured interview schedule in the form of a google form. The collected data was classified, tabulated, analyzed and interpreted in order to make the findings meaningful. The statistical measures such as frequency, percentage, mean score, standard deviation and coefficient of correlation were used in the study.

RESULTS AND DISCUSSION

Perception can be operationally defined as the act of interpretation of some object, fact or idea. The perception of agricultural graduates towards agriculture as a profession was understood in terms of their interpretation of the proposed benefits derived by practising agriculture as a profession. The data regarding the perception of agricultural graduates towards agriculture as a profession is presented in Table 1.

Table 1: Distribution of agricultural graduates according to their perception towards agriculture as a profession (n=120)

Sr. No.	Category	Frequency	Percent
1	Low level of perception (less than 80.80)	15	12.50
2	Medium level of perception (80.80 to 93.25)	86	71.67
3	High level of perception (above 93.25)	19	15.83
Mean = 87.78			S. D. = 6.11

It is evident from Table 1 that more than two-third of the agricultural graduates (71.67 per cent) had a medium level of perception towards agriculture as a profession, followed by 15.83 per cent had a high level of perception and 12.50 per cent had a low level of perception towards agriculture as a profession. The probable reason might be due to the fact that most of the agricultural graduates had an agricultural background and also due to the good practical education imparted upon them in their undergraduation. The present finding of the study was similar to the findings reported by Vihari (2018) and Naik (2019).

Characteristics influencing the perception of agricultural graduates towards agriculture as a profession

To know the characteristics that influence the perception of agricultural graduates, certain profile characteristics of the agricultural graduates were selected for the study. Therefore, to ascertain the relationship between the characteristics of the agricultural graduates and their perception, the correlation coefficient ('r') was calculated and the data is presented in Table 2.

Table 2: Correlation between profile of the agricultural graduates and their perception towards agriculture as a profession (n=120)

Sr. No.	Name of the independent variable	'r' value
X_1	Age	0.3253**
X_2	Academic performance	0.2746**
X_3	Place of residence	0.1995*
X_4	Family type	0.0771^{NS}
X_5	Family size	0.1539^{NS}
X_6	Parental occupation	0.2481**
X_7	Size of land holding	0.2426**
X_8	Annual income	0.2710**
X_9	Mass media exposure	0.2394**
X_{10}	Achievement motivation	0.2680**
X_{11}	Agricultural business anxiety	0.2294*
X_{12}	Economic motivation	0.2991**
X_{13}	Risk orientation	0.2756**
X_{14}	Self-confidence	0.2498**

* = Significant at 0.05 level ** = Significant at 0.01 level
NS = Non-significant

The characteristics of the agricultural graduates *viz.,* age, academic performance, parental occupation, size of land holding, annual income, mass media exposure, achievement motivation, economic motivation, risk orientation and self-confidence had a positive and highly significant relationship with the perception of agricultural graduates towards agriculture as a profession. The characteristics of the agricultural graduates *viz.,* place of residence and agricultural business anxiety had a positive and significant relationship with the perception of agricultural graduates towards agriculture as a profession. The characteristics of the agricultural graduates *viz.,* family type and family size had a positive and non-significant relationship with the perception of agricultural graduates towards agriculture as a profession. The present findings related to age and parental occupation were similar to the findings reported by Bodake (2016) and the present findings to family size, size of land

holding, annual income, mass media exposure, achievement motivation, economic motivation and risk orientation was similar to the findings reported by Vihari (2018).

CONCLUSION

The study infers that majority of the agricultural graduates had medium to high level of perception towards agriculture as a profession. Thus, efforts should be made to maintain that interest by improving their practical knowledge related to agriculture. The agricultural universities should train the students with more practical oriented education due to the declining job availability at present, so that the students would be inclined towards adopting agriculture as a profession and get self-employed through farming. The characteristics influencing the perception of agricultural graduates towards agriculture as a profession should be considered during the curriculum planning of their course.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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AN EMPIRICAL STUDY OF STRUCTURE AND PERFORMANCE OF STATE CO-OPERATIVE AGRICULTURE AND RURAL DEVELOPMENT BANKS AND AFFILIATED PRIMARY COOPERATIVE AGRICULTURE AND RURAL DEVELOPMENT BANKS IN INDIA

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ABSTRACT

In India, the Rural Co-operative credit structure includes 'Short Term Co-operative Credit Structure' and 'Long Term Co-operative Credit Structure'. LTCCS comprises SCARDBs (State Co-operative Agriculture and Rural Development Banks) and PCARDBs (Primary Co-operative Agriculture and Rural Development Banks), which mainly dispenses long term investment credit to farmers. As on 31st March 2020, the total number of operational units of fully functional 13 SCARDBs is 1719. Total members of LTCCS are 86.04 lakhs. NABARD continues to be the main source of funds for SCARDBs. Borrowings of functional SCARDBs stood at Rs. 7763.44 crores during the year 2019-20. Except Tripura SCARDB 12 out of 13 fully functional SCARDBs are now mobilizing deposits. The fund raised by the SCARDBs consist of borrowings, deposits and shares etc. which are utilized mainly for advancing loans and repayment to NABARD & other creditors. During 2019-20, total advances of SCARDBs were Rs. 3923.37 crores for farm & non-farm sectors. SCARDBs invest their funds to comply with statutory requirements as well as to deploy surplus funds. Most of the investment are parked either in fixed deposits with SCBs / CBs / DCCBs or other instruments such as Government Securities, NABARD bonds etc. Eight SCARDBs have achieved profit in 2019-20. The ground level recovery of SCARDBs is 38.60%. This structure needs to chalk out suitable and time bound viability action plans. They have to focus their attention towards improving the recovery performance for better rotation of funds lent. These banks need their attention towards improving quality of their assets and take all out steps to reduce their NPA level (34.42%) substantially to become eligible for refinance from NABARD. LTCCS is losing its importance in the policies and programs of Government, RBI, NABARD etc., due to its declining performance in the last ten years, in specific in the recent four years from 2017-18. Major areas of concern which are hampering the progress of SCARDBs & PCARDBs shall be tackled with immediate corrective steps.

Keywords: *agriculture, co-operative, credit, rural, primary, performance*

INTRODUCTION

The Rural Co-operative credit structure in India is bifurcated into Short Term Co-operative Credit Structure (STCCS) and Long Term Co-operative Credit Structure (LTCCS). The Co-operative credit structure in India is 117 years old. State Co-operative Banks (SCBs) are the apex of the three tier Co-operative credit structure dispensing mainly short and medium term credit whereas State Co-operative Agricultural and Rural Development Banks (SCARDBs) are dispensing mainly long term investment credits. (Nishanth, 2021), www.nafscob.org

The LTRCCS consisting of Cooperative Agriculture & Rural Development Banks (ARDBs) at State and Primary levels is a specialized agency for giving long term loans to farmers. These institutions played a very important role in capital formation and productivity enhancement in agriculture (Bansal *et al.,* 2021). Though ARBDs are engaged in financing farmers for nearly 100 years they are not licensed as banks so far. Because of this, they are unable to accept public deposits and borrow from market like other rural financial institutions. Consequently, they face severe shortage of resources to meet the demand for credit from their members. As they are not licensed as banks, they are also not allowed to implement various Government schemes for farmers including interest subvention scheme for crop loans, affordable housing, interest subvention scheme for education loans, centrally sponsored scheme for renewable energy sources etc. At present, a good number of farmers who borrow investment loans from SCARDBs are not able to access crop loans from other agencies as they already mortgaged their land to the ARDB as security for investment credit. Due to difficulties in availing crop loans, these farmers at present are unable to fully make use of farm assets created

out of investment loans, affecting their income and repaying capacity. (Chaudhari & Mayuri, 2021)

OBJECTIVE

The objective of the study is empirical study to understand the structure and analyze performance metrics of SCARDBs and affiliated PCARDBs in India.

METHODOLOGY

This empirical study evaluates the performance of the SCARDBs and PCARDBs in India. The paper is solely based on the secondary data which are sourced from statistical bulletin and annual reports of the National Co-operative Agriculture & Rural Development Bank's Federation Ltd., Navi Mumbai. In addition, website and publications of NACRDBF are also referred. The data collected are of SCARDBs & PCARDBs in various States of India disbursing investment credit within the years 2015-16 to 2019-20.

Structural pattern

Out of thirteen fully functional SCARDBs, five are unitary structure operating through their branches and six are federal structure operating through affiliated primary ARDBs at grass roots level. The remaining two SCARDBs have a mixed structure operating through own branches in some areas of the State and affiliated PCARDBs in other areas.

Organizational network

The organizational network of LTRCCS comprises operational and supervisory units as given in Table-1 which are analyzed hereunder :

Table 1 : Organizational network of LTRCCS (Number)

Sr. No.	Organizational Network	2015-16	2016-17	2017-18	2018-19	2019-20
1	SCARDBs	13	13	13	13	13
2	SCARDB branches	604	615	637	624	624
3	Supervisory units	114	112	108	118	124
4	PCARDBs	601	601	601	578	578
5	PCARDB branches	431	460	462	392	393
6	**Operational Units (2+3+4+5)**	**1750**	**1788**	**1808**	**1712**	**1719**

Source: Statistical bulletins, NCARDF, Navi Mumbai, www.nafcard.org

The number of SCARDB branches of fully functional banks shown an increasing trend over the years, 604 in 2015-16, 615 in 2016-17 and 637 in 2017-18. There is a slight drop, so now it is only 624, in the last two years. Operational units are delivery points of credit to the ultimate borrowers. These consist of branches and sub-branches of unitary SCARDBs as also that of PCARDBs affiliated to SCARDBs. The total number of operational units of fully functional SCARDBs were 1750 in 2015-16, 1788 in 2016-17, increased to 1808 in 2017-18 and reduced to 1712 as on 31 March 2019 and 1719 as on 31 March 2020.

Supervisory units are located either at the district, regional or divisional level. The total numbers of supervisory units of fully functional SCARDBs were 114 in 2015-16 reduced to 112 in 2016-17 and 108 in 2017-18 which increased from 118 in 2018-19 to 124 in 2019-20.

Membership at ultimate borrowers' level

The number of individual members with break-up between borrowing and non-borrowing members is exhibited in Table-2 as below. They are direct members of the SCARDBs in the case of unitary structure and/or members of affiliated PCARDBs in respect of federal structure.

The total memberships of SCARDBs were 108.51 lakhs in 2015-16, 108.19 lakhs in 2016-17 and 111.39 lakhs in 2017-18.This explains that the total membership has decreased by 16.50 lakhs during 2019-20 as compared to that of 2018-19. The number of borrowing membership was 64.94 lakhs in 2015-16, 61.38 lakhs in 2016-17 and 63.92 lakhs in2017-18. Further, it is observed that the borrowing members have decreased during the year 2019-20. Gujarat, Himachal Pradesh, Jammu & Kashmir, Kerala, Pondicherry and Punjab SCARDBs had reported increase in membership while borrowing membership of Haryana, Karnataka, Rajasthan and Uttar Pradesh SCARDBs decreased during 2019-20.

Table 2 : Membership details (Borrower's level) at SCARDBs

Membership	2015-16	2016-17	2017-18	2018-19	2019-20
Borrowing Members (Lakhs)	64.94	61.38	63.92	59.46	35.36
Non-borrowing Members (Lakhs)	43.57	46.81	47.47	43.08	50.68
Total Membership (Lakhs)	108.51	108.19	111.39	102.54	86.04

Source: Statistical bulletins, NCARDF, Navi Mumbai, www.nafcard.org

SOURces of funds & net-worth of SCARDBS

The financial position of fully functional SCARDBs for the years 2017-18, 2018-19 and2019-20 at a glance is given in Table-3.

Table 3 : Sources of Funds **(₹ Crores)**

Sr. No.	Particulars	During the Year			Growth (Last 2 Years)	
		2017-18	2018-19	2019-20	Amount	Percent
I	Share Capital Outstanding					
	a) Borrowers	851.62	818.73	820.32	(+) 1.59	(+) 0.19%
	b) Government	82.35	68.35	65.86	(-) 2.49	(-) 3.64%
	Total-I (a+b)	**933.97**	**887.08**	**886.18**	**(-) 0.90**	**(-) 0.10%**
II	Free Reserves Outstanding					
	a) Reserve fund	658.39	667.13	690.96	(+) 23.83	(+) 3.57%
	b) Credit stabilization fund	337.95	342.57	352.39	(+) 9.82	(+) 2.87%
	c) Other funds & free reserves	2055.90	2495.97	2315.73	(-) 180.24	(-) 7.22%
	Total-II (a+b+c)	**3052.24**	**3505.67**	**3359.08**	**(-) 146.59**	**(-) 4.18%**
III	Accumulated losses	486.88	648.04	519.63	(-) 128.41	(-) 19.82%
IV	**Net worth (I+II)-III**	**3499.33**	**3744.71**	**3725.63**	**(-) 19.08**	**(-) 0.51%**

Source : Statistical bulletins, NCARDF, Navi Mumbai, www.nafcard.org

It is seen that Share Capital (-0.90), free reserves (-146.59) and net worth (-19.08) of SCARDBs decreased during 2019-20 compared to previous year.

Share capital

The total paid up share capital of fully functional SCARDBs was ₹ 933.97 crores in 2017-18 which dropped and stood at ₹ 886.18 crores, as on 31 March 2020 as against ₹ 887.08crores, as on 31 March 2019 registered a dip of ₹ 0.90 crore over the previous year. The share capital contributed by individual members has increased by ₹ 1.59 crores, while share capital contributed by the Government decreased by ₹ 2.49 crores, during 2019-20.

Reserves andother funds

The total of free reserves and other owned funds of SCARDBs had decreased from ₹ 3505.67crores, in 2018-19 to ₹ 3359.08 crores during 2019-20. There has been increase in the reserve fund and credit stabilization fund by ₹ 23.83 crores, and ₹ 9.82 crores respectively, while other funds and free reserves decreased by ₹ 180.24 crores, during 2019-20.

Net worth of SCARDBS

Total net-worth of fully functional SCARDBs stood at ₹ 3725.63 crores, as on31 March 2020 as against ₹ 3744.71 crores, indicating decrease of ₹ 19.08 crores, from previous year. The net-worth was mainly affected by accumulated losses which however has decreased from ₹648.04crores, during 2018-19 to ₹ 519.63 crores, during 2019 20. Haryana SCARDB (₹ 390.34crores), Himachal Pradesh (₹ 10.60 crores), Jammu & Kashmir (₹ 102.31 crores), Pondicherry (₹ 4.53crores) and Uttar Pradesh (₹ 11.85 crores,) banks had accumulated losses in 2019-20.

Gujarat, Haryana, Karnataka, Kerala, Punjab, Tamil Nadu and Uttar Pradesh SCARDBs had reported increase in profits during the current year 2019-20. Only Rajasthan SCARDB has reported decline in its profit during 2019-20 over the previous year. Himachal Pradesh, Jammu & Kashmir and Pondicherry states incurred loss of ₹ 12.10 crores, ₹ 22.37 crores, and ₹ 0.25 crores, respectively in 2019-20.

Borrowings

NABARD continues to be the main source of funds for SCARDBs. Since 2012-13, these funds have been allotted as loans instead of subscriptions to debentures. Central and State Governments also give refinance to the extent of shortfall in loans given by NABARD. SCARDBs also avail funds from NCDC, SCBs and commercial banks through loans or line of credit.

Borrowings made during the year 2018-19 and 2019-20

Table-4 depicts the aggregate borrowings by fully functional SCARDBs under various heads for the period 2018-19 and 2019-20.

Table 4 :Borrowings

(₹ Crores)

Sr. No.	Types of Borrowings	During the Year		Growth		Percentage to Total Borrowings	
		2018-19	2019-20	Amount	%	2018-19	2019-20
1	Borrowings from Government	204.60	142.00	(-) 62.60	(-) 30.60%	5.91%	1.83%
2	Borrowings from NABARD	1989.80	2034.79	(+) 45.19	(+) 2.27%	57.50%	26.21%
3	Borrowings from Others	1265.99	5586.65	(+) 4320.68	(+)341.29%	36.59%	71.96%
Total (1+2+3)		**3460.39**	**7763.44**	**(+) 4303.05**	**(+) 124.36%**	**100%**	**100%**

Source: Statistical bulletins, NCARDF, Navi Mumbai, www.nafcard.org

During the year 2019-20, SCARDBs borrowed ₹ 7763.44 crores, as against ₹ 3460.39crores, during 2018-19. SCARDBs' borrowings recorded increase of ₹ 4303.05 crores, during 2019-20 over 2018-19 mainly on account of increase in 'Other borrowings' which include short term borrowings from SCBs/DCCBs by way of interim finance. Borrowings from NABARD during the year stood at ₹ 2034.79 crores, registering an increase of 2.27% and accounted for26.21% of the total resources mobilized during 2019-20, as against 57.50% in 2018 19. Of the total resources, a sum of ₹ 142.00 crores, was contributed by the Governments as against ₹ 204.60 crores, in 2018-19.

Against the total borrowings from NABARD at ₹ 2034.79 crores, during 2019-20, total repayment to NABARD were ₹ 2926.81 crores, Kerala SCARDB had the highest borrowing of ₹ 1507.24crores, during 2019-20, followed by Karnataka with ₹169.09 crores, Rajasthan ₹114.20 crores, Gujarat ₹ 100.00 crores, Uttar Pradesh ₹70.12 crores, Himachal Pradesh ₹ 38.52 crores and Punjab ₹ 35.64 crores, respectively from NABARD. However Haryana, Jammu & Kashmir, Pondicherry, Tamil Nadu SCARDBs did not avail refinance from NABARD due to non-availability of State Government/Union Territory's default guarantee as required.

Share of Government and NABARD in total borrowings raised during 2019-20 was decreased from 5.91% to 1.83%and 57.50% to 26.21% as compared to the previous year.

Borrowings outstanding

The aggregate borrowings outstanding of SCARDBs stood at ₹ 12249.33crores, as on 31 March 2020 as against ₹ 13657.17 crores, as on 31 March 2019 registering a decrease of ₹ 1407.84 crores, (11.49%) over the previous year.(Source: Statistical Bulletin of NAFCARD)

Total borrowings of PCARDBs during 2019-20 were ₹ 3241.11 crores, 88.30% of their total borrowings amounting to ₹ 2861.80 crores, came from SCARDBs as the balance of ₹ 379.31 crores came from other sources. The outstanding borrowings of PCARDBs as on 31.03.2020 increased to ₹ 15140.14 crores, as against ₹ 14922.84 crores, during the previous year. (Source: Statistical Bulletin of NAFCARD)

Deposits

Co-operatives are allowed to collect deposits from their voting members without any restrictions that are applicable to raising public deposits. The said Act also permits Co-operatives to raise deposits from non-members as per deposit scheme approved by State Government which is the sole regulator of deposit scheme of Co-operatives. Majority of SCARDBs are mobilizing deposits now. The aggregate of deposits raised during 2019-20 was ₹ 1221.39 crores, as against ₹ 1189.06 crores, during the previous year showing increase of ₹ 32.33 crores. The total deposit outstanding of these banks as on 31March 2020 increased marginally from 1829.56 crores, to ₹1857.61 crores, from the previous year. (Source: Statistical Bulletin of NAFCARD)

Utilizationof funds

The funds raised by the SCARDBs consist of borrowings, deposits, share capital from borrowers and loan recovery, which are utilized for mainly advancing loans and repayment to NABARD and other creditors. Following are the major purposes for which loans are issued.

- Long term loans in non-farm sector (excludes rural housing)
- Long term loans for rural housing
- Long term loans for Agriculture and Non-agriculture purposes
- Short term loans for Agriculture and Non-agriculture purposes

Advances at apex bank level

During 2019-20, total advances of SCARDBs were ₹ 3923.37 crores, as against ₹ 3987.82 crores, during 2018-19. Advances during the year decreased by ₹ 64.45 crores, which comes to 1.62% less than that of the previous year. The Table-5 given below depicts the breakup of advances between farm and non-farm sectors during the years 2018-19 and 2019-20 by SCARDBs.

The aggregate loans outstanding at Apex Bank level as on 31 March 2020 stood at ₹ 19337.49 crores, as against ₹ 19476.02 crores, as on 31 March 2019. There has been a decrease in the loans outstanding of Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan and Uttar Pradesh SCARDBs while outstanding loans of Karnataka, Kerala, Pondicherry and Tamil Nadu SCARDBs were less than the previous year.(Source: Statistical Bulletin of NAFCARD)

Table 5 : Loans disbursed at apex bank level

Sr. No.	Types of Advances	Amount (₹ Cr.)		Growth		Remarks
		2018-19	2019-20	Amount (₹ Cr.)	Percentage	
1	**Farm Sector Advances**					Haryana, Karnataka, and Kerala SCARDBs had increased their long term farm sector advances, while Gujarat, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan and Uttar Pradesh SCARDBs showed decline in their farm sector lending's. Kerala SCARDB registered an increase in their short term farm sector advances while Rajasthan shown a declining trend.
i	**Long Term**	1394.89	1241.40	(-) 153.49	(-) 11.00%	
ii	**Short Term**	55.65	59.26	(+) 3.61	(+) 6.49%	
2	**Non-farm Sector (Long Term)**	375.90	338.56	(-) 37.34	(-) 9.93%	Gujarat and Karnataka SCARDBs has increased in their LT non-farm sector advances while remaining banks had recorded declining trend.
3	**Rural Housing**	998.63	945.75	(-) 52.88	(-) 5.30%	Haryana, Jammu & Kashmir and Karnataka SCARDBs has increase in their lending's under rural housing segment, the remaining banks had recorded declining trend.
4	**Other Non-agriculture Advance**					Only Haryana has increased their long term other non-agri. advances, while Jammu & Kashmir, Kerala and Uttar Pradesh SCARDBs recorded reduction in their long term lending's. In short term other non-agri. advances, Pondicherry and Tamil Nadu had shown increasing trend while Gujarat SCARDB registered declining trend for the same.
i	**Long Term**	257.31	231.08	(-) 26.23	(-) 10.19%	
ii	**Short Term**	905.44	1107.32	(+) 201.88	(+) 22.30%	
	Total	**3987.82**	**3923.37**	**(-) 64.45**	**(-) 1.62%**	Increase in the total lending's were registered by Haryana, Karnataka, Kerala, Pondicherry and Tamil Nadu SCARDBs while the remaining banks had registered declining trend in their total lending's.

Source : Statistical bulletins, NCARDF, Navi Mumbai, www.nafcard.org

Advances at ultimate borrowers' level

The Table-6 depicts the breakup of advances between farm and non-farm sectors for the period 2018-19 to 2019-20 by the affiliated PCARDBs. The loans disbursed at ultimate borrowers' level decreased by 0.03% from ₹ 4376.22 crores, during 2018-19 to ₹ 4374.72 crores, during 2019-20. The advances of PCARDBs in Haryana, Karnataka, Pondicherry and Tamil Nadu states reported growth in advances while advances by PCARDBs in Himachal Pradesh, Kerala, Punjab and Rajasthan states were less than the previous year.

The aggregate loans outstanding at ultimate borrowers' level as on 31 March 2020 stood at ₹ 17796.37 crores, as against ₹ 18080.88 crores, as on 31 March 2019. PCARDBs in Karnataka, Kerala and Tamil Nadu States had increased their loan outstanding while there was decline in the loans outstanding of PCARDBS in Haryana, Himachal Pradesh, Punjab and Rajasthan States compared to the previous year.(Source: Statistical Bulletin of NAFCARD)

Table 6 : Loans disbursed at ultimate borrowers' level

Sr. No.	Types of Advances	Amount (₹ Cr.)		Growth		Remarks
		2018-19	2019-20	Amount (₹ Cr.)	Percentage	
1	**Farm Sector Advances**					Haryana, Karnataka, and Kerala SCARDBs had increased their long term farm sector advances while Gujarat, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan and Uttar Pradesh SCARDBs showed decline in their farm sector lending's. Kerala SCARDB registered an increase in their short term farm sector advances while Rajasthan shown a declining trend.
i	**Long Term**	1336.75	1261.79	(-) 74.96	(-) 5.61%	
ii	**Short Term**	90.43	68.49	(-) 21.94	(-) 24.26%	
2	**Non-farm Sector (Long Term)**	393.16	356.14	(-) 37.02	(-) 9.42%	Gujarat, Haryana and Karnataka SCARDBs has increased in their LT non-farm sector advances while remaining banks had recorded declining trend.
3	**Rural Housing**	1006.72	957.19	(-) 49.53	(-) 4.92%	Haryana, Jammu & Kashmir and Karnataka SCARDBs has increase in their lending's under rural housing segment, the remaining banks had recorded declining trend.
4	**Other Non-agriculture advance**					Jammu & Kashmir, Kerala, Punjab, Rajasthan and Uttar Pradesh SCARDBs recorded reduction in their long term other non-agri. lending's. In short term other non-agri. advances, Pondicherry and Tamil Nadu had shown increasing trend while Gujarat SCARDB registered declining trend.
i.	**Long Term**	356.28	252.34	(-) 103.94	(-) 29.17%	
ii.	**Short Term**	1192.88	1478.77	(+) 285.89	(+) 23.97%	
	Total	**4376.22**	**4374.72**	**(-) 1.50**	**(-) 0.03%**	**Increase in the total lending's registered by Haryana, Karnataka, Kerala, Pondicherry and Tamil Nadu SCARDBs while the remaining banks had registered declining trend in their total lending's.**

Source: Statistical bulletins, NCARDF, Navi Mumbai, www.nafcard.org

Purpose-wise classification of advances

The purpose-wise classification of farm and non-farm long term advances and break-up of short term advances between agriculture and non-agriculture purposes during 2017-18, 2018-19 and 2019-20 at borrowers level are given in Table-7.

Table 7 : Purpose-wise Advances

Sr. No.	Purpose of advances	2017-18		2018-19		2019-20	
		Amount (₹ Cr.)	%	Amount (₹ Cr.)	%	Amount (₹ Cr.)	%
A	**Farm Sector Advances**						
i.	Minor Irrigation	109.30	2.87%	64.92	1.39%	79.31	1.81%
ii	Farm Mechanization	106.81	2.81%	136.36	2.92%	132.67	3.03%
iii	Plantation & Horticulture	413.57	10.87%	374.39	8.02%	175.55	4.00%
iv	Land Development	218.65	5.75%	180.30	3.86%	150.50	3.43%
v	Allied Sectors (Dairy, Poultry, Others & Fisheries)	461.36	12.13%	489.83	10.5%	270.86	6.18%
vi	Non-productive purposes (Purchase of Land & Others)	15.92	0.42%	4.01	0.09%	5.01	0.11%
	Total Farm Sector Advances	1325.61	34.85%	1249.81	26.78%	813.90	18.56%
B	**Non-farm Sector Advances**						
i	Rural Housing	1063.32	27.95%	1028.35	22.03%	957.19	21.83%
ii	SRTO & Rural Go-downs/ Storage	39.85	1.05%	47.41	1.02%	51.16	1.17%
iii	Others	619.57	16.29%	497.41	10.66%	409.84	9.35%
	Total Non-farm Sector Advances	1722.74	45.29%	1573.17	33.71%	1418.19	32.34%
C	**Short Term Advances**						
i	Short-term Agricultural Advances	114.34	3.01%	90.43	1.94%	68.48	1.56%
ii	Short-term Non Agricultural Advances	641.07	16.85%	1753.65	37.58%	2084.59	47.54%
	Total Short Term Advances	755.41	19.86%	1844.08	39.51%	2153.07	49.10%
	Grand Total (A+B+C)	**3803.76**	**100%**	**4667.06**	**100%**	**4385.16**	**100%**

Source: Statistical bulletins, NCARDF, Navi Mumbai, www.nafcard.org

During 2017-18 and 2018-19, the share of farm sector advances was 34.85% and 26.78% respectively while that of non-farm sector stood at 45.29% and 33.71% respectively of which Rural Housing was 27.95% and 22.03% respectively accounted for the major share and short-term advances accounted for 19.86% and 39.51%respectively.

During 2019-20, the share of farm sector advances was 18.56% while that of non-farm sector stood at 32.34% of which rural housing was 21.83% accounted for the major share and short-term advances accounted for 49.10%.

Investments

SCARDBs invest their funds to comply with statutory requirements as well as to deploy surplus funds. These investments relate mainly to reserve funds and other reserves/ funds. Majority of these investments are made either in Fixed Deposits with SCBs / CBs / DCCBs or other instruments such as Government Securities, NABARD bonds etc. The aggregate investments of the SCARDBs, as on 31 March 2020 was 2476.76 crores, as against 3247.40croresin 31.03.2019 registering decrease of 23.73%. (Source: Statistical Bulletin of NAFCARD)

Financial position of SCARDBS - income and expenditure

Income

Table-8below depicts the break-up of aggregate income between interest income and other income during 2017-18, 2018-19 and 2019-20 together with their relative share for these years.

Table 8 : Income **(₹ Crores)**

Sr. No.	Types of income	During 2017-18		During 2018-19		During 2019-20		Growth (Last 2 Years)	
		Amount	%	Amount	%	Amount	%	Amount	%
1	Interest income	2283.70	96.41%	2321.96	96.39%	2278.22	91.75%	(-) 43.74	(-) 1.88%
2	Other income	85.12	3.59%	86 84	3.61%	204.86	8.25%	(+)118.02	(+) 135.91%
Total Income (1+2)		**2368.82**	**100%**	**2408.80**	**100%**	**2483.08**	**100%**	**(+) 74.28**	**(+) 3.08%**

Source: Statistical bulletins, NCARDF, Navi Mumbai, www.nafcard.org

The total income of SCARDBs during the financial year 2019-20 was Rs. 2483.08 crores, as against Rs. 2408.80 crores in 2018-19. During 2019-20, the other income increased by Rs. 118.02 crores, and interest income decreased by Rs. 43.74 crores, resulting in 3.08% increase in total income over the previous year. It is concluded that 91.75% incomes is from interest.

Expenditure

During 2019-20, the total expenditure of SCARDBs stood at Rs. 2235.70 crores, as against Rs. 2461.98 crores, during 2018-19 registering a decrease of 9.19% over the previous year. Provisions was increased by Rs.37.46 crores, while Interest Paid, Cost of Management and Other Expenditure were decreased by Rs. 119.30 crores, Rs. 21.46 crores and Rs. 122.98 crores, respectively as compared to the previous year. It is seen that interest paid is decreasing while cost of management is increasing in subsequent years. Details of expenditure for the years 2017-18, 2018-19 and 2019-20 together with variations are presented in Table-9.

Table 9 : Expenditure **(₹ Crores)**

Sr. No.	Types of expenditure	During 2017-18		During 2018-19		During 2019-20		Growth (Last 2 Years)	
		Amount	%	Amount	%	Amount	%	Amount	%
1	Interest paid	1457.34	61.27%	1294.69	52.59%	1175.39	52.57%	(-) 119.30	(-) 9.21%
2	Cost of management	385.24	16.19%	420.81	17.09%	399.35	17.86%	(-) 21.46	(-) 5.10%
3	Provisions	463.07	19.46%	408.34	16.59%	445.80	19.94%	(+) 37.46	(+) 9.17%
4	Other Expenditure	73.33	3.08%	338.14	13.73%	215.16	9.62%	(-) 122.98	(-) 36.37%
Total expenditure (1+2+3+4)		**2378.98**	**100%**	**2461.98**	**100%**	**2235.70**	**100%**	**(-) 226.28**	**(-) 9.19%**

Source: Statistical bulletins, NCARDF, Navi Mumbai, www.nafcard.org

Working results of SCARDBS

Among all the thirteen SCARDBs in 2015-16, Rs. 112.16 crores profits were made by nine banks and four banks registered a loss of Rs. 28.12 crores. In 2016-17Rs. 70.19crores profit was made by seven banks. Six banks registered loss of Rs. 272.60 crores. In 2017-18, profit making ARDBs were eight and the others were in loss. Eight banks were in profit during 2019-20 as against seven banks during 2018-19. However, aggregate profits increased to Rs. 282.70 crores, in 2019-20 from that of Rs. 120.69crores,in 2018-19. FiveSCARDBs were in loss of Rs. 34.72crores in 2019-20 as against Rs. 173.27crores loss made by Six SCARDBs during 2018-19. As on 31 March 2020, five SCARDBs

namely Haryana, Himachal Pradesh, Jammu & Kashmir, Pondicherry and Uttar Pradesh SCARDBs had accumulated loss ofRs.519.63 crores, as against Rs. 648.04 crore as on 31 March 2019 by four SCARDBs viz., Haryana, Jammu & Kashmir, Pondicherry and Uttar Pradesh. The accumulated loss has increased substantially after 2015-16, which shown decreasing trend in 2019-20. The working results of fully functional SCARDBs are presented inTable-10.

Table 10 :Working results of SCARDBs

Particulars	2015-16	2016-17	2017-18	2018-19	2019-20
Total SCARDB (No.)	13	13	13	13	13
In profit (No.)	9	7	8	7	8
Profit amount (₹ Cr.)	112.16	70.19	73.58	120.69	282.70
In Loss (No.)	4	6	5	6	5
Loss amount (₹ Cr.)	28.12	272.60	83.15	173.27	34.72
No. of banks having accumulated losses	5	7	5	6	5
Accumulated Loss (₹ Cr.)	217.69	486.85	486.88	648.04	519.63

Source: Statistical bulletins, NCARDF, Navi Mumbai, www.nafcard.org

Working results of PCARDBs

Among 601 PCARDBs, 309 were in profit and 292were in loss during the year 2015-16. During the year 2016-17, 241 PCARDBs have registered profit and 360 PCARDBs have registered loss. A profit of Rs. 39.20 crores showed by 179 PCARDBs and 422 PCARDBs showed a loss of Rs. 671.52 crores in 2017-18. As on 31 March 2020, out of 578 PCARDBs affiliated to SCARDBs under federal and mixed structures, 209 PCARDBs were in profit aggregating to Rs. 80.84 crores, whereas 369 PCARDBs had incurred loss to the tune of Rs. 584.60 crores.440PCARDBs had accumulated loss of Rs. 4872.76 crores, during 2019-20 as against Rs. 4428.35 crores, during 2018-19. The accumulated losses of PCARDB had increased substantially by Rs. 444.41 crores, during 2019-20 compared to previous year. Working results of PCARDBs are presented in Table-11 below.

Table 11. Working Results of PCARDBs

Particulars	2015-16	2016-17	2017-18	2018-19	2019-20
Total PCARDBs (No.)	601	601	601	578	578
In profit (No.)	309	241	179	224	209
Profit amount (₹ Cr.)	174.14	77.75	39.20	90.72	80.84
In loss (No.)	292	360	422	354	369
Loss amount (₹ Cr.)	275.01	629.50	671.52	525.52	584.60
No. of banks having accumulated losses	378	413	361	424	440
Accumulated Losses (₹ Cr.)	3140.13	3634.87	4000.05	4428.35	4872.76

Source: Statistical bulletins, NCARDF, Navi Mumbai, www.nafcard.org

Recovery performance: demand, collection, balance position

Table-12 below furnishes the demand, collection (recovery) and balance (overdue) position at the Apex bank level and at ultimate borrowers' level. As against a total demand of Rs. 11786.21 crores, for 2019-20, total collections at the Apex Bank level were Rs. 5036.03 crores, with a recovery rate of 42.73%compared to 45.04% as on previous year. Total Apex level overdue in 2019-20 stood at Rs. 6750.15 crores, as compared to Rs. 6148.31 crores in 2018-19, showing an increase of overdue of Rs. 601.84 crores, over the previous year.

The total ground level demand of SCARDBs during 2019-20 were Rs. 14316.50 crores, against which collections were Rs. 5528.14 crores, which show 38.61% of recovery in 2019-20 as against 38.57% in 2018-19. Total ground level overdue in 2019-20 stood at Rs. 8788.36 crores, as compared to Rs. 8241.51 crores, during 2018-19, showing an increase of Rs. 546.90 crores, over the previous year.

Table 12 : DCB Position **(₹ Crores)**

Sr. No.	Particulars	2018-19		2019-20		Growth	
		Apex	Ultimate Borrowers	Apex	Ultimate Borrowers	Apex	Ultimate Borrowers
1	**Demand**	11186.40	13415.61	11786.21	14316.50	(+) 599.81	(+) 900.89
2	**Collection**	5038.01	5174.10	5036.03	5528.14	(-) 1.98	(+) 354.04
3	**Balance**	6148.31	8241.51	6750.15	8788.36	(+) 601.84	(+) 546.90
4	**Recovery (%)**	45.04%	38.57%	42.73%	38.61%	--	--

Source: Statistical bulletins, NCARDF, Navi Mumbai, www.nafcard.org

SCARDBs need to chalk out suitable and time-bound viability action plans in consultation with the Board of Management of these PCARDBs. Unless the ground level recoveries improve, the higher tier i.e. SCARDBs may not be in a position to show a better rotation of funds lent. The SCARDBs have to focus their attention towards improving the recovery performance of their branches as also that of their affiliated PCARDBs if they want to improve their eligibility for availing higher limits of refinance from NABARD.

ASSET CLASSIFICATION

Asset classification of SCARDBs as on 31 March 2018, 2019 and 2020 are as given in Table-13below.

Table 13 : Asset classification **(₹ Crores)**

Asset Classification	2017-18	2018-19	2019-20	Growth (Last 2 years)	
				Amount	%
Total loans outstanding	20235.35	19068	18962.2	(-) 105.83	(-) 0.56%
Standard assets	15050.40	13878.1	12435.9	(-) 1442 19	(-) 10.39%
Sub standard assets	1942.20	1972.08	2532 25	(+) 560.17	(+) 28.41%
Doubtful assets	3214.39	3189.77	3961.89	(+) 772.12	(+) 24.21%
Loss assets	29.37	29.12	33.17	(+) 4.05	(+) 13.91%
Total NPAs*	5184.94	5190.97	6527.31	(+) 1336.34	(+) 25.74%
Total provision made	2040.41	2547.98	2598.86	(+) 50.88	(+) 2.00%
NPA as% of loans outstanding	25.62%	27.22%	34.42%	-	-

Source : Statistical bulletins, NCARDF, Navi Mumbai, www.nafcard.org

* Excluding Rs. 1.02 crores and Rs. 1.00 crore of Special reserved suspense account pertaining to Gujarat SCARDB for the year 2018-19 and 2019-20 respectively.

It can be seen from the above that the total impaired assets to total loans outstanding stood at Rs. 6527.31 crores, as on 31 March 2020 registering an increase of Rs. 1336.34 crores, over the previous year. The total impaired assets (NPA) to total loans outstanding were at Rs. 5184.94 crores, as on 31 March 2018.The impaired asset to total loans outstanding has increased to 34.42% as on31 March 2020 from 27.22% as on 31 March 2019. The quantum of doubtful assets at Rs. 3961.89 crores, as on 31 March 2020 rose by Rs. 772.12 crores, registering an increase of24.21% over the previous year, while the standard assets have decreased by Rs. 1442.19 crores. There has been an increase in the case of sub-standard assets by Rs. 560.17 crores, during the same period. Total doubtful assets were Rs. 3214.39 crores where as standard assets was Rs. 15050.40 crores in 2017-18.The banks need to focus their attention in improving the quality of their assets and take all out steps to reduce their NPA level substantially so as to become eligible for getting unrestricted refinance from NABARD in the coming years.

RESULTS AND DISCUSSION

- Majority of membership of SCARDBs comes from individuals. The numbers of borrowing membership has decreased during the year 2019-20 as compared to previous year. Women members were 13.72 lakhs accounting for 15.94% of the total membership of 86.04 lakhs.
- The share capital contributed by the Government decrease by Rs. 2.49 crores in 2019-20.

- SCARDBs borrowings recorded increase in 2019-20 over 2018-19.
- The aggregate of deposits rose in 2019-20, showed an increase of ₹ 32.33 crores against previous year.
- Advances during the year 2019-20, decreased by Rs. 64.45 crores which comes to 1.62% less than that of the previous year.
- The aggregate investments of the SCARDBs as on 31 March 2020 stood at Rs. 2476.76 crores, registered decrease of 23.73%.
- Total impaired assets to total loans outstanding stood at ₹ 6527.31 crores, as on 31 March 2020 registering an increase of ₹ 1336.34 crores over the previous years.

CONCLUSION

Major areas of concern which are hampering the progress of SCARDBs are poor recovery and rising NPAs, rising accumulated losses, lesser growth in loans and advances, limited scope for deposit mobilization, heavy dependence on borrowings, non-availability of Government guarantee, lack of skilled and professional staff, not updated to latest technology, weak internal systems and procedures, lack of good governance, resource crunch for expansion of credit and increase in number of loss making PCARDBs.

The structure is in urgent need of reforms to address deficiencies in its design as non-resource based institutions with the only business of advancing long term loans.

The SCARDBs are required to bestow immediate attention for taking corrective steps to tackle the above major areas of concern for upgrading the performance of LTRCCS in India. SCARDBs need to prepare action plans to step up lending, resource mobilization and timely recovery of loan installments. LTCCS may seek enhanced support from respective State Government, RBI, NABARD and Government of India.

The new initiatives recommended for Agriculture & Rural Development Banks cover important areas in the working of SCARDBs & PCARDBs including lending, recovery, deposit mobilization and computerization. In view of the declining role and relevance of the structure SCARDBs should take steps to implement these recommendations.

Recovery

Mounting overdue is the single factor responsible for financial weaknesses of institutions in the structure and also the issues they are facing in profitability, liquidity and refinance / borrowing eligibility.

The trend of increase in the amount of overdue at ground level year after year should be arrested and reversed.

New approach to lending

Slowdown in lending under farm and non-farm sectors in the last few years has resulted in drastic fall in business level and viability of SCARDBs & PCARDBs branches. In this context, banks should consider adopting a new approach to lending with focus on the following:

(i) Financing post production value chain including storage, processing and marketing which is given high priority by the Government and NABARD as it results in creating jobs in large numbers and also helps farmers to increase their income. Vast scope for financing agricultural value chain will also help ARBDs to attain viable business level. Banks can finance most of the activities under non-farm sector as also under farm sector itself with the refinance support on NABARD.

(ii) Cluster based lending

Quality of lending in ARBDs has generally gone down impacting loan utilization, loan effectiveness and loan recovery. Inadequate loan follow-up and supervision due to shortage of field staff is the reason for poor quality of lending. Most of the branches which covers an entire tehsil or block are operating with one or two filed staff who cannot ensure proper supervision and follow-up of loans scattered all over the jurisdiction of the bank. Cluster lending is the answer to this problem. It involves identifying clusters with high potential for lending under available schemes of the bank and sanctioning loans to all interested parties from the identified cluster around the same time by organizing credit camp for collection and completing processing of application. A joint liability group can also be formed by including all such borrowers for collaborating each other in the purchase of inputs, sale of produce, by liaison with Government extension agencies and also to create peer pressure for timely repayment.

The ARDBs can also consider relaxation in the security norms when loans are sanctioned to members of joint liability group even if it is an informal group.

The biggest advantage of cluster approach is that it facilitates effective loan supervision in a most efficient manner compared to dealing with applications coming sporadically form different areas in the jurisdiction of the bank. Banks, however, should continue to meet loan demand coming from other areas as well, while organized marketing of loans will be carried out in identified clusters.

SCARDBs shall conduct public contact programs on occasion of celebration of 75 years of Independence- Azadi Ka Amrit Mahotsav (AKAM) under cluster based lending by organizing credit camps at branch level.

(iii) Introducing short term loan products :

Enabling provisions for giving short term loans by ARDBs is now included in the act of the States. Long term lending by SCARDBs has stagnated or declined considerably due to inadequate returns on long term investments at farmer level. Limited availability of NABARD's refinance, non-availability of Government guarantee to the extent required and declining eligibility for refinance which is liked to risk rating etc., have also restricted the scope of long term lending is the farm sector by ARDBs.

Diversification to short term credit, in this context is important for maintaining viable business level and also to help long term borrowers to meet their production / working capital / contingency credit needs.

Revolving credit limit to long term borrowers

The scheme involves sanctioning a short term credit limit also while sanctioning new long term loans and also to existing borrowers who are regular in repayment. The security for credit limit shall be the same given for long term loans. The credit limit is sanctioned on a yearly basis and renewed every year subject to drawl and repayment limit with interest as per terms and conditions laid down by the banks.

The credit limit scheme apart from helping the borrower to meet short term credit needs will also give leverage to borrowers for timely payment of installments of long term loans. Gold loan, consumer loans for employed persons etc. are other short term products recommended for ARDBs.

Deposit mobilization

Deposit mobilization is the only reliable source of resources for funding short term loan products. ARDBs have vast scope for raising resources through deposits. The Banning of Unregulated Deposit Schemes (BUDS) Act 2019 empowers cooperative societies to accept deposits from their members without any of the restrictions as applicable to public deposits. The said Act has also given regulatory powers of deposit schemes of cooperative societies to State Governments. Hence cooperative societies can also accept nonmember deposits subject to terms and conditions as being approved by the State Government.

Computerization

Computerization at all levels is an essential requirement for revival of SCARDBs. SCARDBs in most of the States have initiated the process which needs to be completed in a time bound manner.

(Ref. Source: Proceedings of the 167th Board of Management meeting of NCARDB Federation, Navi Mumbai).

IMPLICATION

The research can be useful for SCARDBs and PCARDBs in India for strengthening their position for performance planning, monitoring and implementing effective and timely action plans to step up their business activities. This research can also be useful to authorities related to LTCCS and policy makers as well as researchers.

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CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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ANTECEDENTS AND MANAGERIAL EFFICIENCY OF THE INLAND FISH FARMERS

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ABSTRACT

The study was carried out in Anand district of Gujarat state with 150 randomly selected inland fish farmers. A pre-tested interview schedule was prepared in light of the objectives and respondents were interviewed either at their home or work place. Ex-post facto research design was used. For measurement of variables, different scales and scoring techniques were used. The result designated that majority of inland fish farmers had medium to high level of knowledge regarding fish farming management practices, ability in planning, ability in coordinating activities, budgeting ability, competence in evaluation of situation and market orientation with very high to medium level of adoption of scientific inland fish farming practices and neutral to favourable attitude towards inland fish farming with low to medium level of information seeking ability, ability to make rational decisions and ability to mobilize resources. Among all the indicators which determine the managerial efficiency, Market orientation performed best followed by attitude towards inland fish farming, competence in evaluation of situation, ability in planning, knowledge regarding fish farming management practices, budgeting ability, ability to make rational decisions, information seeking ability and ability to mobilize resources, whereas ability in coordinating activities and adoption of scientific inland fish farming practices were not up to the mark. The overall managerial efficiency of inland fish farmer was found to be 57.10 per cent. The result amongst the nineteen selected variables of the of inland fish farmers in the study education, caste, annual income, participation in training, contact with extension agency, exposure to agricultural mass media, pond size, economic motivation, risk orientation, achievement motivation, scientific orientation, innovation proneness and self confidence had establish positive and significant relationship with the managerial efficiency of inland fish farmers, whereas age and social participation failed to show any significant influence on the managerial efficiency of inland fish farmers.

Keywords: *managerial efficiency, fish farmers, relationship*

INTRODUCTION

There is a huge untapped potential in fisheries and aquaculture, which can contribute considerably to improve the livelihoods as also women empowerment. The future development of aquaculture depends on adoption of new and innovative production technologies, management and utilization of less utilized water resources and proper market tie-ups. Fish farmer are engaged in the various activities of fish farming and the most important activity from those which has provided them better way of living (Makwana and Bhatt, 2021). With the help of technological innovations, greater degree of specialist availability and power of human resource has developed lot. However, in this process fish farmers' efforts was involved and that have risen to management and hence, it is an important factor to utilize these available resources and accumulate capital in effective manner. Raising managerial efficiency or improving the quality of human factor is of paramount importance and will open up new vistas for inland fish farmers and make possible for them to achieve substantial gains in farm income (Vinaya and Shivamurthy, 2021). There is a great scope for raising managerial efficiency and economic performance through manipulation in various factors which determines the managerial efficiency of an individual besides different factors of production for effective and efficient utilization of various availed resources.

OBJECTIVE

(1) To study the managerial efficiency of the inland fish farmers

(2) To find out the relationship between the profile of the inland fish farmers and their managerial efficiency

METHODOLOGY

The study was carried out in Anand district of Gujarat state. The basic information concerning the study was

collected from the records of district, taluka as well as village panchayat and office of the Fisheries Development Officer of Anand district. 150 inland fish farmers were proportionately and randomly selected out of total 464 inland fish farmer from all the eight talukas. A pre-tested interview schedule was prepared in light of the objectives and respondents were interviewed either at their home or work place. Ex-post facto research design Kerlinger, (1976) was used. For measurement of variables included in study, different scales and scoring techniques were used.

RESULTS AND DISCUSSION

Different indicators played an important role in determining the managerial efficiency of inland fish farmers. In this study, eleven indicators were judged for determining the managerial efficiency and the data reflecting their level with respect to all eleven indicators are presented in Table 1.

Table 1: Fish farmers according to different indicators which determines the managerial efficiency (n = 150)

Sr. No.	Indicators	Category	Frequency	Per cent
1	Knowledge regarding fish farming management practices	Very low (0 to 6.20)	00	00.00
		Low (6.21 to 12.40)	35	23.33
		Medium (12.41 to 18.60)	45	30.00
		High (18.61 to 24.80)	45	30.00
		Very high (24.81 to 31.00)	25	16.67
2	Ability in planning	Very low (9.00 to 16.20)	35	23.33
		Low (16.21 to 23.40)	12	08.00
		Medium (23.41 to 30.60)	48	32.00
		High (30.61 to 37.80)	37	24.67
		Very high (37.81 to 45.00)	18	12.00
3	Information seeking ability	Very low (7.00 to 12.60)	24	16.00
		Low (12.61 to 18.20)	34	22.67
		Medium (18.21 to 23.80)	58	38.67
		High (23.81 to 29.40)	23	15.33
		Very high (29.41 to 35.00)	11	07.33
4	Ability in coordinating activities	Very low (4.00 to 7.20)	43	28.67
		Low (7.21 to 10.40)	19	12.67
		Medium (10.41 to 13.60)	53	35.33
		High (13.61 to 16.80)	33	22.00
		Very high (16.81 to 20.00)	02	01.33
5	Adoption of scientific inland fish farming practices	Very low (0 to 1.60)	00	00.00
		Low (1.61 to 3.20)	26	17.33
		Medium (3.21 to 4.80)	20	13.33
		High (4.81 to 6.40)	74	49.34
		Very high (6.41 to 8.00)	30	20.00
6	Ability to make rational decisions	Very low (6.00 to 10.80)	19	12.67
		Low (10.81 to 15.60)	38	25.33
		Medium (15.61 to 20.40)	55	36.67
		High (20.41 to 25.20)	26	17.33
		Very high (25.21 to 30.00)	12	08.00
7	Ability to mobilize resources	Very low (7.00 to 12.60)	21	14.00
		Low (12.61 to 18.20)	41	27.33
		Medium (18.21 to 23.80)	56	37.33
		High (23.81 to 29.40)	16	10.67
		Very high (29.41 to 35.00)	16	10.67
8	Attitude towards inland fish farming	Strongly unfavaourable (13.00 to 23.40)	26	17.00
		Unfavaourable (23.41 to 33.80)	21	14.00
		Neutral (33.81 to 44.20)	47	31.67
		Favourable (44.21 to 54.60)	42	28.00
		Highly favourable (54.61 to 65.00)	14	09.33

Sr. No.	Indicators	Category	Frequency	Per cent
9	Budgeting ability	Very low (4.00 to 7.20)	29	19.33
		Low (7.21 to 10.40)	21	14.00
		Medium (10.41 to 13.60)	60	40.00
		High (13.61 to 16.80)	39	26.00
		Very high (16.81 to 20.00)	01	00.67
10	Competence in evaluation of situation	Very low (5.00 to 9.00)	21	14.00
		Low (9.1 to 13.00)	26	17.33
		Medium (13.1 to 17.00)	66	44.00
		High (17.1 to 21.00)	37	24.67
		Very high (21.1 to 25.00)	00	00.00
11	Market orientation	Very low (4.00 to 7.20)	21	14.00
		Low (7.21 to 10.40)	26	17.33
		Medium (10.41 to 13.60)	60	40.00
		High (13.61 to 16.80)	43	28.67
		Very high (16.81 to 20.00)	00	00.00

(1) Knowledge regarding fish farming management practices

The result specify that more than one forth (30.00 per cent) of the inland fish farmers had medium as well as high level of knowledge regarding fish farming management practices. The probable cause for this might be their medium inland fish farming experience and medium level of education coupled with enough self interest in taking up fish farming activities and participation in training programme conducted by extension functionaries. The results were in conformity with Sarma *et al.* (2013), Jadav (2018) and Makwana (2020).

(2) Ability in planning

The table concluded that nearly one third (32.00 per cent) of the inland fish farmers had medium level of ability in planning. Majority of the fish farmer were intended to plan their activities in advance to ensure good remuneration by minimizing risk in fish farming might be the possible explanation of this type of result. These results were consistent with Reddy, (2006) and Mande, (2015).

(3) Information seeking ability

The result observed that more than one third (38.67 per cent) of the inland fish farmers had medium level of information seeking ability. The probable reason behind this might be medium level of mass media exposure and low to medium level of extension contact. The results were conforming to Prabhu, (2006) and Mande, (2015).

(4) Ability in coordinating activities

The result observed that more than one third (35.33 per cent) of the inland fish farmers had medium level of ability in coordinating activities. Enterprise with more intricate activities requires higher coordination efforts and hence the respondents might have aware that how money, labour and time can be saved by coordinating activities might be the probable reason behind this result. The results were in accordance with Reddy, (2006) and Mande, (2015).

(5) Adoption of scientific inland fish farming practices

The result observed that nearly half (49.34 per cent) of the inland fish farmers had high level of adoption of scientific inland fish farming practices. The possible reason for this might be the moderate to high extent of knowledge of the respondents to fish farming technologies. The results were in agreement with Jadav, (2018) and Makwana *et al.*, (2020).

(6) Ability to make rational decisions

The result indicated that more than one third (36.67 per cent) of the inland fish farmers had medium level of ability to make rational decisions. Decision making concept is highly influenced by close interaction among co-growers, family members and friends. Most of the decisions are influenced by these close members of group dynamics which in turn effect the decision making process of an individual. This might be the probable cause behind the low to medium level of ability to make rational decisions of the respondents. The results were as specified by Mande, (2015).

(7) Ability to mobilize resources

The result revealed that more than one third (37.33 per cent) of the inland fish farmers had medium level of ability to mobilize resources. This might be due to their medium size of ponds and limited resources with low annual income. The results were according to Reddy, (2006).

(8) Attitude towards inland fish farming

The result unfolded that less than one third (31.67 per cent) of the inland fish farmers had neutral attitude towards inland fish farming. Fish farming is not much more remunerate enterprise as expected by the inland fish farmer might be the possible explanation for this type of result. The results were in line with Thorat, (2010) and Patel *et al.,* (2013).

(9) Budgeting ability

The result depicted that exactly two fifth (40.00 per cent) of the inland fish farmers had medium level of budgeting ability. The extent of nature of the respondents to think twice before use their money on certain managerial practices and inputs might be the probable logic behind this. The results were according to Patel *et al.,* (2013).

(10) Competence in evaluation of situation

The result culminated that more than two fifth (44.00 per cent) of the inland fish farmers had medium level of competence in evaluation of situation. It was observed that majority of the inland fish farmers kept records of quantity of produce and prices realized. This might be due to their respective level of experience in fish farming, knowledge level about the practices and mass media exposure. These results were in harmony with Reddy, (2006) and Mande, (2015).

(11) Market orientation

The result unfolded that two fifth (40.00 per cent) of the inland fish farmers had medium level of market orientation. The probable reasons must be the sufficient demand from local market, wherein good price was obtained by the respondents.

Overall managerial efficiency of the inland fish farmers

The data regarding distribution of inland fish farmers according to their overall managerial efficiency towards inland fish farming is presented in Table 2.

Table 2: Inland fish farmers according to their overall managerial efficiency

(n = 150)

Sr. No.	Category	Frequency	Per cent
1	Very low (0 to 20)	00	00.00
2	Low (20.1 to 40)	43	28.67
3	Medium (40.1 to 60)	42	28.00
4	High (60.1 to 80)	64	42.67
5	Very high (80.1 to 100)	01	00.66

The result unfolded that two fifth (42.67 per cent) of the inland fish farmers had high level of overall managerial efficiency. The probable cause behind these results might be the attributed to education, trainings attended, their mass media exposure and the psychological factors. These results were in line with Reddy, (2006), Birajdar *et al.* (2012) and Mande, (2015).

Difference in different indicators which determines the overall managerial efficiency of the inland fish farmers

To study the difference in different components which determines the overall managerial efficiency of the inland fish farmers, one-way analysis of variance was applied to data related to mean per cent score of each indicator of managerial efficiency. The data pertaining to this are propounded in Table 3.

Table 3: The components wise Mean Per cent Scores which determine the managerial efficiency

(n = 150)

Sr. No.	Components	Mean per cent score
1	Knowledge regarding fish farming management practices	57.92
2	Ability in planning	58.61
3	Information seeking ability	56.29
4	Ability in coordinating activities	53.33
5	Adoption of scientific inland fish farming practices	52.20
6	Ability to make rational decisions	57.05
7	Ability to mobilize resources	56.13
8	Attitude towards inland fish farming	59.60
9	Budgeting ability	57.84
10	Competence in evaluation of situation	59.20
11	Market orientation	59.89
12	Overall managerial efficiency	57.10
S.Em±		1.400
C.D (0.05)		3.885
C.V. (%)		30.04

The significant F value shows that, there is significant difference among the different indicators which determine the managerial efficiency of inland fish farmers

hence the null hypotheses (H02), that there is no difference in different indicators of managerial efficiency among the inland fish farmers is rejected.

The mean per cent score of market orientation (59.89) was highest and at par with attitude towards inland fish farming (59.60), competence in evaluation of situation (59.20), ability in planning (58.61), knowledge regarding fish farming management practices (57.92), budgeting ability (57.84), ability to make rational decisions (57.05), information seeking ability (56.29) and ability to mobilize resources (56.13). The ability in coordinating activities (53.33) and adoption of scientific inland fish farming practices (52.20) were inferior to all rest of the indicators. Overall managerial efficiency mean per cent score was 57.10.

Concluding the finding it can be said that among all the indicators which determine the managerial efficiency, Market orientation performed best followed by attitude towards inland fish farming, competence in evaluation of situation, ability in planning, knowledge regarding fish farming management practices, budgeting ability, ability to make rational decisions, information seeking ability and ability to mobilize resources, whereas ability in coordinating activities and adoption of scientific inland fish farming practices were not up to the mark. The overall managerial efficiency of inland fish farmer was found to be 57.10 per cent.

The action of individual farmer is governed by personal, socio-economic, communicational, situational and psychological factors involved in situation. An inland fish farmer shows different degree of perception towards various aspects of the inland fish farming because of the difference in their personal characteristics. Thus, it may be stated that the degree of managerial efficiency of inland fish farmers toward inland fish farming differs with their personal, socio-economic, communicational, situational and psychological characteristics. Hence, considering the importance of these characteristics and review of past research studies, an attempt has been made in this investigation to ascertain the relationship if any, between personal, socio-economic, communicational, situational and psychological characteristics of inland fish farmers and their managerial efficiency.

A statistical method of Karl Pearson's coefficient correlation (r) was used to calculate relationship between the characteristics of inland fish farmers and their managerial efficiency. The result obtained is dispensed in Table 4.

Table 4: Relationship between profile of inland fish farmers and their managerial efficiency

(n = 150)

Sr. No.	Characteristics	Correlation coefficient ('r' value)
X_1	Age	0.117
X_2	Education	0.306**
X_3	Caste	0.370**
X_4	Annual income	0.586**
X_5	Social participation	-0.011
X_6	Participation in training	0.286**
X_7	Contact with extension agency	0.694**
X_8	Exposure to agricultural mass media	0.625**
X_9	Pond size	0.172*
X_{10}	Economic motivation	0.526**
X_{11}	Risk orientation	0.645**
X_{12}	Achievement motivation	0.528**
X_{13}	Scientific orientation	0.678**
X_{14}	Innovation proneness	0.634**
X_{15}	Self confidence	0.575**

* Significant at 0.05 per cent level of probability

** Significant at 0.01 per cent level of probability

(1) Age and managerial efficiency

The data presented in Table 4 clearly revealed that age of the inland fish farmers (r = 0.117) was found non-significantly co-related with their managerial efficiency which implies that irrespective of different age groups of fish farmer, their level of managerial efficiency was uniform. Generally young aged farmers were more enthusiastic in nature with unique power of reception and had ability to interpret the information and ideas and on other hand, old age farmers had greater accumulated experience might have resulted into its non-significant influence on managerial efficiency. Thus, it can be said that age of inland fish farmers was the trivial factor for determination of management efficiency. This result was in conformity with Reddy, (2006), Birajdar *et al.* (2012) and Mande, (2015).

(2) Education and managerial efficiency

It was clear from the data introduced in Table 4 that education of the inland fish farmers had positive and highly significant (r = 0.306**) correlation with their managerial efficiency. Education opens mental horizons of an individual, which resulted in to promotion of analytical thinking to find out different ways and means for getting higher returns in different conditions which ultimately build better perception

and comprehension about different managerial characters which in turn reflected into better managerial efficiency might be the possible explanation of this type of result. Thus education is vital factor in shaping managerial efficiency of inland fish farmer. This finding was in conformity with the finding of Jadav, (2018) and Makwana, (2020).

(3) Caste and managerial efficiency

The data presented in Table 4 indicate that caste of the inland fish farmers had exerted positive and highly significant (r = 0.370**) correlation with their managerial efficiency. It can be inferred that managerial efficiency was observed higher among general and OBC fish farmers than SC and ST as these caste had a relatively high ritual position in the local caste hierarchy which does not allow them to involving in progressive outlook activities and hence they are traditional and orthodox in nature and run fish farming as traditional occupation. Thus caste plays an important role in determination of managerial ability of fish farmer.

(4) Annual income and managerial efficiency

The data furnished in Table 4 shows that annual income of the inland fish farmers had established positive and highly significant (r = 0.586**) correlation with their managerial efficiency. It is clear that money on hand is the key element to facilitate the management of fish farming and this will be operational motives to direct them for making rational decision among the alternatives with them resulted in to development of other traits of management leading to enhancement of managerial efficiency. This finding was in conformity with the finding of Jadav, (2018) and Makwana, (2020).

(5) Social participation and managerial efficiency

The data submitted in Table 4 depicted that there was negative and non-significant (r =-0.011) correlation between social participation of the inland fish farmers and their managerial efficiency. Concluding the finding it can be said that managerial efficiency of fish farmer was similar among the different level of their social participation as it was observed during field survey that majority of the fish farmers were members in co-operative societies where the issues of fish farming are rarely discussed and hence social participation has no role to play in deciding managerial efficiency might be the one of the cause for this finding.

(6) Participation in training and managerial efficiency

The data presented in Table 4 disclosed that participation in training of the inland fish farmers was positively and highly significantly (r = 0.286**) correlated with their managerial efficiency. Thus, Training is the tool by which desired changes in managerial efficiency can be brought about and hence managerial efficiency was higher among those inland fish farmer who have undergone training and thus training provides defreezing of old behaviour and refreezing of new behaviour for managerial aspect coupled with application of new technologies leading to their success in managing their enterprise. Thus, participation in training influenced managerial efficiency of inland fish farmers. This result was in accordance with Birajdar *et al.,* (2012) and Mande, (2015).

(7) Contact with extension agency and managerial efficiency

The data in Table 4 designate that contact with extension agency of the inland fish farmers had shown positive and highly significant (r =0.694**) correlation with their managerial efficiency. It can be inferred that contact with extension agencies by the inland fish farmers enhance their extent of managerial efficiency as more exposure of inland fish farmer to extension agencies, favourably predisposed to acquire information, consequently raising their knowledge and confidence level which might reinforce them to participate in decision making process which in turn reflected in to this types of result. Thus, contact with extension agencies of inland fish farmers are an important variable which affect their overall managerial efficiency. This result was commensurate with Patel *et al.*, (2010), Alam, (2017) and Makwana, (2020).

(8) Exposure to agricultural mass media and managerial efficiency

The data pointed out in Table 1 revealed that exposure to agricultural mass media of the inland fish farmers had exerted positive and highly significant (r = 0.625**) correlation with their managerial efficiency. To epitomize the result it can be said that generally, inland fish farmers exposed more mass media are able to get information about various governments schemes which compelled to make contact with extension agencies resulted into get clue for better managements tactics lead to develop their managerial efficiency. Hence exposure to agricultural mass media had made significant contribution in managerial efficiency of inland fish farmers. This result was in compliance with Rajan, (2013).

(9) Pond size and managerial efficiency

The perusal of data Table 4 find out that pond size of the inland fish farmers had positive and significant (r = 0.172*) correlation with their managerial efficiency. The probable reason might be that the big pond size owners solely

depend on the income from the fishery where a large amount of capital is invested and are much cautious in managing the pond in a better way to get the adequate return resulted in to have higher managerial ability than marginal and small pond size holder. Thus, with the different pond size of the inland fish farmer, their managerial efficiency was different and had key role to play in deciding the managerial efficiency. The result was accordant with Nath, (1993).

(10) Economic motivation and managerial efficiency

The data depicted in Table 4 show that economic motivation of the inland fish farmers had positive and highly significant (r value) (0.526**) correlation with their managerial efficiency. From the above findings, it can be summarized that economic motivation is the basic character upon which other motives and drives are built. When one develops higher level of economic motivation and wants to achieve it, he would strive hard and get internalize himself about different aspects of profit maximization. Operating motive of earning higher income is a mental virus which naturally activates the fish farmer in the direction of rational decision making which in turn contributing in significant influence in different areas of management of fish farming and which in turn reflected in to enhancement of the management efficiency. Hence economic motivation of inland fish farmers had great influence in moulding their managerial efficiency. The result was in assent with Birajdar (2012) and Makwana (2020).

(11) Risk orientation and managerial efficiency

The data in Table 4 stated that risk orientation of the inland fish farmers had positive and highly significant (r value) (0.645**) correlation with their managerial efficiency. From the above findings, it can be concluded the fish farmer with higher levels of risk orientation would be much ahead of other in exploiting the benefits of timely fish farming activities to be done which enforced to take decision in natural way might be possible explanation of this result. Thus, risk orientation of inland fish farmer is important determinant in shaping managerial efficiency in desirable direction. The result was accordant with Mande, (2015).

(12) Achievement motivation and managerial efficiency

The data put forward in Table 4 calculated that achievement motivation of the inland fish farmers had positive and highly significant (r = 0.528**) correlation with their managerial efficiency. The higher achievement motivated inland fish farmers had greater drives to excel effective functioning to reach a sense of personal accomplishment than lower achievement motivated inland fish farmer as higher achievement motivated inland fish farmers realize the latent potential resources for its optimum utilization to earn higher income which open an avenue for best achievement which in turn enforced them to perform better leading to develop traits related to managerial efficiency might be the possible explanation of these type of result. Thus achievement motivation of the inland fish farmers was the determinant factor for enhancing their managerial efficiency. The result was accordant with Patel *et al.,* (2010).

(13) Scientific orientation and managerial efficiency

The data put forward in Table 4 calculated that scientific orientation of the inland fish farmers had established positive and highly significant (r value) (0.678**) correlation with their managerial efficiency. The probable cause for the significant association might be that scientific orientation of the inland fish farmers opens their mental horizon which acts as a catalyst in developing reception power regarding the inland fish farming practices and thereby creating positive disposition towards it, which ultimately reflected in better managerial efficiency. Therefore, it is logical to assume that inland fish farmers having higher scientific orientation had better managerial efficiency. Thus, scientific orientation of inland fish farmer was the vital variable in shaping managerial efficiency of the inland fish farmer. The result was in obedience with Makwana (2020).

(14) Innovation proneness and managerial efficiency

The data put forward in Table 4 calculated that innovation proneness of the inland fish farmers had recognized positive and highly significant (r = 0.634**) correlation with their managerial efficiency. It can be concluded that innovation proneness offers inland fish farmers impetus for working for excellence which would enable them to manifest this excellence in availing the opportunities through its various activities. It means that the inland fish farmers who had higher level of innovativeness had more favourable disposition about inland fish farming activities that helps in shaping their managerial efficiency. Thus, managerial efficiency of inland fish farmer was greatly influenced by innovation proneness. The result was in harmony with Patel *et al.,* (2010).

(15) Self confidence and managerial efficiency

The data put forward in Table 4 signify that self confidence of the inland fish farmers had shown positive and highly significant (r =0.575**) correlation with their managerial efficiency. The result shows that respondents with high degree of assurance on their own ability and resourcefulness in carrying out any activity in the fish farming had high level of managerial efficiency. It is natural that high level of knowledge, positive attitude, skill, better

understanding of different aspects and deep involvement in various activities makes man self confident. All such qualities are also important ingredients to be a good manager. This might be the reason to have high level of managerial efficiency among those respondents, who had high level of self confidence. Thus, self confidence of inland fish farmers play an important role in enhancement of their managerial efficiency. The result was in harmony with Mande, (2015).

CONCLUSION

The result designated that majority of inland fish farmers had medium to high level of knowledge regarding fish farming management practices, ability in planning, ability in coordinating activities, budgeting ability, competence in evaluation of situation and market orientation with very high to medium level of adoption of scientific inland fish farming practices and neutral to favourable attitude towards inland fish farming with low to medium level of information seeking ability, ability to make rational decisions and ability to mobilize resources. It can be said that among all the indicators which determine the managerial efficiency, Market orientation performed best followed by attitude towards inland fish farming, competence in evaluation of situation, ability in planning, knowledge regarding fish farming management practices, budgeting ability, ability to make rational decisions, information seeking ability and ability to mobilize resources, whereas ability in coordinating activities and adoption of scientific inland fish farming practices were not up to the mark. The overall managerial efficiency of inland fish farmer was found to be 57.10 per cent.

Among the selected personal, socio-economic, communicational, situational and psychological variables; education, caste, annual income, participation in training, contact with extension agency, exposure to agricultural mass media, pond size, economic motivation, risk orientation, achievement motivation, scientific orientation, innovation proneness and self confidence had establish positive and significant relationship with the managerial efficiency of inland fish farmers, whereas age and social participation failed to show any significant influence on the managerial efficiency of inland fish farmers.

IMPLICATIONS AND RECOMMENDATIONS

The overall managerial efficiency of inland fish farmers was found 57.10 per cent in terms of mean per cent score and the gap is to be narrowed by effective and efficient execution of innovative ideas implementation and task functions of inland fish farming as the performance of these indicators were not up to the mark.

The findings of the present investigation revealed the training needs and profile of inland fish farmers of the inland fish farming which may be tell-tale of the training needs of inland fish farmers. The extension agencies may use these findings for improving the profile of respective inland fish farmers, wherever possible. Further, they may consider these characteristics while planning and executing the programmers for promoting the inland fish farmers to increase the inland fish farming production for food and nutritional security.

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CONFLICT OF INTEREST

I kindly declare that there is no conflict of interest among researchers among this research.

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EFFECT OF FoCT TRAINING ON ADOPTION OF COCONUT TREE CLIMBING DEVICE FOR HARVESTING COCONUTS

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ABSTRACT

Coconut (Cocos nucifera L.) is an important and versatile tree crop with diverse uses, supporting the livelihood of many farm families in the primary sector, grown in many states of India. Coconuts are known for their great versatility as evidenced by many traditional uses ranging from food to cosmetics. Assamese people prepare different types of edible items from coconut fruit in many festivals. Now, the majority of the coconut growers in Assam were facing the problems of shortage of skilled labour for nut harvesting. The traditional method of harvesting the nuts is quite risky and accident-prone. To overcome this problem, Krishi Vigyan Kendra, Barpeta, Assam conducted training for unemployed rural youths in collaboration with Coconut Development Board, Guwahati. The objectives of the FoCT training were to impart training to a group of unemployed youths in developing their technical skills for harvesting of coconuts, to mitigate the problem of non-availability of coconut tree climbers for coconut harvesting. The present study was conducted at KVK, Barpeta (Assam) with an attempt to know the effect of friends of coconut tree (FoCT) training on the adoption of coconut tree climbing devices. For the present study, 40 trainees were selected purposively. The majority 45% of the trainees use the coconut climbing device only for plucking of their own coconut tree followed by 35% who use the coconut climbing device as a source of income generation and 20% of trainees do not at all use the device. Among the two methods of climbing, the advanced method of coconut tree climber takes less time (3-5 minutes) to climb than the traditional method (7-10 minutes). On the other hand, among the two methods of climbing, the advanced method of coconut tree climber harvested a greater number of nuts and many numbers of harvesting trees over the traditional method.

Keywords: *farmers; tree, coconut, adoption and climber*

INTRODUCTION

Training is a significant aspect of entrepreneurship development and it is considered to be an integral part of the growth and development of an organization. Mostly, training is planned to help individuals to get insight and to bring the desired standard of efficiency, condition and behaviour (*Sharmal, 2013*). Generally, Courses are based on the need analysis which is basically received through family and village surveys of the respective district. There is no specific qualification is needed to be a participant in the training programme. After conducting the training programmes by the scientists of Krishi Vigyan Kendra, a follow up programmes are organized to evaluate how many participants, in reality, converting their obtained skills into practice. While designing the training programmes, the concept of the farming system approach is always taken into account to make the enterprises economically viable.

Coconut (*Cocos nucifera L.*) is an important and versatile tree crop with diverse uses, supporting the livelihood of many farm households in the primary sector, grown in many states of India. Coconuts are known for their great versatility as evidenced by many traditional uses ranging from food to cosmetics. They form a regular part of the diets of many people in the tropics and subtropics. Coconuts are distinct from other fruits for their large quantity of water (Juice) and harvested as tendered nuts for potable coconut water. When matured they can be used as seed nuts or processed to obtain oil from the Kernel, charcoal from the hard shell and coir from the fibrous husk. The oil and milk derived from it are commonly used in cooking and frying as well as in soaps and cosmetics. The coconut also has cultural and religious significance in Hindu rituals. Assamese people prepare different types of edible items from coconut fruit in Bihu and other festivals. The coconut palm has been successfully cultivated in coastal regions of South India as well as in West Bangle, Tripura and Assam. The world's annual production of coconut is 57.514 billion nuts or 10.52 million tons of copra from an area of 14.231 million hectares. More than 75 per cent of this is contributed by the four major players' viz.,

India, Indonesia, Philippines and Sri Lanka. India ranks third on the world coconut map. Coconut is cultivated in 16 states and 4 UTs in the country and provides food and livelihood security to more than 12 million people (*Annual Report, 2016*). The area and average yield of coconut in Assam are 20340 Ha and 52 nos. nuts per bearing plant (*Statistical data for 2015-16)* respectively. The Av. Yield of coconut in Assam per bearing palm is slightly low in comparison to National Av. Yield (59 nos nuts per palm) due to poor management and cultural practices. According to a study carried out by the CDB, Assam's climatic conditions are quite favourable for coconut cultivation. Moreover, there is a lot of fallow and wasteland available in the state which can easily be used for coconut cultivation without disturbing any other crop (*Jose, 2012*). The CDB has already identified about two lakh hectares of land in Assam for taking up coconut plantation in the next five years.

Now, the majority of the coconut growers in Assam were facing the problems of shortage of skilled labour for nut harvesting as well as growers were also losing good quality nuts and prices in the market. The traditional method of harvesting the nuts i.e., physically climbing tall trees is quite risky and accident-prone. To overcome this problem, Krishi Vigyan Kendra, Barpeta, Assam conducted training programmes for unemployed rural youths in collaboration with Coconut Development Board, Guwahati. The objectives of the FoCT training were to impart training to a group of unemployed youths in developing their technical skills for harvesting of coconuts and to mitigate the problem of the non-availability of coconut tree climbers for coconut harvesting.

OBJECTIVES

(1) To study the effect of FoCT training on the adoption of coconut tree climbing devices

(2) To know the perceived attributes of trainees involved in adopting coconut climbing devices

METHODOLOGY

This study was conducted at Barpeta District of Assam. Two skill development trainings programmes on "Friends of coconut tree" (FoCT), were conducted at Krishi Vigyan Kendra, Barpeta during the year 2018-19 with the financial support of Coconut Development Board (CDB) to coconut farmers/Climbers to impart the knowledge and skill of using palm climbing device and management of coconut plantations for higher yields. These trainees got acquainted with the skill of using the device. The selection of unemployed rural youths was made in collaboration with department of agriculture, ATMA, Village head through media coverage by print and social media. From each training programme 20 trainees were attended. The knowledge of coconut palm management and interculture operations was also taught to the trainees. Total 40 coconut farmers were trained for safe climbing of coconut trees using coconut tree climber and improved coconut cultivation practices. The trainees were provided with a palm climbing device after successful competition of the training programme. On the other hand, free accidental insurance for one year and a certificate for attending the programme so as to enable him to take this as his profession. For the present study, all the 40 trainees were selected purposively. The information relating to tree climbers by traditional methods and advanced methods of coconut tree climbers was collected by using a well-structured interview schedule. Adoption was operationalized here as a decision to make full use of coconut climbing device for source of income generation. Farmers adopt them either partially i.e., for harvesting of their own coconuts or do not adopt at all. Score 3, 2 and 1 was given for full, partial and non-adoption respectively. In order to interpret collected data and to draw meaningful conclusions, data were analyzed by using simple statistical tools viz. frequency and percentage.

RESULTS AND DISCUSSION

Table1: Percent of adoption of Coconut climbing devices.

(n=40)

Sr. No.	Particulars	Frequency	Percent
1	Use the coconut climbing device as a source of income generation	14	35
2	Use the coconut climbing device only for harvesting of their own coconut tree	18	45
3	Not at all use	8	20

A perusal of data presented in table 1 revealed that majority 45% of the trainees use the coconut climbing device only for harvesting of their own coconut tree followed by 35% use the coconut climbing device as a source of income generation and 20% of trainees not at all use the device. The majority of the trainees expressed their views that the device is time-saving, easy to handle and safe and reduced the harvesting cost. The results are in line with Tavethiya *et al.* (2021)

It was evident from Table 2 that among the two methods of climbing, the advanced method of coconut tree climber takes less time (3-5 minutes) to climb than the traditional method (7-10 minutes). On the other hand, among the two methods of climbing, the advanced method of

Table 2 : Advantages of advanced method over traditional method (n=40)

With traditional method			With advanced method		
Av. Time taking to climb	**Average plucking of nos. of nuts/tree**	**Average nos. Of tree climbing per day**	**Av. Time taking to climb**	**Average plucking of nos. of nuts/tree**	**Average nos. Of tree climbing per day**
7-10 mins.	15-20	8-10 nos.	3-5 mins.	20-40	18-28 nos.

coconut tree climber harvested a greater number of nuts (20-40 nuts/tree) and a greater number of harvesting trees (18-28 trees/day) over traditional method i.e., physical tree climbing (15-20 nuts/ tree) and lesser number of harvesting trees (8-10 trees/day). The result of the present study conforms to the findings of Deepthi (2017). Regarding perceived attributes of trainees involved in adopting climbing 70% of trainees perceived the device is most advantageous, 60% of them think that the device involves average risk during use, 35% of them perceived that the use of this device is profitable, 80% of them perceived the device is highly compatible and 60% think that it is simple to understand and use. (Table.3).

Table 3 : Perceived attributes involved in adopting climbing device (n=40)

Sr. No.	Attributes	Frequency of Trainees	Percent
1	Most advantageous	28	70
2	Average risk during use.	24	60
3	Use of the device is profitable	14	35
4	Device is highly compatible	32	80
5	Simple to understand and use.	24	60

The trainees also mentioned a few problems which are faced during the use of the device. Out of which three major problems that they mentioned are 1. The Belt system of the toe plate is not comfortable 2. The safety belt is necessary during the plucking of coconuts 3. A suitable head cap is also essential during harvesting the nuts.

CONCLUSION

The study has clearly revealed the scenario that the majority 80% of the trainees were adopted the coconut tree climbing device either for the source of income generation or for harvesting of their own trees. On the other hand, the majority of the trainees stated that the device is time saving, simple, safe and reduced the harvesting cost. The device was well designed to attract rural youth and non-traditional coconut climbers to take up coconut harvesting as a profitable vocation. The farmers having few numbers of coconut trees or having coconut orchards were very pleased to harvest nuts on their own by using this simple device. As well as the trainees were also felt little bit modification of the device which may able to provide better services.

Awareness and training programme on Friend of coconut tree (FoCT) in handling of coconut climbing device as well as management of coconut tree helped in drudgery reduction, income generation and to mitigate the shortage of labours. It also provided an opportunity to strengthen the link between farmers and scientists of coconut development board to get regular advice and schemes related information to coconut farming which helped in technology dissemination and overall development of the weaker section. Hence, there is an urgent need to organize and conduct more nos. of FoCT training programmes covering nos. of district in the state which can enable to help the coconut farmers.

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CONFLICT OF INTEREST

There is no conflict of interest among researcher.

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RELATIONSHIP BETWEEN SELECTED CHARACTERISTICS OF COTTON GROWERS AND THEIR KNOWLEDGE ABOUT INTEGRATED PEST MANAGEMENT

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ABSTRACT

The present investigation was carried out in three talukas of surendranagar district of Gujarat state, where maximun land under cotton cultivation. From each selected taluka four villages were selected randomly. Thus, total twelve villages were surveyed during the study. From each selected village, 10 farmers were considered as respondents, thus total 120 farmers, who grow the cotton crop, were considered as respondents for the present study. The ex-post facto research design was used for the research study. It can be enunciated that among the selected twelve variables. Nine variables viz. Education, farm experience, training received, annual income, social participation, mass media exposure, scientific orientation, risk orientation and innovativeness had exerted positive and significant influence on knowledge of cotton growers about Integrated Pest Management. Three variables viz. age, size of family and land holding failed to show any significant contribution in knowledge of cotton growers about Integrated Pest Management.

Keywords : *cotton, farmers, integrated pest management, knowledge*

INTRODUCTION

Cotton is one of the major *Kharif* crop grown under both irrigated and rain-fed conditions in India. On one hand, cotton crop gives high economic return to the farmers, while on the other hand, there are many risks involved in it. The cultivation of cotton also needs costly inputs in terms of seeds, fertilizers and pesticides (Rathwa *et al.,* 2021). If proper care is not taken, it proves as monetary uncertain business. It is also sensitive crop to many diseases and pests. It is known as risky crop considering natural hazards, as well as the everyday fluctuating of wholesale price index. Thus, sometimes crises involved in cotton crop create serious climatic consequences on the income and life style of the farmers.

Cotton is cultivated in three distinct agro-ecological regions (north, central and south) of the country. Northern zone comprising Punjab, Haryana, parts of Rajasthan and Uttar Pradesh where hirsutum and arboretum types of cotton are grown. After the introduction of Bt. Cotton, intra-hirsutum Bt. Cotton is being extensively cultivated. Central zone comprises primarily rainfed tract of Madhya Pradesh, Maharashtra and Gujarat. In Gujarat state, Surendranagar district is pioneer in introducing cotton cultivation. The district comprises of 10 talukas out of them chotila, chuda and wadhavan taluka has been considered as productivity potential region of cotton crop due to assured irrigation facilities and favourable soil and climatic conditions. That's why current study was conducted in surendranagar district of Gujarat state.

OBJECTIVE

To find out relationship between selected characteristics cotton growers and their knowledge about Integrated Pest Management.

METHODOLOGY

The present study was carried out in Surendranagar district of Gujarat State. three talukas from Surendranagar district were selected for the study of the respondents. From each selected taluka four villages were selected randomly and from each selected village, 10 farmers were considered as respondents, thus total 120 farmers, who grow the cotton crop, were considered as respondents for the present study. An interview schedule based on objective of the study was developed and respondent were personally interviewed for collection of information. Ex-post facto research design was used for the research study (Ker linger, F. N., 1976). All the responses were recorded and transferred to master excel sheet. The data were compiled, scored, tabulated and analyzed to give statistical treatment in such a way that they might give proper answers to the specific objectives of the study.

RESULTS AND DISCUSSION

Knowledge of the farmers about Integrated Pest Management

Table 1: Relationship between knowledge of the cotton growers about Intergrated Pest Management and independent variables (n=120)

Sr. No.	Independent variables	'r' value
X_1	Age	-0.0175^{NS}
X_2	Education	0.2705**
X_3	Farm Experience	0.1920*
X_4	Training received	0.2193*
X_5	Size of family	-0.0062^{NS}
X_6	Annual income	0.2780**
X_7	Land holding	0.1563^{NS}
X_8	Social participation	0.2136*
X_9	Mass media exposure	0.2743**
X_{10}	Scientific orientation	0.3556**
X_{11}	Risk orientation	0.3601**
X_{12}	Innovativeness	0.3723**

* = Significant at 0.05 level of probability

** = Significant at 0.01 level of probability

NS = Non-significant

Age and knowledge

The negative and non-significant relationship between knowledge of the cotton growers about Integrated Pest Management and their age. It can be inferred that there was non-significant relationship between knowledge and their age. It means knowledge of cotton growers was not related with their age. To epitomize the results of the study, it can be stated that irrespective of different age of cotton growers, the knowledge level was uniform. Generally young aged farmers were more enthusiastic in nature with unique power of reception and had ability to interpret the information and on other hand, old age farmers had greater accumulated experience might have resulted into its non-significant influence on knowledge. This finding was in conformity with Chaudhari and Chauhan, (2017).

Education and knowledge

The positive and highly significant relationship between knowledge of cotton growers about Integrated Pest Management and their education. It means that knowledge of cotton growers increased significantly with an increase in education. This might be due to the fact the educated farmers generally have high social participation, high innovativeness and also have progressiveness and rational thinking. Thus, they understand the importance of Integrated Pest Management. This finding was in line with Chaudhari and Chauhan, (2017).

Farming experience and knowledge

The positive and significant relationship between knowledge of cotton growers about Integrated Pest Management and their farming experience. It means that knowledge of cotton growers increased significantly with an increase in farming experience. This finding was in conformity with Sangeetha *et al.* (2009).

Training received and knowledge

It can be concluded, that there was positive and significant relationship between knowledge of cotton growers about Integrated Pest Management and their training received. It means that knowledge of cotton growers increased significantly with an increase in training received. This finding was in line with that of Patel and Sanwal, (2015).

Size of family and knowledge

There was negative and non-significant relationship between knowledge of cotton growers about Integrated Pest Management and their size of family. The probable reason might be due to that knowledge of cotton growers about Integrated Pest Management did not increase significantly with an increase or decrease in family size. This finding was in conformity with Dobariya *et al.* (2017).

Annual income and knowledge

There was positive and highly significant relationship between knowledge of cotton growers about Integrated Pest Management and their annual income. Thus, it can be said that annual income play significant role in decrease or increase knowledge of cotton growers about Integrated Pest Management. This finding was in line with study of the Chaudhari and Chauhan, (2017).

Land holding and knowledge

It can be inferred that there was positive and non-significant relationship between knowledge and their annual income. It means knowledge of cotton growers was not related with their land holding. It can be concluded that there was non-significant relationship between knowledge and their land holding. It means knowledge of cotton growers was not related with their land holding. Similar finding had been reported by Dobariya *et al.* (2017).

Social participation and knowledge

It can be concluded that there was positive and significant relationship between knowledge of cotton growers about Integrated Pest Management and their social participation. It means that knowledge of cotton growers increased significantly with an increase in social

participation. This finding may be due to the fact that cotton growers who participated more in voluntary organization, develop broader outlook and thereby come across with new idea and knowledge. This finding was in conformity with the findings of Dobariya *et al.* (2017)

Mass media exposure and knowledge

There was positive and highly significant relationship between knowledge of cotton growers about Integrated Pest Management and their mass media exposure. It means that knowledge of cotton growers increased significantly with an increase in mass media exposure. The probable reason might be that cotton growers having higher exposure to mass media could get more useful information for their farming. They could got more advantages of mass media. So, mass media exposure played important role for enhancement of knowledge. This finding was in line with finding of Hadiya, (2013).

Scientific orientation and knowledge

There was positive and highly significant relationship between knowledge of cotton growers about Integrated Pest Management and their scientific orientation. It means that knowledge of cotton growers increased significantly with an increase scientific orientation. This finding was supported by the findings of Chaudhari and Chauhan, (2017).

Risk orientation and knowledge

There was positive and highly significant relationship between knowledge of cotton growers about Integrated Pest Management and their risk orientation. It means that knowledge of cotton growers increased significantly with an increase in risk orientation. The finding may be due to those cotton growers who had high risk orientation are psychologically prepared to try new practices with a view to make progress in farming. This finding was supported by the finding of Chaudhari and Chauhan, (2017).

Innovativeness and knowledge

There was positive and highly significant relationship between knowledge of cotton growers about Integrated Pest Management and their innovativeness. It means that knowledge of cotton growers increased significantly with an increase in their innovativeness. That means the innovativeness of the cotton growers increased their level of knowledge about Integrated Pest Management which might be due the frequent contacts with extension functionaries in their jurisdiction and outside contact with other innovators. This finding was supported by the findings of Chaudhari and Chauhan, (2017) Dobariya *et al.* (2017) and Sardhara *et al.* (2020).

CONCLUSION

From above result it can be concluded that education, farm experience, training received, annual income, social participation, mass media exposure, scientific orientation, risk orientation and innovativeness had exerted positive and significant contribution in knowledge of cotton growers about Integrated Pest Management.

POLICY IMPLICATIONS

The results of this study would be helpful in generating data based existing level of knowledge about various aspects of Integrated Pest Management which will serve as a guideline to planners and extension agencies to understand the knowledge gap if any among various aspects and help to increase knowledge regarding Integrated Pest Management.

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CONFLCT OF INTEREST

No conflict of interest among the researcher.

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SCENARIO OF LIVESTOCK EXTENSION SYSTEM, ITS ORGANIZATION AND REGULATION

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ABSTRACT

With the changing global scenario and changing pattern of the agriculture extension professionals need to brace up with the new challanges. Among agriculture and allied sectors livestock sector is facing new challenges in terms of the production, adaptation, stress and other factors. Present study was conducted in the two districts of the Jammu and Kashmi namely Srinagar and Ganderbal. The respondents of the study were middle level extension officers (Veterinarians) and the lower level extension functionaries (Para-Veterinarians). From each district 15 veterinarians and 15 Para-Veterinarians were chosen for the study that made a total of 60 respondents for the present study. Data was collected through an unstructured questionnaire from middle and low level livestock extension professionals. The educational qualification of the Veterinarians was found to be adequate while as of para-veterinarians was not impressive. Majority of the professionals were having extension contacts with state veterinary hospitals (98.33%), information flow through the animal husbandry department was found to be fare (48.33%), and information flow between the VAS centres and centre departments was found to be monthly by majority (65.00%). The basic amenities were found to be adequate (56.67%), with majority reported non-availability of computer, internet facilities, audio-visual aids etc. Majority (95.00%) of the extension professionals were satisfied with their job and level was high. Currently the scenario of the livestock extension departments and professionals is not much impressive. The current challenges in the livestock extension professionals can only be solved when there is better collaboration and coordination between the field, research labs and with other extension agencies.

Keywords: *livestock extension, infrastructure, job satisfaction, information flow, extension service*

INTRODUCTION

Livestock sector is expected to emerge as an engine of agricultural growth in view of rapid growth in demand for animal food products (Saran et al., 2020). Livestock is important in supporting the livelihoods of poor farmers, consumers, traders and laborers throughout the developing world (FAO, 2002). Livestock extension is an important tool in achieving changes in animal production. This system has been created and recreated, adopted and developed over the centuries for the dissemination and application of research results in order to improve animal production and health, including food safety (Khoury, 2011). The developments in livestock sector can help in changing the face of rural India as it is demand driven, inclusive and pro-poor (Shubeena, 2019) and this change is possible when the agencies providing the livestock extension services are sound and competent. Most of the livestock producers being small and marginal farmers, their capacity to mobilize resources required to absorb the latest technologies developed by research institutions are limited. Absence of an effective extension machinery for this purpose compounds the problem. India's huge livestock resources are poorest in the world when it comes to productivity because this sector has remained under-invested and neglected by the financial and extension institutions (Chander *et al.,* 2010). Veterinary extension Services focus on controlling animal disease programmes (vaccination programmes, diagnosis of diseases and veterinary quarantine, amongst others), without giving veterinary extension the attention it requires (Khoury, 2011). There is a huge gap between the availability and requirement of major stake holders in livestock extension like less availability of the field veterinarians and Para veterinarians (Rao, 2015). The lacunas are many but the remedies are not effective. In order to take the effective steps and policy changes the current scenario of the livestock extension department must be known. This

calls for an urgent need of the studies that can bring out the current scenario and its bottle necks so that the future strategy can be developed accordingly.

OBJECTIVE

To understand the scenario of livestock extension system, its organization, regulation and operation in Kashmir valley

METHODOLOGY

The study was conducted in the two districts of the Kashmir Valley namely Srinagar and Ganderbal. A Random sampling method was adopted for choosing the respondents of the study i.e., middle level field Extension functionaries (Veterinary Assistant Surgeons) and low level field Extension functionaries (Para-Veterinarians). 15 Veterinary extension officers and 15 para veterinarians were chosen from each district. A total of 60 field veterinary extension functionaries (Veterinarians and para-veterinarians) were selected for the study. The data was collected through survey with the help of the well-structured interview schedule that was designed in consultation with the experts. The respondents of the study were interviewed at their respective places of posting based on various parameters of the study. Descriptive statistics like frequency and percentage along with the chi square test was used for data analysis.

RESULTS AND DISCUSSION

Personal characteristics of the veterinary extension professionals

Table 1: Socio-economic parameters of the respondents of the study area (n=60)

Particulates	Veterinarians	Para-vets	Overall	P value (Chi square)
a Age (years)				
Low (20-34)	11 (36.66)	11(36.66)	22 (36.66)	130
Middle (35-49)	14 (46.66)	13 (43.33)	27 (45.00)	
Old (40-60)	05 (16.66)	06 (20.00)	11 (18.33)	
b Gender				
Female	03 (10.00)	1 (3.33)	4 (6.67)	0.076
Male	27 (90.00)	29 (96.66)	56 (93.33)	
c Qualification				
10^{th}	0 (0.00)	11 (36.67)	11(18.33)	<0.001
12^{th}	0 (0.00)	05(16.67)	05 (8.33)	
Graduation	0 (0.00)	08 (26.67)	08(13.33)	
Master's degree	0 (0.00)	05 (16.67)	05(8.33)	
BVSc.	15(50.00)	01(3.33)	16 (26.67)	
MVSc	13(43.33)	0 (0.00)	13 (21.67)	
PhD	02 (6.67)	0 (0.00)	02 (3.33)	
d Years in the government service				
1-10	13(43.33)	12(40.00)	25(41.67)	0.144
11-20	11(36.67)	10(33.33)	21(35.00)	
21-30	04(13.33)	05(16.67)	09(15.00)	
31-40	02(6.67)	03(10.00)	05(8.33)	

(Figures in parenthesis indicate the percentage) (P value statistical significant at level of P<0.05)

The results in Table 1 disclose that respondents of the study were mainly middle level and lower level extension functionaries i.e., Veterinarians and para-veterinarians. The majority of the field level extension functionaries were in middle age group of 35-49 years (45%). The results were also defended by the results of Idrisa *et al.* (2008), Ogunbameru (2008) and Olorunfemi (2018) who believed that individuals best suited for extension service delivery are the ones in middle age. This turns to be a great asset for the extension work as this age group is having both enthusiasm of the young and experience of the old. People in this age group are generally more eager to serve the society in the best way and are more empathic towards their community. Major extension service providers were found to be males and proportion of the female extension workers was found to be very low (6.66%). This result is consistent with the

reports of Ajayi, (2013) and Olorunfemi (2019) who in their study found that there are more males in extension services than females. This low percentage of female professionals in the field can be attributed to the fact that majority of the females prefer to work in offices and are less motivated for the field level work. The education qualification of the majority (50%) of the middle level extension functionaries (veterinarians) was Bachelor of Veterinary Sciences (B.V.Sc) that is the minimum qualification for the post of veterinary assistant surgeons. 43.33 percent and 6.67 percent were having Masters and Doctorate degree in veterinary sciences. Good number of the professionals were having the expertise (Masters) in some of the veterinary subjects that can be taken as a positive point towards the delivery of efficient services and more understanding of the field level livestock problems. This finding are in consistent with Fabusoro, (2008) and Olorunfemi, (2019) who reported that extension agents are having good qualifications deeming them good for the assigned jobs. Majority (36.66%) of para-vets (mostly senior ones) were having qualification up to 10th class which is the minimum qualification for the job of para-vet followed by the 26.67 percent with graduate level qualification and 3.33 percent with Masters. It was seen that the young para-vets who were also newly recruited are having higher qualifications above the 12th level. No para-vet in recent few years of the recruitment was having qualification less than graduation. The new generation of both low and middle level extension professionals are coming with high qualifications therefore more useful in delivery of efficient services. Majority of the respondents were found to be engaged in service for 1-10 years (41.67%). No significant association was found between the age, gender and years in service between veterinarians and para-vets while as the qualification varied significantly between the two. Majority of the respondents were found to be engaged in service for 1-10 years (41.67%).

Contact with other extension service providing agencies

Table 2: Contact of livestock extension professionals with the other extension service providing agencies (n=60)

Extension contacts	Veterinarians	Para-veterinarians	Overall	P value (Chi square)
a. Contact with Krishi Vigyan Kendra's (KVK's)				
No	18 (60.00)	26(86.67)	44(73.33)	0.005
Yes	12(40.00)	04(13.33)	16(26.67)	
b. Contact with research institutes				
No	16 (53.33)	26(86.67)	42 (70.00)	0.010
Yes	14(46.67)	04(13.33)	18 (30.00)	
c. Banks				
No	22 (73.33)	27 (90.00)	49 (81.67)	0.095
Yes	08(26.67)	03 (10.00)	11(18.33)	
d. Dairy Cooperatives				
No	19 (63.33)	26 (86.67)	45 (75.00)	0.065
Yes	11(36.67)	04 (13.33)	15 (25.00)	
e. Private veterinarians				
No	23 (76.67)	26 (86.67)	49(81.67)	0.197
Yes	07 (23.33)	04(13.33)	11(18.33)	
f. Non -Government Organization (NGO)				
No	27(90.00)	29(96.67)	56 (93.33)	0.554
Yes	03 (10.00)	01(3.33)	04(6.67)	
g. Entrepreneurship Development Institute (EDI)				
No	22 (73.33)	29 (96.67)	51 (85.00)	0.011
Yes	08 (26.67)	001 (3.33)	09 (15.00)	
h. Animal Husbandry department				
No	0 (0.00)	01 (3.33)	01 (1.67)	1.00
Yes	30 (100.00)	29 (96.67)	59 (98.33)	

(Figures in parenthesis indicate the percentage) (P value statistical significant at level of P<0.05)

Importance of profound comprehension linkages between research and extension has been widely recognised in order to improve the process of agricultural technology design and delivery (Kumar, 2016). The study revealed that extension contacts of professionals were very low. It can be seen in Table 2 that highest contact was with state animal

husbandry department (98.33%) because it was the main agency to which majority of livestock extension professionals are concerned with. It was followed by research institutes (30%) to whom sometimes farmers are referred for doing the diagnostic tests of some complex pathological conditions, etc. and also model trainings are organized for field extension agencies by these research institutes. There are very less contact of the extension professionals with other extension related agencies like private vets (18.33%) who are very few in the state, Entrepreneurship Development Institute (EDI) (15%) and Non -Government Organizations (NGO) (6.67%) that can be a reason for less sharing of the knowledge and can be a reason for less know how of the farmers about these agencies. The least contact with the Non -Government Organizations (NGO) may be attributed to least presence of such agencies related to animal husbandry at the ground level. There was no significant association between the veterinarians and para-veterinarian in case of contact with banks, dairy cooperatives, private veterinarians, Non -Government Organizations (NGO), Entrepreneurship Development Institute (EDI) and Animal Husbandry department while a contact with Krishi Vigyan Kendra (KVK) and research institutes was varying significantly between the two.

Information flow through the animal husbandry department

Table 3: Information flow through the animal husbandry department (n=60)

Information flow through the department	Veterinarians	Para-veterinarians	Overall	P value (Chi square)
a Efficiency of information flow				
Good	06(20.00)	10(33.33)	16 (26.67)	0.498
Fair	16 (53.33)	13 (43.33)	29 (48.33)	
Poor	08(26.67)	07 (23.33)	15(25.00)	
b Frequency of the information flow				
Never	03 (10.00)	04 (13.33)	07 (11.67)	0.241
Three Monthly	03 (10.00)	03 (10.00)	06 (10.00)	
Monthly	18 (60.00)	21(70.00)	39 (65.00)	
Fortnightly	02(6.67)	02 (6.67)	04 (6.67)	
Weekly	04(13.33)	0 (0.00)	04 (6.67)	

(Figures in parenthesis indicate the percentage) (P value statistical significant at level of P<0.05)

The results in the Table 3 shows that majority of the respondents (48.33%) perceived information flow through the livestock departments as fair followed by 26.67 percent and 25 percent who perceived it to be good and poor respectively. Similar results were reported by Ravikumar, *et al.* (2007), Channappagouda and Sasidhar (2018) in their respective studies that services provided that also includes the information flow by the animal husbandry department is average. Majority of respondents (61.67%) said that there is monthly flow of the information from the ground departments (district livestock hospitals and village level dispensaries) to the higher ones (central and block veterinary offices) and vice versa. There are regular monthly meetings of the field veterinarians at the district headquarters where the reports and monthly information is shared with the officials. A low majority (11.67%) revealed that there is no information flow through the extension departments. Extension education performed by state departments of animal husbandry need to be analysed so as to ascertain a paradigm for livestock extension services (Chander, 2010). The reason for the less frequent information flow can be due to the absence of the proper procedure to update information from professionals working in far flung areas especially from the para-vets. The majority of paravets are not able to transfer updated information to higher departments. Monthly meetings at district headquarters are mostly held in between the veterinarians and for para-vets there is no such formal procedure for continuous information channel that results in the break in efficient flow of the information. No significant association was found between the veterinarians and para-veterinarians in case of efficiency of information flow and its frequency.

Availability of various infrastructure facilities

The extension professionals reported that there is adequate availability of the basic amenities like table, chairs, stationary and electric fans in their respective veterinary centers. Table 4 shows that only 40 percent of the respondents have the adequate presence of the computers in their offices that indicate reports or the record keeping is still done

Table 4: Availability of various infrastructure facilities in state veterinary centers (n=60)

Infrastructure facilities available	Veterinarians	Para-vets	Overall	P value (Chi square)
A Basic amenities				
Not available	01(1.32)	0(0.00)	01(1.65)	0.550
Not adequate	12(31.58)	13(33.77)	25(41.67)	
Adequate	17(67.11)	17(66.23)	34(56.67)	
B Computer facilities				
Not available	16(53.33)	08(26.67)	24 (40.00)	0.016
Not adequate	09(30.00)	04(13.33)	13 (21.67)	
Adequate	05(16.67)	18(60.00:	23 (38.33)	
C Internet facilities				
Not available	12(40.00)	28(93.33)	40(66.67)	<0.001
Not adequate	12(40.00)	02(6.67)	14(13.33)	
Adequate	06(20.00)	0(0.00)	06(10.00)	
D Audio-Visual aids				
Not available	10(33.33)	27(90.00)	37(61.67)	<0.001
Not adequate	14(46.67)	02(6.67)	16(26.67)	
Adequate	06(10.00)	01(3.33)	07(11.67)	
E Technical literature				
Not available	03(10.00)	13(43.33)	16(26.67)	0.002
Not adequate	17(56.67)	16(53.33)	33(55.00)	
Adequate	10(33.33)	1(3.33)	11(18.33)	
F Protection clothes				
Not available	01(3.33)	01(3.33)	2(3.33)	1.00
Not adequate	18(60.00)	19(63.33)	37(61.67)	
Adequate	11(36.67)	10(33.33)	21(35.00)	
G Availability of medicines and vaccines				
Not available	01(3.33)	0	01(1.67)	0.052
Not adequate	12(40.00)	20(66.67)	32(53.33)	
Adequate	17(56.67)	10(33.33)	27(45.00)	
H Availability of cryocan				
Not available	02(6.67)	01(3.33)	03(5.00)	0.543
Not adequate	03(10.00)	03(10.00)	06(10.00)	
Adequate	25(83.33)	26(86.67)	51(85.00)	
I Availability of labs				
Not available	17(56.67)	11(36.67)	28 (46.67)	0.150
Not adequate	04(13.33)	13(43.33)	17(28.33)	
Adequate	09(30.00)	06(20.00)	15(25.00)	
J Availability of refrigerator				
Not available	25 (83.33)	13 (43.33)	38 (63.33)	0.011
Not adequate	02 (6.67)	04(13.33)	06 (10.00)	
Adequate	03 (13.33)	13 (43.33)	16 (26.67)	

Infrastructure facilities available	Veterinarians	Para-vets	Overall	P value (Chi square)
K Presence of microscope				
Not available	21 (70.00)	13 (43.33)	34 (56.67)	.057
Not adequate	07 (23.33)	07 (23.33)	14 (23.33)	
Adequate	02 (6.67)	10 (33.33)	12 (20.00)	
L. Automatic syringes				
Not available	13(43.33)	29 (96.67)	42 (70.00)	<0.001
Not adequate	10 (33.33)	01(3.33)	11 (18.33)	
Adequate	07 (23.33)	0(0.00)	07 (11.67)	
M Availability of surgical sets				
Not available	07 (23.33)	08 (26.67)	15 (25.00)	0.776
Not adequate	14 (46.67)	14 (46.67)	28 (46.67)	
Adequate	09 (30.00)	08(26.67)	17 (28.33)	
N Animal restraining equipment's				
Not available	05(16.67)	16(53.33)	21 (35.00)	0.004
Not adequate	15(50.00)	06(20.00)	21 (35.00)	
Adequate	10(33.33)	08(26.67)	18(30.00)	
O Transport and staff availability				
Not available	10(33.33)	13 (43.33)	23 (38.33)	0.285
Not adequate	15(50.00)	09 (30.00)	24 (40.00)	
Adequate	05(16.67)	08 (26.67)	13 (21.67)	

(Figures in parenthesis indicate the percentage) (P value statistical significant at level of P<0.05)

manually in these departments. The majority of the respondents (66.67%) do not have availability of the internet facilities. This can show the condition of the state regarding the provision of the information through Information Communication and Technologies (ICT). Lack of internet facilities to the livestock professionals makes them helpless to share daily updated information to the farmers. A majority (61.67 %) of the respondents reported that they don't have audio-visual aids in their centers. Audio-visual aids are main equipment's for any extension profession for the dissemination of information, conducting trainings in campaigns, surveys and the exhibitions. The unavailability of such equipment renders these programmes less effective and less attractive to the people. The majority (55.00%) of the professionals reported there is inadequate availability of the technical literature that otherwise is a powerful tool for giving information to the people. There is not adequate supply of the medicines (61.67%) and protection clothes (53.33%) at the veterinary centers and if medicines are available it is not of good quality that makes it ineffective on the animals and farmers have to purchase medicines from outside markets. Veterinarians have to work with the livestock hence are susceptible to many health hazards during their work. There has to be adequate supply of protection cloths, gloves, masks and automatic syringes that to some extent can prevent the transfer of the communicable and zoonotic diseases. The results are similar to the findings of Channappagouda and Sasidhar (2017). The availability of the cryocans was found to be adequate (85.00%). The veterinary centers of the state are in the drastic condition with majority facing non availability of necessary facilities like labs (46.67%), microscopes (56.67%), refregirator (63.33%) and automatic syringes (70.00%). Phand, (2021) reported that Indian livestock sector is suffering from poor infrastructure and human resources. Livestock extension professionals work to their best potential in minimum possible facilities. Non-availability of necessary facilities and equipment renders them handicapped and unable to give best performance in the field. The unavailability of the physical facilities are proving demotivating agents to extension professionals. There is an urgent need to fill the gap between the availability and actual requirement of these facilities in livestock health centers for efficient delivery of livestock health services. Availability of the internet facilities, Audio-visual aids, technical literature, automatic syringes and animal restraining equipments was varying significantly between the Veterinarians and para-

veterinarians. Infrastructure is a major concern that arises in every discussion about livestock service delivery. The use of veterinary technical skills is frequently hampered by a lack of simple diagnostic kits (Punjabi, 2005). Lack of infrastructure facilities at VAS centers were also reported by Jeyaretnam *et al.*, (2000), Rajput (2006) and Moola (2016).

Job satisfaction of the livestock extension professionals

Table 5: Job satisfaction and level of job satisfaction of livestock extension professionals (n=60)

Job satisfaction of the livestock extension professionals	Veterinarians	Para-vets	Overall	P value (chi square)
A Job satisfaction				
No	02 (6.67)	01 (3.33)	03 (5.00)	0.554
Yes	28 (93.33)	29 (96.67)	57 (95.00)	
B Level of satisfaction				
Low	02 (6.67)	01(3.33)	03 (5.00)	0.524
Moderate	01 (3.33)	01 (3.33)	02 (3.33)	
Average	12 (40.00)	10 (33.33)	22 (36.67)	
High	12 (40.00)	12 (40.00)	24 (40.00)	
Very high	03(10.00)	06 (20.00)	09 (15.00)	

(Figures in parenthesis indicate the percentage) (P value statistical significant at level of P<0.05)

The results in Table 5 divulge that majority of the livestock extension professionals (95.00%) are satisfied with their current job and level of satisfaction is high (40.00%). The level of the job satisfaction is high among the majority of the professionals. The results are in contradiction to the study of Adisa, (2015) on his relevant study on competencies of livestock extension professionals in which professionals were found to have low to very low level of job satisfaction. The state of Jammu and Kashmir has the least presence of the private sector jobs and getting a government job is like luxury in the state. The other reason for the job satisfaction is the satisfaction in veterinarians that they are serving the ones who can't speak about their diseases and this gives an intrinsic motivation to do the job.

CONCLUSION

The findings of the study indicates that livestock extension departments, their contacts, linkages, facilities etc. are not on par with the current need of the livestock owners. There is urgent need to improve the contacts of the livestock extension professionals with other extension agencies that will lead to better understanding and the better solutions to the field problems. The flow of information between the line departments is low which leads to the message breakdown. Due to less information flow there is less awareness and knowledge about the various happenings of the field (Bhabhor *et al.,* 2020). The linkages between the all stake holders of the profession need necessarily to be improved. The research to field linkage is the life line of extension work that needs due consideration and attention. The basic infrastructure facilities that are the urgent need of the present time should be made available to livestock extension professionals in order to give best delivery of the extension services.

RECOMMENDATION

Improvement of the extension contacts and linkages Furtherance of infrastructure in livestock health centers. Infrastructure facilities at the primary veterinary centers are poor that means the extension professionals are not well equipped to give best service to the farmers.

Intensify the number of female extension professionals. The livestock extension professionals are working with the all types of the communities and tribes. Due to some cultural or the religious taboos they are not freely able to engage in discussions with the women farmers. This factor leads to the less participation and involvement of the women hence render professionals less efficient in diversity competencies. The presence of the female field extension workers can solve this problem

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CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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OPINION OF THE STUDENTS ABOUT ONLINE CLASSES AND EXAMINATION

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ABSTRACT

COVID19 situation has changed the examination pattern from classroom exams to online examinations. The present study assesses the opinion about and constraints faced during online classes and examinations. Data were collected from 540 undergraduate and postgraduate students of different universities of twelve states and one union territory. Google form was used for collecting data. Data were analyzed by using frequency and percentage. The findings revealed that 92.22 per cent of students attended online classes and 87.75 per cent of them had appeared in examination through online mode. Besides saving time and money online classes and examination had many constraints like poor connectivity, stress, Difficult to read and answer due to the small screen of mobile, Cannot attempt long answers question due to limitations with the device, less hands-on work in practical and Difficult to acquire a proper understanding of substances. It can be concluded that students still prefer offline teaching and examination that will retain the quality as well as the value of the education system.

Keywords: *covid-19, internet, google form, constraints, online classes, examination*

INTRODUCTION

The way of traditional education has changed to a great extent within the last couple of years. There is no need to be physically present in the classroom to study due to the technological development and internet. Nowadays, the access to a quality education is possible from anywhere as long as long the person has access to computer, mobile and internet. Although the online education system has been rising but still classroom system is preferred and followed by most of the education institution. But COVID 19 has changed the complete teaching pattern from live class rooms to the virtual class rooms. Online teaching became compulsory in COVID19 situation. Many people advocate online teaching, while some are opposed to online teaching. Online teaching has its pros and cons.

Online teaching enables the teacher and the student to set their own learning pace, and there's the added flexibility of setting a schedule that fits to every student (Bhuva *et al.,* 2021). Studying online teaches vital time management skills. Student can study from anywhere in online teaching (Vegad *et al.,* 2021). There is no need to commute from one place to another. Online classes offer high-quality education to students at their own place. It saves time as well as money. The online classes can help students to learn things visually, and because of this, they can easily remember the things that they have learnt. It means through online classes, students learn in more effective ways. Online classes also improve the technical skills of students.

Besides the numerous advantages of online classes there are some limitations that create problems for the students in teaching. The major problem is the poor network connectivity that affects the learning of the students. Online study requires the self-discipline of a student to set the time to complete the studies. Online study creates a sense of isolation among students. Online classes require from a student to be an active learner otherwise it is very difficult for him/her to learn. Effective monitoring is also not possible in online teaching.

Examination is a formal test to check the knowledge and ability of students in a particular subject. Examination is an assessment process to create proof of students' learning and then making a judgment about that proof (Elliott, 2008). Examinations channelize students' energies and feedback provides them opportunities for reflection. Examinations play crucial role in qualitative education. Examinations are generally conducted in paper and pencil way. But COVID 19 has changed the scenario and paper based test have been replaced with online examination. In COVID 19 situation students have to give online examination to promote in the next class. It was the first time for many students to appear in online examination. It might be difficult for many students to understand the pattern and other aspects of online examination. Poor connectivity is also a biggest hurdle to give examination smoothly. Looking to all these facts the present investigation was undertaken with following objectives.

OBJECTIVES

(1) To identify the constraints faced by the students in online teaching and examinations

(2) To checks the opinion of the respondents regarding online teaching and examinations

METHODOLOGY

The data in the present study were collected from the students of various universities of twelve states and one union territory of India. The questionnaire method was used for collecting data. Questionnaire was prepared in Google form and circulated via email and whatsapp to undergraduate and post graduate students. Total 540 responses were received from students of different colleges of twelve states and one union territory. The sample included 500 undergraduate and 40 post graduate students. Data were analyzed by using frequency and percentage. The state wise details of sample is given below

Table 1 : Details of sample

Name of states	Total Respondents	Education	
		Under graduation	Post graduation
Gujarat	353	335	18
West Bangal	61	56	5
Rajasthan	35	33	2
Nagaland	31	31	-
Tamilnadu	16	16	-
Karnataka	12	-	12
Maharashtra	9	7	2
Delhi	7	7	-
Andhra Pradesh	5	5	-
Haryana	5	5	-
Madyapradesh	3	3	-
Manipur	3	2	1
Total	**540**	**500**	**40**

RESULTS AND DISCUSSION

(1) General information about online classes and gadgets

(i) Availability of gadgets and service

Electronic gadgets like computer, laptop, smartphone etc and services viz. internet connection are essential for appearing in online examination. Data regarding availability of such gadgets and services with students are presented in Table 2.

Table 2 shows that 97.78 per cent respondents had personal smart phones along with internet connection. Less than one fourth of the students (22.04%) had laptop with them and 10.56 per cent had computer at their home. Only 5 per cent students had printer.

Table 2 : Distribution of respondents as per the gadgets and service available at their home (n=540*)

Sr. No.	Gadgets and Services	Frequency	Percent
1	Computer	57	10.56
2	Printer	27	5.00
3	Laptop	119	22.04
4	Personal Smartphone	528	97.78
5	Internet connection /WiFi	528	97.78

*Multiple responses

(ii) Speed of internet

Access to internet and its speed has direct impact on performance and learning of the students thus the information regarding the speed of internet at their places was gathered. Speed of internet was categorized as high, medium and slow. Data revealed that majority of the students (58.89%) reported that the speed of internet is average at their place while 33.70 per cent said speed of internet was slow. High speed of internet is found at very less places that were reported by very few students (7.41%)

Table 3 : Distribution of respondents as per the speed of internet at their place (n=540)

Sr. No.	Speed of internet	Frequency	Percent
1	High	40	7.41
2	Average	318	58.89
3	Slow	182	33.70

(2) Participation in online classes

(i) Knowledge about and participation in online classes

Knowledge is the most important component of behavior. It plays a major role in the covert and overt behaviour of the human beings. It can enable them to take certain action in accepting new things. Hence efforts were made to know how far students were aware of online classes. Data given in table 4 reveal that all the respondents were aware about the online classes and 92.22 per cent of them attended the online classes. About eight per cent (7.78%) respondents did not did attend online classes till date.

Table 4 : Distribution of the respondents as per their knowledge about and participation in online classes (n=540)

Sr. No.	Aspects	Frequency	Percent
1	Knowledge about online classes	540	100
2	Attended online classes	498	92.22

(ii) Views of students regarding online classes

The colleges and universities have been shutting down for an indefinite time due to COVID 19. The traditional teaching has been shifted to online teaching. Many people advocate online teaching, while some are opposed to online teaching. Online teaching has its pros and cons. Thus efforts were made to find out the view of the students regarding online classes.

Table 5 : Distribution of respondents as per the views regarding online classes (n=498*)

Sr. No.	Aspects	Frequency	Percent
1	Videos play without interruption	213	42.77
2	Audio play without interruption	234	46.99
3	Able to easily understand whatever is taught in online classes	246	49.40
4	Comfortable with online theory classes.	285	57.23
5	Online classes save time	375	75.30
6	Online classes enhance your confidence in handling technology issues.	313	62.85
7	Attendance improved with online classes	333	66.87
8	Teachers transact better in online classes	210	42.17
9	More attentive in online classes	248	49.80
10	Learning is better in online classes	157	31.53
11	Get disturbed while attending online classes at your home/room.	322	64.66
12	Online classes are stressful.	243	48.80

*multiple responses

Data regarding the views of students about online classes has been reported in Table 5. More than 50 per cent students reported that online classes saves time (75.30%), improves attendance (66.87%), enhance confidence in handling technology issues (62.85%) and feel comfortable with online theory classes (57.23%). About 45 per cent students reported that they are more attentive in online classes (49.80%) and able to understand whatever is taught in online classes (49.40%). Less than half of the students reported that audio (46.99%) and video (42.77%) play without interruption at their places. 42.17 per cent students said that teachers transact better in online classes. Other aspect like learning is better in online classes (31.53) and comfortable with online theory classes (57.23) were also reported by the students. Students further reported that they get disturbed while attending online classes at their home/room (64.66%) and online classes are stressful (48.80%). It can be said that the students have mixed views regarding online classes. Although they had some advantages from online classes but simultaneously they were facing problems too.

(iii) Online practical classes

(a) Medium of submission of practical assignments

In online classes, practical also conducted online and the students submitted their assignment online through email or various apps like Whatsapp, Google classroom etc. Findings regarding the medium of submission of practical assignments show that most of the students (81.33%) submitted practical assignments through email while 76.51 per cent used whatsapp to submit assignments. More than 40 per cent students (45.78%) submitted their practical assignment on Google classroom.

Table 6 : Distribution of respondents as per the medium of submission of practical assignments (n=498*)

Sr. No.	Medium	Frequency	Percent
1	Email	405	81.33
2	Google classroom	228	45.78
3	Whatsapp	381	76.51

* Multiple responses

(b) Constraints faced in online practical classes

Constraints are the impediments or obstacles as experienced by students during online classes. The constraints faced by the students in online practical classes are presented in Table 7.

Table:7 Distribution of respondents as per the constraints faced by the respondents in online practical classes (n=498*)

Sr. No.	Constraints	Frequency	Percent
1	Cannot do Experiments without laboratory	432	86.75
2	Actual implementation is not possible in many practical	456	91.57
3	Less hands-on work	429	86.14
4	Difficult to acquire proper understanding of substances	370	74.30
5	Unavailability of equipment	435	87.35

* Multiple responses

The data clearly depict that most of the students faced constraints in online practical classes. The constraints faced by students were experiments cannot be done without laboratory (86.75%), actual implementation is not possible in many practical (91.57%), less hands-on work (86.14%), difficult to acquire proper understanding of substances (86.35%) and unavailability of equipment (87.35%).

(iii) Online examination

Feedback plays an important role in the learning process that determines the knowledge gaps between achieved and expected learning outcomes. Online examinations become essential during COVID19 to assess the performance and learning of the students.

(i) Participation in online examination

Table 8: Distribution of respondents as per the participation in online examination (n=498*)

Sr. No.	Aspect	Frequency	Percent
1	Appeared for online examination	437	87.75
Websites used for online examination			
2	Google forms	258	59.04
3	speedexam.net	174	39.82
4	justexam.in	30	6.86
5	onlineexambuilder.com	55	12.59

*Multiple Responses

Education system has changed in many ways over the last decade, especially, during COVID 19, with the most important change coming in mode of learning and examination. Educational institutions are slowly moving into online teaching and examination. In the COVID 19 situation, most of the examinations were conducted online. Regarding the participation in online examination, 87.75 per cent students appeared in examination online.

There are many applications available for conducting online examination. Some of the applications are google form, speedexam.net, justexam.in and onlineexambuilder.com. It was found from the data that 59.04 per cent students used Google forms for the online examination followed by speedexam.net (39.82%). Some of students used onlineexambuilder.com (12.59%) and justexam.in (6.86%).

(ii) Experience in online examination

Table 9: Distribution of respondents as per the experience of online examination (n= 437*)

Sr. No.	Experience	Frequency	Percent
1	Good	271	62.01
2	Not Good	166	37.99

The experience of students regarding online examination was categorized as good and not good. It is evident from table 9 that 62.01 per cent respondents had good experience of online examination while 37.99 per cent did not liked online examination.

(iii) Problem faced in giving online examination

Table: 10 Distribution of respondents as per the problem faced by them in giving online examination (n =437*)

Sr. No.	Problems	Frequency	Percent
1	Slow Internet speed	413	94.51
2	Poor connectivity	398	91.08
3	Difficult to read and answer due to small screen of mobile	311	71.17
4	Cannot attempt short answers question due to limitations with device (Mobile)	330	75.51
5	Time management issues during online examination	402	91.99
6	More stress in online examination than routine exam	331	75.74

*Multiple responses

Table 10 gives the information about the problems faced by the students in attending online examination. It is

evident from table that slow internet speed (94.50%), time management issues during online examination (91.99%) and poor connectivity (91.08%) were the constraints faced by more than ninety percent respondents. The other constraints faced by the respondents were more stress in online examination than routine exam (75.74%), they cannot attempt short answers question due to limitations with device i.e. mobile (75.51%) and difficult to read and answer due to small screen of mobile (71.17%). It can be seen that nearly majority of the respondents faced one or more problems in online examination.

(iv) Preference of online examination over classroom examination

Although online examination is not a new phenomenon but most of the students have first experience of online examination. Thus, the efforts were made to know the preference of students about online examination over classroom examination.

Table 11 : Distribution of respondents as per the preference of online examination over classroom examination (n= 437)

Sr. No.	Preference	Frequency	Percent
1	Preferred	98	22.43
2	Not preferred	339	77.57
Reasons for Preference of online examination			n= 98*
3	Saves time	72	73.47
4	Fast result	98	100.00
5	Saves money	46	46.94

*Multiple responses

Data in Table 11 show that 77.57 per cent respondents did not prefer online examination while 22.43 per cent students liked online examination. Reasons for preference of online examination were it saves time (73.47%) and money (46.94%) and provide result immediately (100%). Online examinations take very less time in checking the answer sheet and preparing the result and the applications and software have automatic system of mark computation.

Results are supported with findings of Osuji, (2012) and Farzin, (2016) that online examination systems enable the simplification of the traditional paper-based examinations process especially when class sizes are large, from the designing and delivering the exam to marking, reporting, storing the results and conducting statistical analysis (Osuji, 2012 and Farzin, 2016).

(v) Reasons for preference of classroom examination over online examination

Regarding the preference of online or paper based classroom examination; it was found that the student still preferred paper based classroom examination. Out of 437 students, who appeared in online examination, 339 students liked paper based classroom examination. Hence efforts were made to explore reasons for the preference of classroom examination and results are presented in Table 12. The reasons reported by the students were everyone study well in paper based examination (89.97%), possibility of cheating is less (89.09%), they are habitual of this type of examination (83.78%), getting proper environment for examination in classroom (79.06%), less distraction in classroom exam (78.17%), feel comfortable (49.26%), and difficulty and any problem can be asked in classroom examination (30.97%). The students stated that online examination could harm the ranks and position of brilliant students due to the possibility of more cheating. The dull students can also scored more by unethical means and scored good marks. Monitoring is not possible in online examination.

Table 12 : Distribution of respondents according to the reasons for preference of classroom examination over online examination (n= 339*)

Sr. No.	Aspects	Frequency	Percent
1	Less distraction	265	78.17
2	Habitual of this type of examination	284	83.78
3	Less stressful	147	43.36
4	comfortable	167	49.26
5	Less cheating	302	89.09
6	Everyone study well	305	89.97
7	Difficulty and problem can be asked in classroom examination	105	30.97
8	Get proper environment for examination in classroom exam	268	79.06
9	Reduce value of education in online examination	265	78.17
10	Practical exam is difficult in online	314	92.63
11	Insufficient time in online examination	269	79.35
12	It is difficult to read and answer in mobile	194	57.23
13	Network and speed problem in online examination	295	87.02

*Multiple responses

The students faced difficulties in online examination were also the reasons for preference of paper based classroom examination. They reported that practical exam is difficult in online mode (92.63%), having network and speed problem (87.02%), time given for examination was usually insufficient (79.35%), value of education is reduced (78.17%) and many times it is difficult to read and answer in mobile in online examination (57.23%). There are many subjects in which the laboratory facilities are essentials for doing practical exercises that they could not avail in online mode. Assignments are an essential component of practical examination and many students reported that they faced problems in making word documents and power point presentation in mobile. Possibility of submission of wrong file was also faced by the students.

Correlation between independents variables and dependents varibales

(i) Correlation between possession of gadgets and services and views about online classes.

In order to ascertain relationship if any between independents variables i.e. possession of gadgets and services and views of the students regarding online classes, Pearson's correlation was computed. This has been presented in Table 13. Data show that possession of personal smart phone (r= 0.135**) and speed of internet ('r'= 0.375**) were highly significantly positively correlated with views of the students regarding online classes.

Table 13: Correlation between independents variables and views about online classes (n=540)

Variables	Possession of gadgets and services				
	Computer	Printer	Laptop	Personal Smart phone	Speed of internet
	'r' value				
Views of the students regarding online classes	0.061	0.035	0.009	0.135**	0.375**

** Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed)

(ii) Correlation between independents variables and constraints faced in online practical classes

Pearson's correlation was computed to determine the relation between possession of gadgets and services and medium of submission of practical assignments with the constraints faced by the students in online practical classes and presented in Table 14. It was found that speed of internet was highly significantly negatively correlated with speed of internet (r= 0.112**).

Table 14: Correlation between independents variables and constraints faced in online practical classes (n=540)

Variables	Possession of gadgets and services					Medium of submission of practical assignments		
	Computer	Printer	Laptop	Personal Smart phone	Speed of internet	email	Google Classroom	Whatsapp
	'r' value							
Constraints faced in online practical classes	0.054	0.054	0.080	0.034	-0.112**	0.081	-0.011	0.033

** Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed)

(iii) Correlation between independents variables and problems faced in online examination

Table 15 presents the data depicting the relation between possession of gadgets and services and websites used for online examination with problems faced in online examination. Table reveals that maximum independent variables had negative correlation with problems faced by the students in online examination.

Table 15: Correlation between independents variables and problems faced in online examination (n=540)

Variables	Problems in online exams 'r' value
Possession of gadgets and services	
◆ Computer	-0.106*
◆ printer	-0.032
◆ laptop	-0.099*
◆ Smart phone	-0.096*
◆ Speed of internet	-0.385**
Websites used for online examination	
◆ Google forms	-0.128**
◆ speedexam.net	-0.056
◆ Just exam.com	-0.115**
◆ onlineexambuilder.com	-0.096*
Experience of exam	-0.357**

** Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed)

The possession of computer (r= 0.106*), laptop (r= 0.099*) and personal smart phone (r= 0.096*) were significantly negatively correlated with the problems faced by the students in online examination. Speed of internet (r= 0.385**) was highly significantly negatively correlated with the problems faced in online examination. Students had given online examination through various websites and it can be seen that the applications like Google forms (r= 0.128**), Just exam.com (r= 0.115**) and onlineexambuilder.com (r= 0.096*) were significantly negatively correlated with the problems faced by the students in online examination. Similarly experience of students of online examination was also highly significantly negatively correlated with the problems faced in online examination.

CONCLUSION

On basis of the findings it can be concluded that students preferred and liked classroom teaching and paper based examination. Many students faced constraints in online classes and examination like slow speed of internet, network problem, difficult to read and answer due to small screen of mobile, time management issues during online examination, cannot attempt short answers question due to limitations with device etc. As there is no option other than online teaching and examination till the COVID 19 situation improves. There are some suggestions to improve the online classes

(1) University should use its own site and software to conduct exam as it creates less error when used by bulk of people at same time.

(2) Give only objective type questions

(3) More time should be given in online examination.

(4) Result should be shown immediately after the exam.

(5) Colleges should give training and proper guidelines on the use of software as many students were using these softwares first time.

(6) Such software should be developed which have video system so teacher can supervise each student during the exam and that reduce cheating and malpractices.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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FACTORS GOVERNING FOOD SECURITY AMONG RURAL HOUSEHOLDS IN TRIBAL DISTRICT OF SOUTH GUJARAT

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ABSTRACT

Availability of food is associated with purchasing power and food insecurity is caused by poverty. The needs of the poor should be protected by improving their purchasing power, through proper planning of agricultural activities for future that can produce more employment and income generation programmes. Around 20.4 per cent of Gujarat's current population does not get enough calories from food as compared to the all-India figure of 13.4 per cent. The problem of food insecurity is basically not found in all sections of the people, rather it is mostly confined to certain marginalized sections. It includes scheduled tribes (STs) as they are socially and economically disadvantaged due to their isolation both geographically as well as culturally from the mainstream population. The attempt has been made to study the major factors governing food security in the Dangs - a tribal district of south Gujarat having 95 per cent scheduled tribe population. Results showed that household size, dependency ratio and age of the household head has significant negative association with food security whereas animal herd size and above poverty level status of household have positive influence on food security. The government should focus on awareness creation on effective family planning and the impact of large family size on ensuring food security, Government can initiate or strengthen old programmes for alternative income generation through facilitation of labour-intensive schemes.

Keywords: *food security, poverty, scheduled tribes, rural households*

INTRODUCTION

According to FAO *et al.,* (2001), food security is a situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life. The concept of food security basically stands on three pillars, food availability, food stability and food accessibility. Availability of food is associated with purchasing power and food insecurity is caused by poverty (Sunil and Vinaya, 2016). If people do not have purchasing power, they have substitute of food reserves. Food security and poverty are directly related to each other. So the needs of the poor should be protected by improving their purchasing power, through employment and income generation programmes. A large proportion of the world's underfed population starves not because of general food shortage but because of insufficient access to food supplies or insufficient consuming power of people (Vinaya *et al.,* 2020). Availability of food will be of no use, until and unless people have means to buy the available food (Ghosh, 2000 and Shinde *et al.,* 2021).

India is the home of 1.21 billion people as per 2011 census out of which, as estimated by Food and Agricultural Organization, 195 million people or 15 per cent of the total population, are undernourished which account for one-fourth of the world's hungry population (FAO/IFAD/WFP, 2015). All the UN Millennium Development Goals (MDGs) are centered to health parameter which influences all other MDGs (John *et al.,* 2021). India ranked 94 among 107 countries in the Global Hunger Index 2020 and is in the 'serious' hunger category with a score of 27.2. India features behind Nepal (73), Pakistan (88), Bangladesh (75), and Indonesia (70) among others despite of various initiatives by Government of India like Integrated Child Development Services (ICDS) Scheme, National Food Security Act, POSHAN Abhiyaan etc.

Despite the economic significance of the agriculture sector, there are undoubtedly misguided perceptions regarding the status of food security in India. The agricultural industry, crucial to maintaining India's large population, employs approximately 743 million Indian (O'Brien, 2004; Kapila *et al.*, 2009). Although agriculture constitutes only 20 per cent of India's national Gross Domestic product, it makes up 85 per cent of the economy in rural India (Kapila *et al.*, 2009).

Around 20.4 per cent of Gujarat's current population does not get enough calories from food as compared to the all-India figure of 13.4 per cent. Seven per cent of Gujarat's

children suffer from severe malnutrition while another 44 per cent suffer from moderate malnutrition. It is estimated that over 60 per cent of children in Gujarat under the age of five are either moderately or severely malnourished (Hirway and Mahadevia, 2003). In Gujarat, NFSA implementation began on April 1, 2016, and 3.41 crore people have been identified for subsidized ration (per person 5 kg) along with 8 lakh most poor (Antyodaya) families (42 lakh people), to whom 35 kg of ration is given per month per family. Thus 3.82 crore people are being covered under NFSA with the support of the Government of India.

The food consumption pattern of household is subject to various socio-economic characteristics including asset position and financial background. Thus, the problem of food insecurity is basically not found in all sections of the people, rather it is mostly confined to certain marginalized sections (John, 2021). It includes scheduled tribes (STs) as they are socially and economically disadvantaged due to their isolation both geographically as well as culturally from the mainstream population. In this context, the present study attempts to analyse factors governing food and nutritional security of rural households in Dang which is tribal district of Gujarat.

OBJECTIVE

To study various factors influencing food security status of the rural households

METHODOLOGY

Data and sampling framework

The Study was carried out in Dang district which is having highest scheduled tribe (ST) population in Gujarat. The study primarily relied on primary data which was collected by using a semi -structured questionnaire focusing mainly on those factors hypothesized to have an effect on the food insecurity status of households. The Dang has a population of 2,28,291 with 44,699 households in the district. Dang is composed with three administrative blocks. Multistage random sampling with proportional to size was used to select 150 sample households. In first stage two tehsils Waghai and Ahwa were selected randomly. In second stage, out of each tehsil, randomly three village panchayats selected. Finally, a sample of 150 households was drawn randomly from villages come under selected six village panchayats. Sample households were selected on the basis of their frequency distribution in each land size category i.e., landless, marginal, small, medium, large.

Analytical tools

Initially incidence of food insecurity was estimated with the help of Foster, Greer and Thorbecke, (1984). Based on the household food security index (Z), the linear model was estimated to identify the factors that affect the food security status of the respondents of Dang district of south Gujarat. This study utilized a regression model to empirically quantify the relative influence of various factor on the respondents.

Model:

$$P = F(Z) = \frac{1}{1+ e^{-Z}}$$

Where,

P = probability that household is food secure or insecure

F = logistic function

$Z = \beta_1 + \beta_2 X$, $Z = 1$ means food secure $Z = 0$ means otherwise

β_1 and β_2 *are* coefficients of explanatory variables

X is matrix of various household characteristics.

The implicit form of the model was as follows:

$$Z_i = \beta X_i + U_i$$

Where,

Z_i = The food security status of i^{th} household;

X_i = Vector of explanatory variables;

Ui = Error term; and

B = Vector of parameter estimates.

Thus, the model has been fitted with following formula:

$$Zi = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + B_7 X_7 + B_8 X_8 + B_9 X_9 + B_{10} X_{10} + B_{11} X_{11}$$

Where,

X1 = Education level of household heads (1- illiterate, 0- literate)

X2 = Primary activity of household head (1- cultivar, otherwise 0)

X3 = Primary activity of household head (1- agricultural labour, otherwise-0)

X4 = Household size (no.)

X5 = Dependency ratio

X6 = Age of household heads (years)

X7 = Total land (Acre)

X8 = Livestock owned (1-If having livestock, otherwise-0)

X9 = Asset possession (Rs.)

X10 = Poverty (If APL-1, Otherwise-0)

X11 = Access to credit (Yes-1, No-0)

RESULTS AND DISCUSSION

Socio-economic backgrounds of the selected households

The data presented in Table 1 depicts the socio-economic background of sample households. The average size of land holding in the study area was 2.74 Acre. Average herd size in the study area was 2.18 animals. Average age of household head found 51 years and family size of around five members.

Table 1: Selected Socio-economic Characteristics of Households (n=150)

Sr. No.	Characteristics		Number
1	Sample households (no.)		150
2	Average land holding (acre)		2.74
3	Average herd size (no.)		2.18
4	Average age of household head (years)		51
5	Average household size (no.)		4.88
6	Gender of households (%)	Male	95.33
		Female	4.67
7	Social group of household (%) scheduled tribes		100
8	Occupation of household head (%)	Self-employed in agriculture	53.33
		Agricultural labour	24
		Employee in services other than agriculture	17.33
9	Landless (%)		28
10	Small and marginal farmers (%)		36
11	Large farmers (%)		36
12	Education of hh head (%)	Literate	44.67
		Illiterate	55.33
13	Above poverty line (%)		22.67
14	Belove poverty line (%)		77.33
15	Access to credit (%)		
16	Yes (%)		17.33
17	No (%)		82.67

As to households' literacy status, the study indicated that 44.67 per cent of the respondents (household head) had access to formal education and capable to make proper decisions. Around 55 per cent household head were illiterate which adversely affect the decision-making capacity for various risks. Furthermore, the study finding showed that 82.67 per cent of the sampled households had no access to credit service in the study area, implying that the majority of the households did not receive any type of credit from formal and informal sources. As 17 per cent household had access to credit which made them capable to mitigate various economic risks. From the total samples, 22.67 per cent households were found Above poverty line which ensure a basic living standard with enough money for things such as food, clothing and place to live and majority of the households that is 77.33 per cent were found Below poverty line affecting income and consumption levels, education, medical requirements and credit access.

Factors influencing food security of households

The results of the maximum likelihood estimate of the logit model are presents in table 2. The model result has indicated that out of eleven variables fitted into the model, six were found statistically significant predictors of households' food security. These include primary occupation of household that is agricultural labour, household size, dependency ratio, age of household head, herd size, poverty line. Other variables included in the model were not found significant

The model result has revealed that there is a positive relationship between food security and those who engaged in labour activity in agriculture. This variable is significant at 10 % significance level.

The result found that there is a negative relationship between the size of household and their probability of being food secure. In other words, it is to mean that as family size increases, the probability of being food secure also decreases marginally, holding other things remaining the same. The

association between household size and household to be food secure is negative and highly significant at less than 1 % level of significance in the study area. As the model result presented in Table 2 below shown, for unit increase in the family size of a household increases the likelihood of being food insecure by 1 per cent. This might be attributed to the prevalence of large number of non-productive age members in a household thereby increasing the dependency ratio of the household.

Table 2: Factors influencing food security of households (n=150)

Factors influencing food security of HH	Coef.	Marginal Effects (ME)	Std. Err.	Z
HH head education (literate-0, illeterate-1)	-0.06	-0.00048	0.86	-0.07
Occupation D1Cultivar (If cultivar-1, otherwise-0	3.27	0.03	2.10	1.55
Occupation D2Agrilabour (If agrilabour-1, Otherwise-0)	4.07*	0.03	2.22	1.83
HH size (Nos.)	-2.05***	-0.017	0.58	-3.50
Dependency ratio	-1.40***	-0.011	0.50	-2.80
Age of HH head (Yrs.)	-0.08**	-0.0007	0.04	-2.02
Operational Holding (Acre)	-0.12	0.0009	0.27	0.42
Herd size (Nos.)	0.47**	0.003	0.22	2.09
Asset possession (₹)	0.0002	2.04e-06	0.001	0.13
Poverty (If APL-1, Otherwise-0)	2.63*	0.056	1.64	1.60
Access to credit (Yes-1, No-0)	0.45	0.0044	1.06	0.43
Constant	11.64	-	3.68	3.16
No. of obs.	150			
LR chi2	90.45			
Pseudo R2	0.60			

(***, **, * Significant parameters at 1%, 5%, and 10%, respectively)

As expected, dependency ratio negatively and significantly affected household food security at 1% significance level. From the model output, the marginal effect revealed that one extra person in the household increased the probability of household's intensity of food energy intake deficiency by 1%. This indicates that households with higher dependency ratio tend to be more food energy deficient. This is due to the reason that, households with large family size could be composed of large number of non-productive members; which imposes high burden on the labour force and food available to each person and ultimately end up with difficulty to achieve food security. Due to the scarcity of resources, an increase in household size especially the non-working members put pressure on consumption than production. An increase in the number of non-working member of household or dependency ratio increases the food insecurity level of household.

It can be seen that household extent of food security is negatively associated with age of household head and significantly at 5% significance level in the study area. The marginal effect, from of the model result, indicated that a one unit increase in the age of head of the household decrease the likelihood of household's extent of food security almost negligibly. This implies that old aged household heads within food insecure households were more likely to face higher degree of energy intake deficiency than younger ones. This is because as age increases households become less productive and have less courage to cultivate larger-size farm than young ones. In addition, mostly elder households have large number of families and their resources are distributed among the members, and this imposes pressure on their income to purchase consumable products.

As predicted, the result confirmed that herd size is positively and significantly associated with food security at 5 % significance level. Livestock contribute to household's economy in different ways: as a source of pulling power, source of cash income, source of supplementary food and means of transport. Thus, households with a greater number of livestock have a better chance to be food secure because of availability of milk products and supplemental income.

On the basis of result obtained households above poverty line positively and significantly affected household food security at 10 % significance level. The households above poverty line which ensure a basic living standard with enough money for things such as food. Household above

poverty line had better access to food than household below poverty line.

The other variables like education of household head have negative relation with household being food secure. Illiterate household head were less likely to be food secure. Households whose primary activity is cultivation has positive impact on food security. Those who possess land were found more likely to be food secure. These variables were not found significant.

Table 2 also presents the marginal effects (ME) of the variables which tell us that how changes in specific variables affect the probabilities of households to be food secure positively or negatively. The marginal effects are used here as they denote the marginal changes of the dependent variables as a result of changes in the respective explanatory variables. It was found that those household were engaged in labour activity in agriculture increased the probability of household being food secure by 3% points. Next most influential variable found was household size as a unit increase in it reduces the probability of household being food secure by 1.7% points. Similarly, unit increase in dependency ratio reduce probability of household being food secure by 1.1% points. The marginal effect, from of the model result, indicated that a one unit increase in the age of head of the household decrease the likelihood of household's extent of food security almost negligibly. Likewise for herd size marginal effects result were negligible. It was found that a unit increase in APL card holders increases chances of household being food secure by 5.6% points.

CONCLUSION

The government should focus on awareness creation on effective family planning and the impact of large family size on ensuring food security, and awareness creation and capacity building for elder households through ensuring the availability and dissemination of accurate information should be strengthened. Government can initiate or strengthen old programmes for alternative income generation through facilitation of labour-intensive schemes.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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KNOWLEDGE LEVEL OF DAIRY FARMERS REGARDING SCIENTIFIC DAIRY HUSBANDRY PRACTICES

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ABSTRACT

The present study was conducted in Amreli district of Gujarat to ascertain the knowledge level of different scientific dairy management practices by livestock owners. Total 300 livestock owners selected randomly from five different talukas of the district were interviewed to get the various data regarding dairy husbandry practices. Among the different aspects of feeding, housing and milking management practices, livestock owner had quite high knowledge in supply of green fodder (100 per cent), dry fodder (98.67 per cent), practice of stall feeding (96.33 per cent), well ventilation in animal house (97.33 per cent), levelled floor (95.67 per cent), separate feed and fodder storage room for concentrate/roughage (95. 33 per cent), cleaning of milk utensil with detergent washing and sun drying (98.33 per cent), kind behaviour and practice of grooming with milking animal (97.33 per cent) whereas, low level of knowledge found in feeding mineral mixture (40.33 per cent), feeding salt (34.33 per cent), east-west long axis of house (9.67 per cent), cleaning and dipping of udder and teats just after milking (39.67 per cent), before milking with antiseptic (38.33 per cent), full hand milking (38.00 per cent). As regards to heathcare and breeding management, livestock owners had high level of knowledge in practices to control ecto-parasites (83.33 per cent), vaccination of animal (73.00 per cent), symptoms to detect sexual-heat (97.33 per cent), use of proven bull for natural service (83.00 per cent), pregnancy diagnosis by veterinary doctor (82.00 per cent) and waiting for placental expulsion up to 12 hours (81.33 per cent). Further, the livestock owners had low level of knowledge in grooming of animals (58.67 per cent), treatment of sick animal by veterinary doctor (44.00 per cent), emphasis given to male for improvement of breed/productivity (51.00 per cent) and initiation of breeding of heifers on the basis of body weight/size (40.67 per cent).

Keywords: *feeding, breeding, milking, healthcare, breeding, knowledge*

INTRODUCTION

Amreli is one of the important districts in the north-saurashtra region of Gujrat. Dairy husbandry plays major role in development of particular region through self employment, boosting up farmers' income along with nutritional security of their family. Inspite of the fact that Amreli district has large population of well-known milch breed of Indian bovine (Gir cattle and Jaffrabadi buffalo), average productivity of livestock is low. Feeding management along with hosing management and milking management practices have significant role in exploiting real potential of dairy animals (Sinha *et al*., 2009, Singh and Gupta, 2015, Bhabhor *et al.,* 2020). Dairy animals fail to prove their genetic potential for higher production when fed at low level, sub-optimum housing management and unhygienic milking practices.

Understanding of dairy animal practices in a region is necessary to identify the strengths and weaknesses of rearing system and formulate suitable intervention system. Therefore, it is imperative to ascertain the knowledge about scientific management practices followed by dairy animal owners.

OBJECTIVE

To ascertain the knowledge level of different scientific dairy husbandry practices among livestock owners

METHODOLOGY

The present study was conducted in Amreli district. The livestock farmers, 20 per village, in pre-decided 3 villages in each of 5 talukas were selected from Amreli district. Ex-post facto research design was applied for this study. The data was collected through the personal interview and desired information for different management practices was collected from dairy farmers with the help of pre-designed questionnaire.

Feeding, housing, milking, healthcare and breeding management practices followed by dairy farmers were surveyed in three villages of each of following talukas of

Amreli district.

Sr. No.	Name of taluka	Name of village	No. of dairy farmers
1	Kukavav	Najapur, Nava Ujda, Jangar	20 per village
2	Khambha	Khadadhar, Raydi , Ingorala	20 per village
3	Lathi	Bhurakhiya, Toda, Asodar	20 per village
4	Babra	Bhiladi, Charkha, Vandaliya	20 per village
5	Amreli	Chital, Vankiya, Chakkargadh,	20 per village
Total	**5 Nos.**	**15 Nos.**	**300 Nos.**

The knowledge of dairy farmers regarding different scientific management practices was interviewed and recorded as Yes or No and percentage was work out for each knowledge and overall ranks were assigned on the basis of percentage.

RESULTS AND DISCUSSION

Knowledge of livestock farmers regarding different scientific dairy husbandry practices:

The results of the study on different scientific dairy husbandry practices like feeding management, housing management, milking management and healthcare management and breeding managementare discussed hereunder.

Feeding management

Data presented in table-1 show that among different feeding management practices, 100 per cent of respondents had knowledge about supply of green folder and free access of drinking water and ranked I, followed by supply of dry fodder (98.67 per cent), practices of stall feeding (96.33 per cent), use of pelleted concentrates mixture (94. 33 per cent), special feeding (calving mixture) after calving (91.00 per cent), feeding based on production (85.67 per cent), feeding of extra conc. to advanced pregnant animal (85.33 per cent), chaffing of fodder (76.00 per cent), Individual feeding of milch animals (71.67 per cent), supply of mixed (Legume + Cereal) fodder (63.00 per cent), feeding colostrum to new born calf before expulsion of placenta (53.00 per cent), feeding mineral mixture (40.33 per cent) and feeding salt (34.33 per cent) ranked **I**I, III, IV, V, VI, VII, VIII, IX, X, XI, XII and XIII, respectively. The probable reason might be due to lack of adequate information regarding importance of nutrients in production and reproduction, value of colostrum feeding to new born calf and chaffing of fodder reduces selectivity of fodder in addition to decrease in wastage of fodder. Among the different practices, Gunaseelan, (2018) reported similar findings in additional concentrates feed to pregnant cows/ buffaloes, correct time to colostrum feeding to newborn calf, drinking water offered to dairy animals and lower level of knowledge in offering dry fodder to dairy animals in Tamilnadu state whereas, higher level of knowledge in feeding of colostrums to calf reported by Mali, (2014).

Table 1 : Distribution of respondents according to their knowledge regarding feeding managementpractices (n=300)

Sr. No.	Knowledge	Frequency	Percent	Rank
1	Practices of stall feeding	289	96.33	III
2	Individual feeding of milch animals	215	71.67	IX
3	Supply of green fodder	300	100.00	I
4	Supply of mixed (Legume + Cereal) fodder	189	63.00	X
5	Supply of dry (Lucerne /Jowar hay /Gotar) fodder	296	98.67	II
6	Use of pelleted concentrates mixture	283	94.33	IV
7	Feeding based on Production	257	85.67	VI
8	Chaffing of fodder	228	76.00	VIII
9	Feeding of extra conc. to advanced pregnant animal	256	85.33	VII
10	Feeding salt	103	34.33	XIII
11	Feeding mineral mixture	121	40.33	XII
12	Special feeding (calving mixture) after calving	273	91.00	V
13	Free access of drinking water	300	100.00	I
14	Feeding colostrum to new born calf before expulsion of placenta	159	53.00	XI

Housing management

Perusal of data on housing management in table-2 show that 97.33 per cent of respondents had knowledge about ventilation in animal house ranked I followed by levelled floor (95.67 per cent), separate feed and fodder storage room for concentrate/ roughage (95. 33 per cent), provision and practice to protect animal from extreme weather (bedding/ curtain) (94.67 per cent), cleanliness of house (94.00 per cent), provision of water through pucca watering trough (92.33 per cent), slope of floor toward back (89.67 per cent), provision of pucca manger (89.00 per cent), distant location of manure pit (88.33 per cent), pucca wall (87.33 per cent), surrounding wall (75.67 per cent), provision of urine drain/ gutter (71.33 per cent), use of disinfectant in house (69.33 per cent), provision of R.C.C. roof (61.33 per cent), pucca floor (60.00 per cent) and east-west long axis of house (9.67 per cent) ranked II, III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII, XIV, XV and XVI, respectively. The probable reason behind this might be low number of livestock holding by the farmers so they depend on only their indigenous knowledge of housing management. Kaur, (2017) reported the similar findings in cleanliness and disinfection of animal shed in border area of Punjab. Knowledge regarding distant location of manure pit from animal shed is in line with the finding of Bhise, (2018).

Table 2 : Distribution of respondents according to their knowledge regarding housing management practices (n=300)

Sr. No.	Knowledge	Frequency	Percent	Rank
1	East-west long axis of house	29	09.67	XVI
2	Pucca floor	180	60.00	XV
3	Levelled floor	287	95.67	II
4	Slope of floor toward back	269	89.67	VII
5	Provision of R.C.C. roof	184	61.33	XIV
6	Surrounding wall	227	75.67	XI
7	Pucca wall	262	87.33	X
8	Provision of pucca manger	267	89.00	VIII
9	Provision of water through pucca watering trough	277	92.33	VI
10	Provision of urine drain/gutter	214	71.33	XII
11	Cleanliness of house	282	94.00	V
12	Provision and practice to protect animal from extreme weather: bedding/curtain	284	94.67	IV
13	Well ventilated house	292	97.33	I
14	Use of disinfectant in house	208	69.33	XIII
15	Distant location of manure pit	265	88.33	IX
16	Separate feed and fodder storage room (Concentrate/ roughage)	286	95.33	III

Milking management

As evident from the table-3 on milking management practices, 98.33 per cent of respondents had knowledge about cleaning of milk utensil with detergent washing and sun drying ranked I followed by kind behaviour and practice of grooming with milking animal (97.33 per cent), calm environment of milking place (92.33 per cent), allow calf for let-down of milk (91.33 per cent), never change of milker (78.33 per cent), stripping at the end of milking (76.33 per cent), milking at separate place and dry place (70.00 per cent), completion of milking within 5 minute per animal (64.67 per cent), clean narrow mouthed milking pail (59.67 per cent), washing hand with antiseptic before milking (55.67 per cent), washing/bathing of animal before milking (55.33 per cent), wet hand milking with water (49.00 per cent), intermittent method of drying an animal (47.67 per cent), cleaning and dipping of udder and teats just after milking (39.67 per cent), cleaning udder and teats before milking with antiseptic (38.33 per cent), full hand milking (38.00 per cent) and ranked II, III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII, XIV, XV and XVI, respectively. This indicates that most of the livestock farmers are not aware of prevention of mastitis and udder infection. Contradictory results reported in term of full hand milking by Singh, (2020) and Kaur, (2017) in which they found 84 per cent and 56 per cent livestock owner have knowledge of full hand milking method. Kaur, (2017) reported higher level of knowledge regarding cleaning udder and teats before milking and lower level of knowledge regarding timing of completion of milking. In case of cleaning of milk utensil with detergent washing and sun drying and kind behavior and grooming practice with milking animal, parallel results were reported by Bhise, (2018).

Table 3 : Distribution of respondents according to their knowledge regarding milking management practices

(n=300)

Sr. No.	Knowledge	Frequency	Percent	Rank
1	Milking at separate place and dry place	210	70.00	VII
2	Calm environment of milking place	277	92.33	III
3	Kind behaviour and grooming practice with milking animal	293	97.33	II
4	Full-hand milking	114	38.00	XVI
5	Stripping at the end of milking	229	76.33	VI
6	Wet hand milking with water	147	49.00	XII
7	Cleaning udder and teats before milking with antiseptic	115	38.33	XV
8	Washing/Bathing of animal before milking	166	55.33	XI
9	Washing hand with antiseptic before milking	167	55.67	X
10	Never change of milker	235	78.33	V
11	Clean narrow mouthed milking pail	179	59.67	IX
12	Allow calf for let-down of milk	274	91.33	IV
13	Cleaning of milk utensil with detergent washing and sun drying	295	98.33	I
14	Cleaning and Dipping of teats just after milking	119	39.67	XIV
15	Completion of milking within 5 minute per animal	194	64.67	VIII
16	Intermittent method of drying an animal	143	47.67	XIII

Health care management

With respect to results on various measure practices under healthcare management as furnished in table-4, 83.33 per cent of respondents had knowledge about practices to control ectoparasites ranked I followed by vaccination of animal (73.00 per cent), colostrum offered to new born calf within an hour (67.67 per cent), disinfection of animal shed (63.33 per cent), deworming of calves (63.00 per cent), isolation of sick animals (61.00 per cent), navel disinfection of calf (60.67 per cent), grooming of animals (58.67 per cent) and treatment of sick animal by veterinary doctor (44.00 per cent) ranked II, III, IV, V, VI, VII, VII and IX respectively. This might be due to most of the livestock owner had no information of registered veterinary practitioner, importance of calf deworming and segregation of sick animal from healthy herd to prevent the spread of contagious disease. Similar results for vaccination of animals, disinfection of animal sheds and control of ectoparasites have been reported by Kavithaa, (2020). While higher level of knowledge for navel disinfection have been reported by Bhise, (2018).

Table 4 : Distribution of respondents according to their knowledge regarding health care management practices

(n=300)

Sr. No.	Knowledge	Frequency	Percent	Rank
1	Isolation of sick animals	183	61.00	VI
2	Treatment of sick animal by veterinary doctor	132	44.00	IX
3	Vaccination of animal	219	73.00	II
4	Deworming of calves	189	63.00	V
5	Navel disinfection of calf	182	60.67	VII
6	Disinfection of animal shed	190	63.33	IV
7	Practices to control Ectoparasites	250	83.33	I
8	Grooming of animals	176	58.67	VIII
9	Colostrum offered to new born calf within an hour	187	67.67	III

Breeding management

It is evident from data on breeding management in table-5 that 97.33 per cent of respondents had knowledge about symptoms to detect sexual-heat ranked I followed by use of proven bull for natural service (83.00 per cent), pregnancy diagnosis by veterinary doctor (82.00 per cent), waiting for placental expulsion up to 12 hours (81.33 per cent), breeding records (76.33 per cent), insemination/mating of animal after heat detection within 12 to 18 hours (74.00 per cent), breeding of animals thorough A.I. (73.67 per cent), pregnancy diagnosis after 3 months of breeding (73.33 per cent), artificial insemination by veterinary doctor (69.00 per cent), calving interval in cows (< 14 months) (63.00 per cent), calving interval in buffaloes (< 15 months) (56.67 per cent), breeding after 2 to 3 months of calving (53.67 per cent), emphasis given to male for improvement of breed/ productivity (51.00 per cent), initiation of breeding of heifers on the basis of body weight/size (40.67 per cent) and ranked II, III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII and XIV, respectively. It indicated that most of dairy farmers had lack of awareness regarding role of elite bull in breed improvement, early pregnancy diagnosis and post-partum sexual health care and breeding to obtain optimum service period of 5 to 6 months in indigenous cattle and buffaloes. Parallel findings were reported in symptoms of heat detection and right time of artificial insemination whereas, higher knowledge reported in breeding after calving and pregnancy diagnosis after breeding in South-India by Gunaseelan, (2018) and Mali, (2014).

Table 5 : Distribution of respondents according to their knowledge regarding breeding management practices

(n=300)

Sr. No.	Knowledge	Frequency	Percent	Rank
1	Emphasis given to male for improvement of breed/productivity	153	51.00	XIII
2	Symptoms to detect sexual-heat (vaginal discharge + other symptoms)	292	97.33	I
3	Breeding of animals thorough A.I.	221	73.67	VII
4	Proven bull for natural service	249	83.00	II
5	Initiation of breeding of heifers on the basis of body weight/size	122	40.67	XIV
6	Breeding after 2 to 3 months of calving	161	53.67	XII
7	Breeding of animal after heat detection within 12-18 hrs	222	74.00	VI
8	Artificial insemination by veterinary doctor	207	69.00	IX
9	Breeding records	229	76.33	V
10	Waiting for placental expulsion up to 12 hours	244	81.33	IV
11	Pregnancy diagnosis by veterinary doctor	246	82.00	III
12	Pregnancy diagnosis after 3 month of breeding	220	73.33	VIII
13	Calving interval in cows (< 14 months)	189	63.00	X
14	Calving interval in Buffaloes (< 15 months)	170	56.67	XI

Overall knowledge of different scientific dairy management

The data tabulated in table-6 about overall knowledge of scientific dairy management practices indicated that majority of respondents 64.67 per cent had medium level of knowledge whereas, 20.00 per cent and 15.33 per cent of them had high and low level of knowledge regardingdifferent scientific dairy management. Similarly Sharma, (2009) reported 58.75 per cent and 20.00 per cent overall knowledge of different scientific dairy management practices. This might be due to the fact that majority respondents were uneducated or had primary education and they come under old and middle age group of farmers, who were not interested in knowing scientific practices of dairy. Interest of dairy women regarding dairy in operation area decreasing day by day and men have main focus on their agriculture farming.

Table 6 : Distribution of respondents according to their knowledge of different scientific dairy management practices

(n=300)

Sr. No.	Knowledge level	No.	Per cent
1	Low level of knowledge (score value Up to 40)	46	15.33
2	Medium level of knowledge (score value 40 to 58)	194	64.67
3	High level of knowledge (More than 58)	60	20.00
Mean=49.45		SD=9.05	

CONCLUSION

Based on findings of present study, it can be concluded that had medium level of knowledge regarding the different aspects of scientific management practices. There is massive chance for the improvement in the knowledge of the dairy farmers. Livestock owners of Amreli district keeping dairy bovines are advised to give emphasis on practices viz., feeding of salt and mineral mixture, cleaning of udder and teats before milking with antiseptic, milking with full-hand method, navel disinfection of newborn calf and initiation of breeding of heifers on the basis of body weight/size in their routine dairy management practices. Further, for effective transfer of livestock management practices in Amreli district, regular exhibitions, awareness campaign, radio talks and animal camp should be organized throughout-reach centre like Krishi Vigyan Kendra's, FTCs, State line department of Animal Husbandry and other para extension to increase the know-how of the dairy practices.

POLICY IMPLICATION

Based on the findings of the study it can be recommended that there is vast scope to improve knowledge of dairy farmers about improved animal husbandry practices. Government should focused on training programmes, demonstrations, field days, exhibitions, camps, radio/TV talks, message through ICT tools at grass root level. There is need to strengthen para extension worker at village level specially trained for animal husbandry practices.

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CONFLICT OF INTEREST

No conflict of interest

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SOCIO-ECONOMIC PROFILE OF FARMERS CULTIVATED GAR-13 VARIETY OF RICE

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ABSTRACT

An attempt was made to study socio-economic profile of respondents growing GAR -13 rice variety developed by Anand Agriculture University (AAU), Anand. The present study was conducted for two years (2020 and 2021). From middle Gujarat Kheda district was selected purposively on the basis of concentration of area under GAR-13 variety of rice. Total 120 respondents which comprise 60 respondents of GAR-13 and 60 respondents which grow local variety were selected to make the comparison between two varieties in first year. In the second year 200 respondents comprises 100 respondents of GAR-13 and 100 respondents of local variety were selected for detailed study. It was observed that decision of a farmer cultivated GAR-13 variety mainly depends on the attributes like age of the respondent, education level, family size, farm size, income etc., This indicated that the young farmers, more educated, small family size, large farm size and having more income were more willing to adopt the improved technologies as compared to local variety adopters.

Keywords : *socio-economic profile, rice, GAR-13 variety, local variety*

INTRODUCTION

The United Nations General Assembly, in a resolution declared the year 2004 as an "International Year of Rice", which has tremendous significance to food security. Rice is a major food staple and supreme commodity (Churpal, 2015), It very eloquently upheld the need to heighten awareness for the role of rice in alleviating poverty and malnutrition. Rice accounts nearly 40.5 per cent of total food grain production and occupies around one quarter of the total cropped area in the country. As per Food and Agriculture Organization India having second position in the world, among rice producing countries (Agarwal, 2018).

In Gujarat the major rice cultivated districts are Ahmedabad, Kheda, Anand, Valsad, Tapi, Dang, Panchmahal, Surat, Dahod and Mahisagar. Gujarat produces about 1930099 MT from the area of 847283 hectares during triennium ending (TE) 2018-19. The district which accounted highest productivity in Gujarat is Sabarkantha followed by Kheda, Tap, Navsari, Valsad and lowest accounted in Narmada during triennium ending (TE) 2018-19. The middle Gujarat region constituted about 65.32 per cent area and 60.50 per cent rice production during the year 2018-19. The districts which has highest area and production of rice in middle Gujarat is Ahmedabad followed by Kheda, Anand, Panchmahal, Mahisagar, Dahod, Vadodara and Chhotaudepur (Anonymous, 2020).

In recent years farmers shifted towards the new crops from traditional ones, such as cotton, groundnut, jeera, gram *etc*., replaced by medicinal crop like shatavari (Saran *et.al.,* 2020). These crops are also having traditional medicine properties like papaya parts used for disease management specially dengue (Saran *et al.,* 2015). Rice and jal brahmi grew under varying soil and climatic conditions (Saran and Patel, 2019). Soil clay loam to clay in nature is best suited for its growth and development. Both plants perform well in poorly drained soils and waterlogged conditions (Saran *et al*., 2022).

The major production and marketing constraints being faced by farmers were labour shortage, high cost of planting material, high cost of inputs, high cost of transportation, prices are not remunerative *etc.,* reported by Devi *et al.*, (2020). In the total cost of cultivation, the maximum share of the rental value of owned land, planting material, human labour, and irrigation was reported by Changela *et al.* and Devi *et al*., (2020) for eucalyptus plantation.

Therefore, with more properties, usefulness and to overcome the constraints, farmers shifting towards diversification but to maintain food production for growing population there is a need to develop high yielding varieties of the traditional crops. Many rice varieties across the country contributed significantly in food grain production, export and other uses. GAR -13 rice variety developed by Anand Agriculture University (AAU), Anand Gujarat, giving

a major boost to rice production in Gujarat. It was released during the year 2009 with special characteristics of mid early, medium slender and fine grain type, multiple resistant to pests and diseases, good cooking quality *etc.* It has recorded yield of about 6000-6500 kg per hectare which is generally higher than other rice varieties in Gujarat. The maturity duration is about 130-135 days, alike any other normal rice variety. Hence, the present study was undertaken to study socio-economic profile which affect significantly the level of adoption of the farmers.

OBJECTIVE

To study the socio-economic profile of GAR-13 rice variety growers vis-a vis local rice variety growers

METHODOLOGY

Kheda district from middle Gujarat was selected purposively on the basis of concentration of area under GAR-13 variety of rice and from Kheda district, two talukas namely Matar and Kheda were selected purposively on the basis of concentration of area under the variety.

The present study was conducted for two years (2020 and 2021). During first year from each selected taluka, 30 respondents were selected randomly those who were cultivating GAR-13 variety of rice released by AAU and 30 respondents who cultivate other local variety of rice. Thus, total 120 (2x60) which comprises 60 respondents of GAR-13 and 60 respondents of local variety were selected. In the second year same sampling procedure was followed with more number of respondents. From each selected taluka, 50 respondents of GAR-13 and 50 respondents of local variety were selected. Thus, total 200 (2x100) which comprises 100 respondents of GAR-13 and 100 respondents of local variety were selected for detailed study.

This study was based on the primary data which were collected from sample households on various parameters of socio-economic profile through well-structured and pre-tested interview schedule. The data were analysed by using tabular analysis, mean, percentage, frequency *etc.,* to draw the meaningful conclusion.

RESULTS AND DISCUSSION

The detail of socio-economic profile of respondents' *viz*., size of family, age, education, occupation, association with organizations, size of land holding, source of irrigation *etc*. affect the economy of the farm and also the decision making about adoption of inventive techniques to a substantial extent. These aspects of sample respondents have been analyzed and presented as under:

Average family size and age

Table 1: Average family size and age of respondents (n=200)

Sr. No.	Particulars	Year 2020			Year 2021		
		GAR-13 (n=60)	Local (n=60)	Overall (n=120)	GAR-13 (n=100)	Local (n=100)	Overall (n=200)
1	Male	2.33 (35.68)	2.18 (32.63)	2.26 (34.09)	2.53 (38.05)	2.48 (35.68)	2.51 (36.84)
2	Female	2.22 (34.00)	2.37 (35.48)	2.30 (34.70)	2.09 (31.43)	2.23 (32.09)	2.16 (31.76)
3	Children	1.98 (30.32)	2.13 (31.89)	2.06 (31.06)	2.03 (30.53)	2.24 (32.23)	2.14 (31.40)
4	Average family size	6.53 (100.00)	6.68 (100.00)	6.61 (100.00)	6.65 (100.00)	6.95 (100.00)	6.80 (100.00)
5	Average Income Earners in family	2.10 (32.16)	1.97 (29.49)	2.04 (30.91)	2.22 (33.38)	2.05 (29.50)	2.14 (31.44)
6	Average age of respondents (year)	47.35	52.05	49.70	50.76	53.11	51.94

Source: Field survey

Note: Figures in parenthesis indicates percentage to total in respective column

The size of family has a bearing on the supply of labour force on the farm as well as the family consumption needs. It was observed in the first year (2020) of the study that overall average size of the family of the respondents was 6.61 with 6.53 and 6.68 in GAR-13 and variety, respectively. The overall average male, female and children were 2.26

(34.09 %), 2.30 (34.70 %) and 2.06 (31.06 %) per family, respectively, on sample farms. During second year the overall average family size was accounted about 6.80 with 6.65 and 6.95 in GAR-13 and Local variety, respectively. The share of male, female and children were 36.84, 31.76 and 31.40 per cent, respectively.

It could be also seen from the Table that the average income earners in the family were about 2.04 and 2.14 during first and second year, respectively. Moreover, the results showed that the average age of respondents was found to be 49.70, 51.94 years, respectively in first and second year. In case of the farmers who cultivate GAR-13 variety of rice the average age of respondents were about 47.35, 49.70 years, whereas in case of local variety, it was 52.05, 53.11 years, respectively, in both the years of study (Table 1). This showed that the younger farmers are willing to more to adopt the new technologies as compared to older one. The study carried out by khan *et al.*, (2017) and Neupanea, (2002) suggested that age of farmer had significant negative effects on the tree planting on farms.

Educational status

Education plays important role in adoption of improved technologies and innovations. Better education enable better comprehension of farming technologies and their possible adoption in farm enterprises. The awareness and knowledge of the farmers are best reflected through their education.

Table 2: Educational status of respondents (n=200)

Sr. No.	Particulars	Year 2020			year 2021		
		GAR-13 (n=60)	Local (n=60)	Overall (n=120)	GAR-13 (n=100)	Local (n=100)	Overall (n=200)
1	Illiterate	01.00 (1.67)	01.00 (1.67)	02.00 (1.67)	04 (4.00)	08 (8.00)	12 (6.00)
2	Primary (up to VII)	02.00 (3.33)	06.00 (10.00)	08.00 (6.67)	11 (11.00)	21 (21.00)	32 (16.00)
3	Secondary (VIII to XII)	43.00 (71.67)	41.00 (68.33)	84.00 (70.00)	59 (59.00)	53 (53.00)	112 (56.00)
4	College	14.00 (23.33)	12.00 (20.00)	26.00 (21.66)	26 (26.00)	18 (18.00)	44 (22.00)

Source: Field survey

Note: Figures in parenthesis indicates percentage to total in respective column

Table 2 indicated that in the first year of the study about 98.33 per cent of the total sample farmers were literate and remaining 1.67 per cent farmers were illiterate. Among the literate respondents 70.00 per cent had education up to secondary level, 21.66 per cent up to college and 6.67 per cent up to primary. During second year also similar type of observations was found with about 94.00 per cent respondents were literate and about 6 per cent were illiterate. Moreover, in both the years majority of respondents were educated up to secondary level followed by college and primary level of education.

Further, it could be inferred from the Table that more or less same pattern was found in both the category of respondents.

The study conducted by Changela *et al.*, (2019) found that age and family size has negative influenced on adoption decision of eucalyptus whereas, education and farm size has positive influence on adoption of eucalyptus plantation. Similar type of studies was also conducted by Ashraf, (2015) Khan *et al.*, (2017) and John *et al.,* (2020).

Occupation

Table 3 depicted the source wise occupation of respondents. The results exposed that in first year (2020) of the study in overall category majority of the farmers (45.00 %) adopted farming with animal husbandry as their main occupation followed by farming (28.33 %), farming + service (13.33 %), farming + animal husbandry + service (10.83 %), farming + business (1.67 %) and farming + animal husbandry + business (0.83 %). The farmers who were cultivating GAR-13 variety of rice, majority of them (38.33 %) engaged in farming + animal husbandry and least numbers are engaged in farming + animal husbandry + business (1.67 %). The similar pattern was observed in the case, those who were cultivate Local variety of rice.

Table 3: Distribution of respondents according to their occupation (n=200)

Sr. No.	Particulars	Year 2020			Year 2021		
		GAR-13 (n=60)	Local (n=60)	Overall (n=120)	GAR-13 (n=100)	Local (n=100)	Overall (n=200)
1	Farming	15.00 (25.00)	19.00 (31.67)	34.00 (28.33)	21.00 (21.00)	25.00 (25.00)	46.00 (23.00)
2	Farming + Animal Husbandry	23.00 (38.33)	31.00 (51.67)	54.00 (45.00)	29.00 (29.00)	37.00 (37.00)	66.00 (33.00)
3	Farming + Animal Husbandry + Business	1.00 (1.67)	0.00 (0.00)	1.00 (0.83)	8.00 (8.00)	7.00 (7.00)	15.00 (7.50)
4	Farming + Animal Husbandry + Service	10.00 (16.67)	3.00 (5.00)	13.00 (10.83)	17.00 (17.00)	10.00 (10.00)	27.00 (13.50)
5	Farming + Business	1.00 (1.67)	1.00 (1.67)	2.00 (1.67)	9.00 (9.00)	8.00 (8.00)	17.00 (8.50)
6	Farming + Service	10.00 (16.67)	6.00 (10.00)	16.00 (13.33)	16.00 (16.00)	13.00 (13.00)	29.00 (14.50)
7	Experience of Rice cultivation (Years)	21.39	19.56	20.47	22.59	20.94	21.77

Source: Field survey

Note: Figures in parenthesis indicates percentage to total in respective column

During the second year also majority of the farmers (33.00 %) adopted farming with animal husbandry as their main occupation followed by farming (23.00 %), farming + service (14.50 %), farming + animal husbandry + service (13.50 %), farming + business (8.50 %) and farming + animal husbandry + business (7.50 %). The similar observations were found across the varieties.

Further, it was noticed that the farmers had on an average 20.47 and 21.77 years of experience of rice cultivation during first and second year, respectively. The farmers who were cultivating GAR-13 variety had more experience (21.39, 22.59 years) as compared to the farmers who were cultivating local variety (19.56, 20.94 years) in both the years, respectively. This clearly indicated that more experience plays an important role in adoption of technologies.

Social participation

Farmer's participation with different organizations is an indication of their widened horizons and their active participation and involvement not only in farming but also in the welfare of the societies. The respondents social participation with different organizations presented in Table 4. During first year of the study, among the different organizations, the highest participation was observed in milk cooperative societies (37.50 %) followed by participation in multi-organizations (35.83 %) indicated the participation with more than one organization, Seva Sahakari (4.17 %) *etc.,* and lowest with farmers club (0.83 %). Overall 16.67 per cent of the farmers were not linked with any of the organization. In second year also the highest participation was found in milk cooperative societies (29.00 %) followed by participated in multi-organizations (22.00 %), Seva Sahakari (10.50 %), ATMA (10.00 %) *etc.,* and lowest with village panchayat (5.00 %). Overall 17.00 per cent of the farmers were not linked with any of the organization. Across the farmers category more or less same pattern was observed.

Table 4: Social participation of respondents with organizations (n=200)

Sr. No.	Particulars	Year 2020			Year 2021		
		GAR-13 (n=60)	Local (n=60)	Overall (n=120)	GAR-13 (n=100)	Local (n=100)	Overall (n=200)
1.	Village Panchayat	2.00 (3.33)	1.00 (1.67)	3.00 (2.50)	7.00 (7.00)	3.00 (3.00)	10.00 (5.00)
2	Milk co-operative society	19.00 (31.67)	26.00 (43.33)	45.00 (37.50)	25.00 (25.00)	33.00 (33.00)	58.00 (29.00)
3	Farmers Club	1.00 (1.67)	0.00 (0.00)	1.00 (0.83)	7.00 (7.00)	6.00 (6.00)	13.00 (6.50)
4	ATMA	2.00 (3.33)	1.00 (1.67)	3.00 (2.50)	11.00 (11.00)	9.00 (9.00)	20.00 (10.00)
5	Seva Sahakari	3.00 (5.00)	2.00 (3.33)	5.00 (4.17)	13.00 (13.00)	8.00 (8.00)	21.00 (10.50)
6	Multiresponse	24.00 (40.00)	19.00 (31.67)	43.00 (35.83)	24.00 (24.00)	20.00 (20.00)	44.00 (22.00)
7	Not associated	9.00 (15.00)	11.00 (18.33)	20.00 (16.67)	13.00 (13.00)	21.00 (21.00)	34.00 (17.00)

Source: Field survey

Note: Figures in parenthesis indicates percentage to total in respective column

Land holding

The overall average size of land holding possess by the farmers were 5.71 and 5.21 hectare in first year and second year of the study, respectively, out of which 100 per cent of land was irrigated. Further, it was observed that during the first year average size of land holding was found slightly more in case of GAR-13 respondents (5.89 ha) as compared Local (5.54 ha). The similar trend was also found in second year. It was also observed that the average area allocated by farmers under rice cultivation was about 3.01 hectare (52.71 %) and 2.90 hectare (55.57 %) in first and second year, respectively. Proportion of land allocation under GAR-13 variety was found to be more as compared to area under Local variety in both the study years (Table 5).

Table 5: Operational size of land holding (n=200)

Sr. No.	Particulars	Year 2020			Year 2021		
		GAR-13 (n=60)	Local (n=60)	Overall (n=120)	GAR-13 (n=100)	Local (n=100)	Overall (n=200)
1	Irrigated land (ha)	5.89 (100.00)	5.54 (100.00)	5.71 (100.00)	5.49 (100.00)	4.93 (100.00)	5.21 (100.00)
2	Un-irrigated land (ha)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
3	Average land holding (ha)	5.89 (100.00)	5.54 (100.00)	5.71 (100.00)	5.49 (100.00)	4.93 (100.00)	5.21 (100.00)
4	Area under rice cultivation (ha)	3.17 (53.82)	2.86 (51.62)	3.01 (52.71)	3.28 (59.74)	2.51 (50.91)	2.90 (55.57)

Source: Field survey

Note: Figures in parenthesis indicates percentage to total in respective column

Source of irrigation

The sources of irrigation of the respondents were presented in Table 6. It could be inferred from the table that in overall category about 35.83 per cent farmers had tube well as a main source of irrigation followed by multisource of irrigation (29.17 %), canal (15.00 %), pond (14.17 %) and well (5.83 %) in the first year. While, in second year 27.00 per cent respondents had tube well as a main source of irrigation followed by multisource of irrigation (23.50 %), pond (18.00 %), canal (16.50 %) and well (15.00 %). The similar observations were found irrespective of the categories of farmer's cultivated GAR-13 and Local variety of rice.

Table 6: Distribution of respondents according to source of irrigation (n=200)

Sr. No.	Source of Irrigation	Year 2020			Year 2021		
		GAR-13 (n=60)	Local (n=60)	Overall (n=120)	GAR-13 (n=100)	Local (n=100)	Overall (n=200)
1	Tube well	26.00 (43.33)	17.00 (28.33)	43.00 (35.83)	30.00 (30.00)	24.00 (24.00)	54.00 (27.00)
2	Well	2.00 (3.33)	5.00 (8.33)	7.00 (5.83)	14.00 (14.00)	16.00 (16.00)	30.00 (15.00)
3	Canal	4.00 (6.67)	14.00 (23.33)	18.00 (15.00)	12.00 (12.00)	21.00 (21.00)	33.00 (16.50)
4	Pond	8.00 (13.33)	9.00 (15.00)	17.00 (14.17)	17.00 (17.00)	19.00 (19.00)	36.00 (18.00)
5	Multisource of irrigation	20.00 (33.33)	15.00 (25.00)	35.00 (29.17)	27.00 (27.00)	20.00 (20.00)	47.00 (23.50)

Source: Field survey

Note: Figures in parenthesis indicates percentage to total in respective column

CONCLUSION

It was observed from the present study that almost the similar trend of results was observed during both the years. The socio-economic profile such as age, education, farm size, size of family, occupation, association with organizations *etc.* influenced the farmer's decision in adoption of GAR-13 variety of rice. Moreover, the respondents cultivating GAR-13 were more educated, have less family size, younger and had more experience about rice cultivation as compared to local variety growers. This indicated that education, younger minds and more experience plays an important role in adoption of technologies, since younger farmers are usually more willing to take risk as compared to older farmer. Further, the results indicated that proportion of land allocation under GAR-13 and farmers associated with organizations was found to be more as compared to local variety which reflected the activeness of the advance farmers.

POLICY IMPLICATION

It was observed that the socio-economic profile of farmers playing the important role in adoption of technologies. Therefore, need to educate and aware farmers more about the new technologies and also the policy makers should focus on the further development of socio-economic standard of farmers.

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CONFLICT OF INTEREST

No conflict of interest among researchers.

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TECHNOLOGICAL GAP IN RECOMMENDED CASTOR PRODUCTION TECHNOLOGY

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ABSTRACT

Agriculture is the backbone of Indian economy. In India, oilseed crops constitute the second largest agriculture produce next to food grains. Castor is an important cash crop for farmer as well as for country too as it fetches valuable foreign exchange by export of seeds, oil and derivatives to all over the world. The present study was conducted in Patan District of Gujarat State. Among the nine talukas of Patan district, only Patan, Saraswati and Harij this three talukas of Patan district were selected purposively for the reason having highest area under castor cultivation as compared to other talukas of the district. The multi-stage sampling (three stage) technique was used for selection of talukas, villages and respondents. Ex-post facto research design was used for this study. The study was conducted to know the technological gap of castor growers of Patan district. Technological gap has been defined as the proportion of gap in the adoption of castor production technology and it is expressed in percentage. In the present study technological gap was operationalized on the division in adoption of castor production technology by the castor growers and expressed in percentage. revealed that the high technological gap was observed in plant protection measures 75.40 per cent followed by seed treatment 71.00 per cent, weed control 68.75 per cent, FYM 64.00 per cent, crop rotation 58.35 per cent, chemical fertilizer 51.77 per cent, sowing time 45.10 per cent, spacing 40.67 per cent, seed rate 36.00 per cent, recommended variety 30.33 per cent, harvesting 27.85 per cent, interculturing 21.90 per cent and irrigation schedule 16.00 per cent, which were ranked as first to thirteen, respectively.

Keywords: *technological gap, adoption, castor production technology*

INTRODUCTION

Castor plant (*Ricinus communis* L.) belongs to *Euphorbiaceae* family. The total area, under castor seed cultivation in India for the year 2019 to 2020 is estimated to be 9.92 lakh hectare and productivity is 2052 kg/ha. Gujarat is the leading castor growing state of the country. Area under castor seed is 647.93 ha with production is 1456.66 tonnes and yield is 2248.17 kg/ha during 2019-20 in Gujarat State. Patan is one of the most important castors growing district of Gujarat State. The area under hybrid castor in this district was 997.85 hectares with a production about 1878.25 Metric Tonnes and productivity of 1882.30 kg/ha during 2015-16. The seed yield gap depends upon technological gap and the extent of technological gap in different production components of the technology contributes differently to the yield gap (Kakkad *et al.,* 2021 and Damor *et al.,* 2021). The several constraints influence the transfer of technology pertaining to seed production. Such constraints may be technological, socio-economic, organizational, infrastructural facilities and extension service related. Considering all these aspects, the present study entitled, "Technological gap in castor production technology by the farmers of Patan district" is planned with the specific objectives.

OBJECTIVE

To determine the extent of technological gap in recommended castor production technology

METHODOLOGY

The present investigation was carried out in Patan district of Gujarat State. Among the nine talukas of Patan district, three talukas *viz.,* Patan, Saraswati and Harij were purposively selected based on higher area and production as compare to other talukas of the district. Five villages from each taluka were selected randomly. From each village ten castor growers were selected randomly. Thus, total 150 respondents were selected for the study. Ex-post facto research design was used for this study. The data were collected by personal contact method with the help of structured interview schedule.

RESULTS AND DISCUSSION

Extent of technological gap in recommended castor production technology by the castor growers

The extent of technological gap in adoption of

different recommended castor production technology among the castor growers are summarised in Table 1.

Table 1 : Extent of technological gap in recommended castor production technology by the castor growers

(n = 150)

Sr. No.	Different practice wise of recommended castor production technology	Total score	Obtained score	Technology gap (%)	Rank according to technological gap
1	Recommended variety/Hybrid variety	150	46	30.33	X
2	Seed rate	150	54	36.00	IX
3	Spacing	150	61	40.67	VIII
4	Seed treatment	150	107	71.00	II
5	Sowing time	300	135	45.10	VII
6	FYM	150	96	64.00	IV
7	Chemical fertilizer	150	78	51.77	VI
8	Irrigation schedule	300	48	16.00	XIII
9	Interculturing	150	33	21.90	XII
10	Weed control	300	206	68.75	III
11	Crop rotation	150	88	58.35	V
12	Plant protection	300	226	75.40	I
13	Harvesting	300	84	27.85	XI
	Overall Technological gap	**2700**	**1262**	**46.70**	

The data presented in Table 1 indicate that the practice-wise technological gap varied from practice to practice. The practice-wise technological gap among the castor growers was ranging from 16.00 to 75.40 per cent.

The data presented in Table 1 revealed that the high technological gap was observed in plant protection measures 75.40 per cent followed by seed treatment 71.00 per cent, weed control 68.75 per cent, FYM 64.00 per cent, crop rotation 58.35 per cent, chemical fertilizer 51.77 per cent, sowing time 45.10 per cent, spacing 40.67 per cent, seed rate 36.00 per cent, recommended variety 30.33 per cent, harvesting 27.85 per cent, interculturing 21.90 per cent and irrigation schedule 16.00 per cent, which were ranked as first to thirteen, respectively. This finding was supported by the earlier findings of Kaid, (2004).

Extent of Overall Technological gap in recommended castor production technology by the castor growers

The technological gap refers to the difference between technology recommended by the scientists and actual technology adopted by the farmers. It was felt that agricultural technology is not generally adopted by the farmers completely in all respects. As a result, technological gap appears and poor yield is obtained. Keeping this in view technological gap has been studied.

Table 2 : Distribution of the castor growers according to their overall technological gap (n=150)

Sr. No.	Technological gap	Frequency	Per cent
1	Low (< 7.00 score)	22	14.67
2	Medium (≥ 7.00 to < 13.00 score)	91	60.66
3	High (≥ 13.00 score)	37	24.67
Mean= 10.00		S.D. = 2.99	

The data presented in Table 2 is indicate that slightly more than two-third (60.66 per cent) of the castor growers were having medium technological gap followed by 14.67 and 24.67 per cent castor growers were having low and high technological gap, respectively. Thus, it can be inferred that (60.66 per cent) of the castor growers had medium extent of adoption. The probable reason for this might be that they had medium level of knowledge, extension contact, scientific orientation, as well as several constraints they faced and limited resources with them.

The similar findings have been reported by Markana, (2016), Chaudhary, *et al.* (2018) and Chaudhary, (2019).

CONCLUSION

This study conclude that Slightly more than three fifth (60.66 per cent) of the castor growers were having medium technological gap followed by 14.67 and 24.67 per cent castor growers were having low and high technological gap, respectively. In extent technological gap, the maximum

technological gap was observed in plant protection measures 75.40 per cent followed by seed treatment 71.00 per cent, weed control 68.75 per cent.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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VIEWS OF SORGHUM GROWERS ABOUT CoFS 29 VARIETY REGARDING ITS USEFULNESS

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ABSTRACT

In Gujarat, sorghum is mainly cultivated for fodder purpose. Out of various zones of Gujarat, middle Gujarat is one of the remarkable zones of livestock population and farmers of this area grow various fodder crops to feed their animals. In middle Gujarat, farmers of Kheda district mainly grow sorghum, pearl millet and maize as a fodder crop. Due to nature of unavailability in some seasons of single cut variety of fodder sorghum and pearl millet, main forage research station, Anand Agricultural University, Anand recommended an improved multi cut variety CoFS 29 of sorghum. After understanding the importance of this variety, Krishi Vigyan Kendra, Kheda conducted the front line demonstrations of this variety in Kheda district from year 2017 with a view to long term fodder availability and to increase the area of production by increase the number of its adopters. To understand the actual usefulness of this variety among the users of it, the study on views of sorghum growers about CoFS 29 variety regarding its usefulness in Kheda district was conducted on those sorghum growers where KVK Kheda conducted FLD of CoFS 29 of fodder sorghum. A total of 200 CoFS 29 variety users were selected for the study. Ex-post-facto research design was used and interview schedule was prepared in light with objective. Usefulness in crop production, usefulness in animal husbandry and economic usefulness were three key indicators to measure the overall usefulness of this variety. Less number of ploughing is needed than other varieties of fodder sorghum, more number of cuttings and less seeds are needed were major perceived usefulness in crop production. Animal likes to feed and no poisoning effect after feeding of immature fodder were major perceived usefulness in animal husbandry. Less cost of cultivation and more profitable were major economic usefulness perceived by the users. Majority of the users had high perceived overall usefulness of this variety.

Keywords: *fodder sorghum, CoFS 29 variety, usefulness, crop production, animal husbandry, economic usefulness*

INTRODUCTION

In India sorghum is known as *jowar, cholam, or jonna*, in West Africa as Guinea corn, and in China as kaoliang. It is especially valued in hot and arid regions for its resistance to drought and heat. It is a source of food and fodder, mostly in the traditional, smallholder farming sector. Consumption of sorghum for food purposes is declining because of a change in food habits and consumer preference brought about by economic status, whereas use for animal feed and other industrial purposes is increasing. In India, area under the cultivation of sorghum was 3.84 million ha with 3.76 million tonnes production and in case of Gujarat, area under the cultivation was 0.08 million ha with 0.10 million tonnes production in year 2018-19 (Anonymous, 2020). The yield of sorghum was 979 kg/ha and 1265 kg/ha for India and Gujarat in year 2018-19, respectively. In Gujarat, sorghum is mainly cultivated for fodder purpose. Out of various zones of Gujarat, middle Gujarat is one of the remarkable zones of livestock population and farmers of this area grow various fodder crops to feed their animals. In middle Gujarat, farmers of Kheda district mainly grow sorghum, pearl millet and maize crop in summer season as a fodder crop but these crops are single cut and cannot available for long period. Due to that reason, main forage research station, Anand Agricultural University, Anand recommended an improved variety CoFS 29 of sorghum. This variety is multi cut in nature and gives 5-6 cut in one year and can be used as a green fodder for feed purpose, getting higher production and long term availability.

After understanding the importance of recommended variety of sorghum, Krishi Vigyan Kendra, Kheda decided to conduct the front line demonstrations (FLDs) of CoFS 29 variety of sorghum in Kheda district from year 2017 with a view to long term fodder availability and to increase the area of production of this variety by increase the number of its adopters. Here, only conducting the FLDs is not sufficient task to increase the number of adopters but it is necessary to

understand the actual usefulness of this variety among the adopters of this variety. Hence, this study was conducted with a view to get the views of CoFS 29 user sorghum growers regarding its usefulness with following objective;

OBJECTIVE

To study the views of CoFS 29 variety user sorghum growers about its usefulness

METHODOLOGY

Ex-post-facto research design was used for the study. The present investigation was conducted in Kheda district of the middle Gujarat. This district was selected purposively for a study because such type of study had not been yet undertaken in this district and this district comes under the jurisdiction of Krishi Vigyan Kendra (KVK), Kheda. Farmers of this district are comparatively more innovative, having with more number of livestock, cultivating green fodder to feed their animals and KVK, Kheda has conducted frontline demonstrations of CoFS 29 of fodder sorghum since 2017 with a view to popularize the variety in district. From ten talukas of Kheda district four talukas- Kheda, Kapadvanj, Mahemdabad and Kathalal where KVK-Kheda has conducted FLD were selected purposively for the study. A total of 200 CoFS 29 user sorghum growers were selected for the study as mentioned in the table 1. To study the views of sorghum growers about usefulness of CoFS 29 variety, structured schedule was developed consisting the statements of various properties of the CoFS 29 variety. A total of a three components namely; (1) usefulness in crop production, (2) usefulness in animal husbandry and (3) economic usefulness were selected for measurement of overall usefulness of CoFS 29 variety. The statements were scored as 5, 4, 3, 2 and 1 for strongly agree, agree, undecided, disagree and strongly disagree of the responses, respectively. Statement wise views regarding usefulness of CoFS 29 variety were studied, mean score was calculated for each statements and on the basis of mean scores, ranks were assigned to each statement. On the basis of measuring the usefulness for each statement, overall usefulness as perceived by the sorghum growers about CoFS 29 variety was calculated. Similar kind of studies of measurement of usefulness was carried out by Patel *et al.,* (2012a), Patel *et al.,* (2012b), Joshi *et al.,* (2015) and Soni *et al.,* (2015).

Table 1: Selected talukas, villages and number of respondents

Sr. No.	Name of taluka	Name of village	No. Of respondent
1	Kapadvanj	Kevadiya	45
		Antroli	25
		Hamirpura	25
		Jaloya	25
2	Kathalal	Bhagatnamuvada	35
3	Mahemdabad	Vanthvadi	25
4	Kheda	Govindpura	20
		Total	200

RESULTS AND DISCUSSION

Views of sorghum growers about CoFS 29 variety regarding its usefulness in crop production is presented in table 2.

Table 2: Usefulness in crop production (n=200)

Sr. No.	Usefulness	Mean Score	Rank
1	Less number of ploughing is needed than other varieties of fodder sorghum	4.41	1st
2	More number of cutting	4.31	2nd
3	Less seeds are needed	4.13	3rd
4	More number of tillers per plant	4.05	4th
5	Height of plant is more than other varieties	4.01	5th
6	More number of leaves per plant	3.99	6th
7	Less affected by hazardous animals	3.93	7th
8	More crop production than other varieties	3.89	8th
9	Early flowering than other varieties	3.84	9th
10	This variety can be tested in small area	3.84	9th
11	This variety is suitable in all type of land	3.83	10th
12	This variety can be sown in all seasons	3.78	11th
13	Less spacing is needed	3.67	12th
14	Width of tillers are more than other varieties	3.58	13th
15	Production technology is easy to understand	3.50	14th
16	Less numbers of weeding are needed	3.50	14th

Sr. No.	Usefulness	Mean Score	Rank
17	Less infestation of diseases	3.42	15th
18	Less fertilizer is needed	3.36	16th
19	Length and width of leaves are more than other varieties	3.30	17th
20	Suitable for storage as dry fodder	3.30	17th
21	Early harvesting than other varieties	3.20	18th
22	Short dormancy period of seeds	2.72	19th
23	Less irrigation are needed	2.72	19th

From the table 2, it can be seen that majority of the CoFS 29 user sorghum perceived usefulness in crop production was less number of ploughing is needed than other varieties of fodder sorghum with 4.41 mean score and which got 1st rank, followed by more number of cutting (4.31 mean score), less seeds are needed (4.13 mean score), more number of tillers per plant (4.05 mean score), height of plant is more than other varieties (4.01 mean score), more number of leaves per plant (3.99 mean score), less affected by hazardous animals (3.93 mean score), more crop production than other varieties (3.89 mean score), early flowering than other varieties (3.84 mean score), this variety can be tested in small area (3.84 mean score), this variety is suitable in all type of land (3.83 mean score), this variety can be sown in all seasons (3.78 mean score), less spacing is needed (3.67 mean score), width of tillers are more than other varieties (3.58 mean score), production technology is easy to understand (3.50 mean score), less numbers of weeding are needed (3.50 mean score) and less infestation of diseases (3.42 mean score). It was also observed that some statements possessed less usefulness for the growers' viz., less fertilizer is needed (3.36 mean score), followed by length and width of leaves are more than other varieties (3.83 mean score), suitable for storage as dry fodder (3.30 mean score), early harvesting than other varieties (3.20 mean score), short dormancy period of seeds (2.72 mean score) and less irrigation are needed (2.72 mean score).

Views of sorghum growers about CoFS 29 variety regarding its usefulness in animal husbandry is presented in table 3.

Table 3: Usefulness of CoFS 29 variety in animal husbandry (n=200)

Sr. No.	Usefulness	Mean Score	Rank
1	Animal likes to feed	4.33	1st
2	There is no poisoning effect after feeding of immature fodder	4.10	2nd
3	Easy to digest for animal	3.95	3rd
4	More milk production	3.71	4th
5	The animal leaves less fodder residues	3.66	5th
6	Available for longer period as green fodder	3.58	6th
7	Suitable for preparation of silage	3.24	7th
8	Increase in fat in milk	2.80	8th

From the table 3, it can be seen that in case of usefulness in animal husbandry, majority of the farmers perceived usefulness as animal likes to feed with 4.33 mean score, followed by there is no poisoning effect after feeding of immature fodder (4.10 mean score), easy to digest for animal (3.95 mean score), more milk production (3.71 mean score), the animal leaves less fodder residues (3.66 mean score), available for longer period as green fodder (3.58 mean score), suitable for preparation of silage (3.24 mean score), and increase in fat in milk (2.80 mean score).

Views of sorghum growers about CoFS 29 variety regarding its economic usefulness is presented in table 4.

Table 4: Economic Usefulness of CoFS 29 Variety

Sr. No.	Usefulness	Mean Score	Rank
1	Less cost of cultivation	4.00	1st
2	More profitable than other varieties of sorghum	3.53	2nd
3	More market price of fodder of this variety	2.83	3rd

From the table 5, it can be observed that major economic usefulness for the farmers was less cost of cultivation with 4.00 mean score, followed by more profitable than other varieties of sorghum (3.53 mean score) and more market price of fodder of this variety (2.83 mean score). They got rank 1st, 2nd and 3rd respectively on the basis of their mean scores.

On the basis of above mentioned three components of usefulness, overall usefulness of CoFS 29 variety was measured. The data presented in table 5 indicates the overall usefulness of CoFS 29 variety among the

Table 5: Overall Usefulness of CoFS 29 variety for sorghum growers (n=200)

Sr. No.	Category	Number	Percent
1	Very Low (0 – 61.2)	00	00
2	Low (61.3 – 88.4)	00	00
3	Medium (88.5 – 115.6)	57	28.50
4	High (115.7 – 142.8)	130	65.00
5	Very High (142.9 – 170.0)	13	06.50

From the table 5, it can be observed that majority (65.00 per cent) of the sorghum growers had high level of usefulness regarding CoFS 29 variety, followed by medium (28.50 per cent) and very high (6.50 per cent) level of usefulness. It was also observed that not a single sorghum user came under the category of low or very low level of overall usefulness of CoFS 29 variety of fodder sorghum.

CONCLUSION

On the basis of entire study, it can be concluded that majority of the CoFS 29 user sorghum growers were perceiving higher level of overall usefulness about CoFS 29 variety. Major usefulness in crop production for CoFS 29 users were less number of ploughing is needed than other varieties of fodder sorghum, more number of cutting is possible and less seeds are needed. In case of views about animal husbandry related usefulness, major usefulness observed by users were animal likes to feed, no poisoning effect after feeding of immature fodder to animals and easy to digest for animal. Less cost of cultivation and more profitable than other varieties of sorghum were major economic usefulness for the CoFS 29 users.

IMPLICATION

The findings of the study would facilitate in knowing the existing level of usefulness of CoFS 29 variety in the farmers of Kheda district. The results of the study suggested that overall perceived usefulness of this variety among the users was high so on the basis of that this variety should be popularized more by conducting more awareness programs and demonstrations by line departments.

CONFLICT OF INTEREST

No conflict of interest among researchers.

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DECISION MAKING OF FARM WOMEN IN DAIRY OCCUPATION

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ABSTRACT

Farm women's decision making in dairy occupation affects their overall efficiency in the development of dairy occupation but adequate attention is not being paid for the economic development of farm women and to encourage them to avail training facilities on dairy management practices for supplementing their family income through development and application of occupational skills and proficiency. The present study was conducted in Banaskantha district of Gujarat state. From Banaskantha District, four talukas were selected randomly. From selected three taluka, four villages each and from one taluka three villages were selected constituting 15 villages and ten farm women were selected randomly from each village having dairy occupation making a sample of 150 farm women. Overall decision making of farm women in dairy occupation was found largest in the aspect of feeding followed by milk and milk products, breeding, management and general aspects. It was observed that majority of farm women were found medium level of decision making in dairy occupation. The independent variable like social participation, source of information, knowledge and size of land holding were highly significant while, herd size was significantly correlated with the decision making of the farm women in dairy occupation.

Keywords: *decision making, farm women, dairy occupation*

INTRODUCTION

Farm women constitute the most important productive work force in the Indian agricultural economy. Agriculture and its allied sectors contribution in GDP/GVA during 2018-19 was 17.1 per cent and alone livestock was 5.1 per cent Anonymous, (2020-21).

Dairy occupation is an integral part of rural agricultural economy (Thakur *et al.*, 2020). Farm women play an important role in performing agricultural, family and dairy husbandry practice and share the responsibility of generating family income. In many places, the entire livestock management is looked after by women only. Still, there is no recognition for their hard work, just because their work is not evaluated in terms of money (Thakur and Patel, 2020). They help in farm operation, take their animals on distant lands for grazing, washing, milking, fodder, breeding management, sale of milk, if necessary by taking it to the market and so on in addition, perform the functions related to house management. Therefore, it has been considered worthwhile to get a clear picture and understanding about decision-making pattern of farm women with respect to dairy occupation. Therefore, present study entitled "Decision making of farm women in dairy occupation" was undertaken.

OBJECTIVE

To study farm women in decision making about dairy occupation

METHODOLOGY

The present study was conducted in Banaskantha district of Gujarat state. From Banaskantha District, four talukas were selected randomly. From selected three taluka, four villages each and from one taluka three villages were selected constituting 15 villages and ten farm women were selected randomly from each village having dairy occupation making a sample of 150 farm women. The present study was confined to "Ex-post facto"research design as the independent variables have already operated in the study area. Interview schedule was prepared on the basis of objective on the subject. The data were collected through face to face interview and by direct observation method. The statistical tests, percentage, frequency, mean, standard deviation and Karl Pearson's co-efficient of correlation were used for analysis the data of the investigation.

RESULTS AND DISCUSSION

Decision making index of farm women in dairy occupation:

In this study, effort was made to determine whether decision making of farm women differs in different aspects of dairy occupation. For this purpose, decision making index of farm women in different aspects of dairy occupation was worked out. The data in this regard are given in Table 1.

Table 1: Distribution of farm women on the basis of their decision making index (n = 150)

Sr. No.	Different aspects	Decision making index
1	General	60.04
2	Breeding	68.27
3	Feeding	70.83
4	Milk and milk products	69.80
5	Management	65.03
	Overall decision making	**66.79**

It can be observed from the data presented in Table 1 that farm women had an overall decision making in dairy occupation was found 66.79 per cent. However, farm women had the largest decision making (70.83%) in the aspect of feeding followed by milk and milk products (69.80%), breeding aspects (68.27%), management aspect (65.03%) and general aspect (60.04%). Similar result have been reported by Shreyansh, (2018).

Decision making of farm women in dairy occupation

The farm women were classified based on score of decision making in dairy occupation is depicted Table 2.

Table 2: Distribution of farm women on the basis of score of decision making (n = 150)

Sr. No.	Decision making score	Frequency	Percent
1	38 to 40	04	02.67
2	41 to 45	23	15.33
3	46 to 50	30	20.00
4	51 to 55	36	24.00
5	56 to 60	37	24.67
6	61 to 65	18	12.00
7	66 and above	02	01.33

The data obtainable in Table 2 show that 24.67 % of farm women had highest decision making score (56 to 60) followed by 24.00 % farm women with 51 to 60 decision making score and 20.00 % farm women with with 46 to 50 decision making score.

Further, the farm women were also classified according to their overall decision making in dairy occupation with three groups. i.e. low, medium and high on the basis of mean and standard deviation. The data in this regard are presented in Table 3.

Table 3: Distribution of farm women on the basis of their decision making (n = 150)

Sr. No.	Decision making	Frequency	Per cent
1	Low level of decision making	29	19.33
2	Medium level of decision making	101	67.34
3	High level of decision making	20	13.33
S.D. = 6.87			$\overline{X}$ = 53.20

The data obtainable in Table 3 show that three-fifth (67.34%) of farm women had medium level of decision making in dairy occupation followed by 19.33 per cent and 13.33 per cent of them had lower and higher level of decision making in dairy occupation, respectively. These finding have been reported by Ahuja *et al.,* (2017), Manthekar and Nigade, (2018) and Patel, (2020).

Relationship between characteristics of farm women with the decision making in dairy occupation

Table 4: Relationship between personal, socio-economic, communicational, psychological and situational characteristics of farm women with their decision making (n = 150)

Sr. No.	Independent variables		Correlation coefficients (r values)
I	**Personal variables**		
	X_1	Age	0.080^{NS}
	X_2	Education	0.063^{NS}
	X_3	Experience in dairyoccupation	0.134^{NS}
II	**Social variables**		
	X_4	Size of family	0.033^{NS}
	X_5	Social participation	0.131^{NS}
III	**Economical variables**		
	X_6	Size of land holding	0.293**
	X_7	Herd size	0.166 *
IV	**Communicational variables**		
	X_8	Source of information	0.594**
V	**Psychological variables**		
	X_9	Knowledge	0.360**
	X_{10}	Participation	0.667**
VI	**Situational variables**		
	X_{11}	Cattle shed (Type of byre)	0.078^{NS}
	X_{12}	Milk yield	0.097^{NS}

* Significant at 0.05 level of probability;
** Significant at 0.01 level of probability and
NS: Non Significant.

In order to find out the relationship between personal, socio-economic, communicational, psychological and situational characteristics of farm women with the decision making in dairy occupation, coefficient of correlation was worked out. The data in this regard are presented in Table 4.

Out of twelve independent variable, only four variables namely, participation, source of information, knowledge and size of land holding were highly significant while, herd size was significantly correlated with the decision making of the farm women in dairy occupation. Remaining independent variable were found non significant.

CONCLUSION

From this investigation, it can be concluded that overall decision making of farm women in dairy occupation was found largest in the feeding aspects followed by milk and milk products, breeding aspect, management aspect and general aspect with medium level of decision making in dairy occupation. Participation, source of information, knowledge and size of land holding were highly significant while, herd size was significantly correlated with the decision making of the farm women in dairy occupation. So, the extension agencies, dairy cooperatives and training institutes should focus their attention more on farm women for enhancing their efficiency and skill in decision making related to dairy activities.

POLICY IMPLICATION

(1) Factor affecting decision making process of farm women may be reckoned, while designing any programmes communication relates to animal husbandry to boost decision making ability of farm women.

(2) The extension agencies, dairy cooperatives and training institutes should focus their attention more on farm women for enhancing their efficiency and skill in decision making related to dairy activities.

(3) Intensive training on this dairy aspect should be advocated at grass root level so that decision making of farm women could be enhanced.

(4) The cost of essential inputs should be subsidized for farm women to accelerate decision making process.

(5) The study showed that farm women mostly took decision about feeding, management, milk and milk products, while they were not independent in taking decision about the economic aspects of dairy. If they were involved in taking decision in economic aspects, certainly they would have worked whole heartedly for success and development of dairy occupation.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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SOIL SURVEY ON THE VERTICAL DISTRIBUTION OF DIFFERENT NEMATODE FEEDING TYPES IN SOILS FROM BRASSICA AND SOLANACEOUS FIELDS IN GWERU PERI –URBAN FARMS OF ZIMBABWE

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ABSTRACT

Nematodes are microscopic wormlike organisms and soil is an excellent habitat for them to survive . They have different feeding types that are determined by their mouth parts . Amongst the different feeding types there are , beneficial and plant parasitic nematodes. The research focused on on identifying the different nematode feeding types in the soil . The different feeding types were extracted from soil samples from different soils from different crops at different depths. The soil samples were collected from three t different farms producing solanaceous and brassica crops at three different depths . the experiment was conducted in Randomised Complete Block Design in 2 x 3 factorial replicated three times , with farms as blocking factors . The baerman funnel was used in the extraction of the nematodes , the infiltrate was analysed under a microscope, and nematode were identified using mouth parts . how ever only four feeding types were identified that is the omnivore, bacterivore, fungivore and herbivore. Bacterivores, fungivores and herbivores were abundant in top soil for there is abundant organic matter. Omnivores were abundant in bottom soils , for they are sensitive to soil distubances and nitrogen .There were more beneficial nematodes in the soil samples than plant parasitic, there for that deter mine soil health.

Keywords : *soil; nematode; brassica, solanaceous*

INTRODUCTION

Nematodes are microscopic, whitish to transparent, unsegmented worms, belonging to the phylum nematoda and occupy almost every possible habitat on earth and mostly in in soils (Barbercheck *et al.,* 2015). As soils are an excellent habitat for nematodes, plant parasitic nematodes attracts a special interest to many farmers ,due to their importance in agricultural production (Storey , 2014).Plant-parasitic nematodes are a serious pest which mainly feed on plant roots causing root malformation, leading to wilting hence loss. However nematodes are not only pests, but a diverse group of species that can play important roles in the soil system . It has been discovered that amongst the nematode species there are relatively a few plant parasitic nematodes and more are beneficial also known as the free living nematodes .They play an important role in the soil food web in nutrient mineralization ,decomposition also regulating the behavior of the microbial community ,also used as soil health bio-indicators for they are abundant in different soil (Storey, 2015)

The free living nematodes are divided into five broad trophic groups for easier identification using their mouth parts(Linsell *et al ,* 2014),which are the herbivores or plant parasitic, omnivores, bacterivores fungivores and predators .Herbivores or plant parasitic nematodes feed on plant roots (McSorley, 2011). Omnivores feed on more than one type of material , even on other nematodes and will help and limit plant-parasitic nematode densities. Omnivores do better in a stable soil environment (Grabau and Melakeberhan, 2016). Fungivores are nematodes which feed on fungi using a stylet to puncture the fungal hyphae and they are also involved in breakdown of recalcitrant materials such as fibrous plant material (McSorley, 2011) . Bacterivores feeds on bacteria only and beneficial for decomposition of organic matter .

The different nematode feeding types in the soil vary between systems and seasons also affected by a variety of factors , including crop and soil management practices . Management practices like tillage, crop rotation, and use of organic matter influence the abundance of nematodes. How ever they are affected by agricultural systems with more physical and chemical disturbances for example fungivores and omnivores are sensitive to soil disturbances (Ugarte, 2014).

However since plant parasitic nematodes(herbivores) co-exist with other free living nematodes, the researcher seeks to identify and compare the vertical distribution and quantity of other nematode feeding types that might exist in brassica and solanaceous crops. This will help farmers to

monitor soil health also developing a better and effective intergrated pest management control.

OBJECTIVES

(1) To determine the total population of different nematode feeding types(herbivores, omnivores, bacterivores fungivores and predators) at different soil depths in brassicas and solanaceous crops

(2) To determine different nematode feeding types(herbivores, omnivores, bacterivores fungivores and predators) of nematodes at different soil levels brassica and solanaceous crops

METHODOLOGY

Soil sampling procedures

Soil samples were collected from three different farms in Gweru peri urban areas ,producing brassicas and solanaceous crops .A composite sample for each crop per depth was obtained using azig zag soil sampling pattern with the aid of soil sampling auger.Composite samples were labeled according to the depthss(0-15cm,16-30cm and 31-45 cm), crops (brassica or solanaceous) also farms (farm 1,2 and 3)where they were collected from and placed in cool places for nematodes are affected by high temperatures.

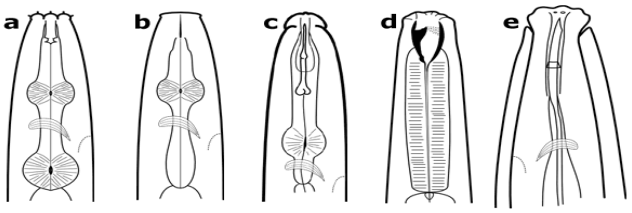
Nematode extraction

Nematode extraction process was carried out Midlands State University under laboratory conditions, using the *Baerman funnel* technique. Composite samples were thoroughly mixed before taking 50gram subsample for nematode extraction. The 50gram sub samples were evenly spread on mutton cloths laid on the funnels of the *Baerman funnel* set ups, half filled with water. The soil samples in the funnels were wrapped with perforated foil papers to reduce evaporation also ventilation of the nematodes. The funnels were left undisturbed under laboratory conditions for 72 hours,however water was added when necessary.

Fig. 1: Baerman funnel technique

NEMATODE IDENTIFICATION

After 72 hours of the extraction process , glass slides with 1 millitre of the nematode suspension solution observed under a microscope at high power. The nematodes were identified according feeding types , using mouth parts illustrated by (Wang et al ,2010) ,(Ugarte and Zaboski , 2014) , (Yeates,1993) and(McSorley,2009). Different nematode feeding types were recorded and shown in fig. 2.



*(*a) bacterial feeder, (b) fungal feeder, (c) plant feeder, (d) predator, (e) omnivore

Fig. 2 : Different feeding types of Nematode (Source: Zaborski, 2014)

Data collection

Data collection was done after 72 hours of nematode extraction

Population density

Mean nematode population density per depth per crop was determined for each treatment

Different feeding types

Number of different nematode feeding types per day per crop was determined for each treatment.

RESULTS AND DISCUSSION

Nematode total population density at different soil depths in brassicas and solanaceous crops

There was interaction , but there was no significant difference (P>0.005) in the nematode total population density at different soil depths in both brassica and solanaceous crops. however there was statistical difference between brassicas and solanaceous at different soil depths. Brassica in relation to depth had an average of 11.67 (0-15cm), 8.00 (16-30cm) and 8.67 (31-45cm). Solanaceous in relation to depth had an average of 12.67(0-15cm) , 9.00 (16-30cm) and 9.33 (31-45 cm).

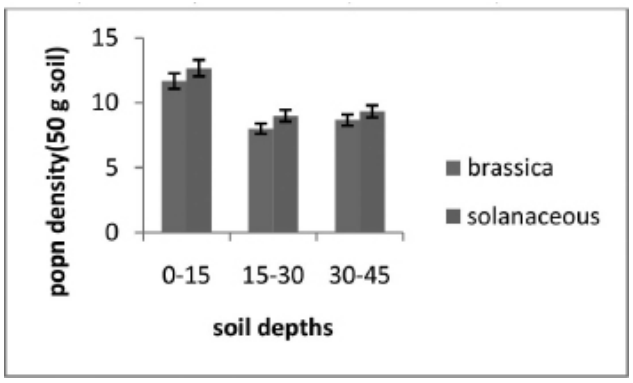


Fig. 3 : Mean nematode total population density

Different feeding types(bacterivore, herbivore, fungivore and omnivore) of nematodes at different soil depths brassica and solanaceous crops

(A) Bacterivore

There was interaction , but there was significant difference (P>0.05) in bacterivore population in in both crops brassica and solanaceous crops and also at different depths.Eventhough there was a statistical difference between bacterivore populations in brassicas 1.642(0-15cm) 1.462(16-30cm) and 2.029 (31-45) cm and in solanaceous crops 1.559 (0-15cm)1.524(16-30cm) and 1.524(31-45cm).

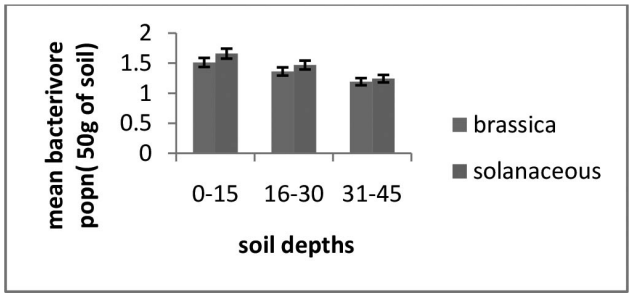


Fig. 4 : Mean bacterivore at different soil depths in brassica and solanaceous

(B) Fungivore

There was an interaction and a significant difference (P< 0.05) in fungivore population in both crops brassica and solanaceous crops and also in different depths. However there was also a statistical difference between fungivore populations in brassicas brassica 0.682(0-15cm) ,0.512(16-30cm) and 0.324(31-45cm) and in solanaceous 0.789(0-15cm), 0.699(16-30cm)and 0.487(31-45 cm)

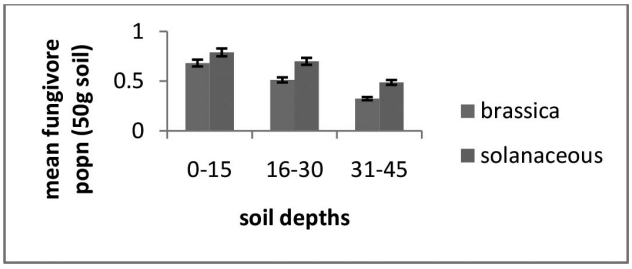


Fig. 5 : Mean fungivore at different soil depths in brassica and solanaceous

(C) Omnivore

There was interaction but there was no significant difference (P>0.05) in omnivore population in depths ,but there was a significant difference (P<0.05) in omnivore population in both crops brassica and solanaceous crops. Eventhough there was a statistical difference between omnivore populations in brassicas in relation to depths there was 0.880(0-15cm), 1.052(16-30cm) and 1.524(31-45cm). In solanaceous there was also a statistical difference in relation to depth 0.707(0-15cm) 0.998(16-30cm) and 1.440(31-45cm).

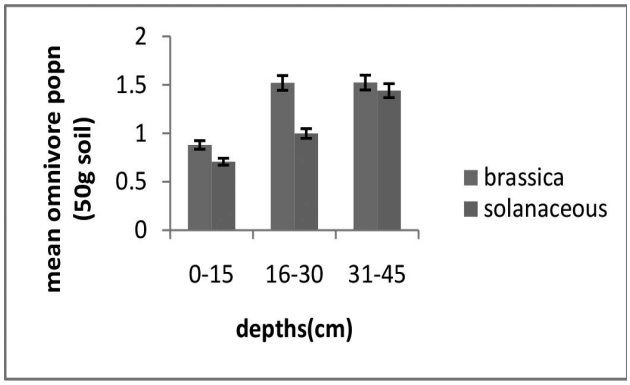


Fig. 6 : Mean omnivore population at different depths , in brassica and solanaceous

(D) Herbivore

There was interaction and a significant difference (P< 0.05) in herbivore population in in both crops brassica and solanaceous crops and also in different depths. There was also a statistical difference between herbivore populations in brassicas 1.871 (0-15cm),1.344 (16-30cm)and 0.880(31-45cm) and solanaceous 2.476 (0-15cm), 1.836 (16-30cm) and 1.871 (31-45 cm.)

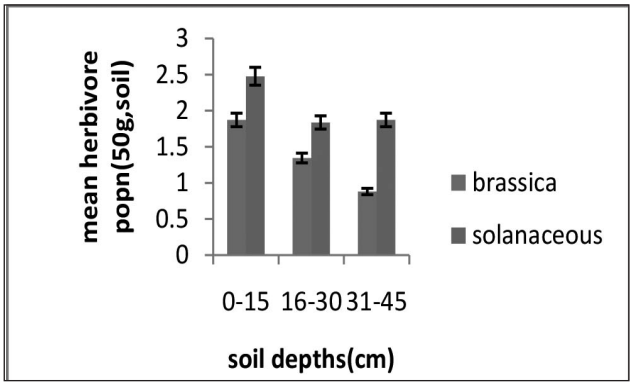


Fig.7 : Mean herbivore population density of different depths in brassica and solanaceous

CONCLUSION

On total nematode population , the top soil layer , which is ranging from 0-15cm was possessing a higher nematode population density as compared to the lower depths . There was a lower nematode population density , in brassica than in solanaceous crops .Omnivore nematode populations were increasing with depth unlike the other nematode populations which were decreasing with depth. Herbivores have got a higher nematode population density , amongst the existing nematode feeding types in the soil. Fungivores have got the least population density amongst the existing nematode feeding types in the soil.However the total population of beneficial nematodes was greater than the plant parasitic nematodes , there more beneficial nematodes than plant parasitic nematodes deter mine soil heathy.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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ASSOCIATION BETWEEN CHARACTERISTICS OF GROUNDNUT GROWERS AND THEIR LEVEL OF KNOWLEDGE ABOUT PLANT PROTECTION MEASURES

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ABSTRACT

Groundnut is an important oilseed crop in India which occupies first position in terms of area and second position in terms of production. The study was undertaken in Banaskantha district of Gujarat state during 2019-20. Three talukas viz., Deesa, Lakhani and Dantiwada were selected purposively having higher areas under groundnut cultivation in the district, (Anonymous 2019). Five villages from each selected taluka were selected randomly. Further from each selected village, ten groundnut growers were randomly selected comprising of 150 respondents. Ex-post facto research design was adopted for this study. The data were collected by personal contact method with help of structured interview schedule and data were coded, classified, tabulated and analysed in the light of objectives. Eight independent and one dependent variables were selected for study. The independent variables viz., education, land holding, annual income, extension participation, source of information and scientific orientation were positively and highly significantly associated with knowledge about plant protection measures. While, age and social participation had non-significant correlation with knowledge about plant protection measures

Key words: *knowledge, association, plant protection, groundnut*

INTRODUCTION

Groundnut is an important oilseed crop in India which occupies first position in terms of area and second position in terms of production. In Gujarat, during the year 2017-18, groundnut crop produces around 3.97 million tonnes from 1.62 million hectare of land with a productivity of 2440 kg/ha. Plant protection plays an important role in crop production. Farmers are not adopting the recommendations properly and hence, the importance of systematic use of plant protection measures to control pests and diseases cannot be neglected. Looking to the importance and urgency of the problem, a study was planned with the following objectives.

OBJECTIVES

(1) To study the personal, socio-economic, communication and psychological characteristics of the groundnut growers

(2) To ascertain the association between personal, socio-economic, communication and psychological characteristics of the groundnut growers with their level of knowledge regarding plant protection measures

METHODOLOGY

The present study was undertaken in Banaskantha district as having large areas and production under groundnut in North Gujarat. Three talukas *viz.,* Deesa, Lakhani and Dantiwada were selected purposively having higher areas under groundnut cultivation in the district. Five villages from each selected talukas were selected randomly. Further from each selected village, ten groundnut growers were randomly selected comprising of 150 respondents.

Ex-post facto research design was adopted for this study. For measurement of selected characteristics, scales developed by past researchers with due modification as well as by developing appropriate schedules were used. The data were collected by personal contact method with the help of structured interview schedule. The collected data were coded, classified, tabulated and analysed in order to make the findings meaningful in light of objectives for drawing meaningful interpretation.

RESULTS AND DISCUSSION

Personal, socio-economic, communication and psychological characteristics of groundnut growers

Keeping in view the objectives of the study, the relevant variables were selected on the basis of an extensive review of literature related to the study, in consultation with experts and members of advisory committee. Only those variables which were found most relevant to the present investigation were finally selected. The result of selected variables were presented in Table 1.

Table 1: Distribution of the groundnut growers according to their age (n=150)

Sr. No.	Selected characteristics of groundnut growers	Frequency	Per cent
	Age group		
1	Young age (up to 35 years)	38	25.34
2	Middle age (36 to 50 years)	73	48.66
3	Old age (above 50 years)	39	26.00
	Education level		
1	Illiterate	08	5.33
2	Functionally literate	19	12.67
3	Primary school	30	20.00
4	Middle school	59	39.33
5	High school	22	14.67
6	College/Post graduation	12	8.00
	Size of land holding		
1	Marginal (up to 1.00 ha)	17	11.33
2	Small (1.01 to 2.00 ha)	40	26.67
3	Medium (2.01 to 4.00 ha)	75	50.00
4	Large (above 4.00 ha)	18	12.00
	Annual income		
1	Low (up to ₹2,50,000)	28	18.66
2	Moderate (₹2,50,001 to ₹5,00,000)	45	30.00
3	High (₹5,00,001 to ₹10,00,000)	61	40.67
4	Very high (Above ₹10,00,000)	16	10.67
	Social participation		
1	No membership	53	35.33
2	Membership in one organization	77	51.33
3	Membership in more than one organization	13	8.67
4	Membership with office bearer	07	4.67
	Extension participation		
1	Low level participation (<30.23)	22	14.67
2	Medium level participation (≥30.23 <72.83)	99	66.00
3	High level participation (≥72.83)	29	19.33
	Mean = 51.53 S. D. = 21.30		
	Utilization level of information sources		
1	Low (<28.56)	28	18.67
2	Medium (≥28.56 <54.70)	85	56.66
3	High (≥54.70)	37	24.67
	Mean = 41.63 S. D. = 13.07		
	Scientific orientation		
1	Low (<12.13)	27	18.00
2	Medium (≥12.13 <23.20)	93	62.00
3	High (≥23.20)	30	20.00
	Total	**150**	**100.00**
	Mean = 17.67 S. D. = 5.53		

The data presented it Table 1 indicates that nearly half (48.66 per cent) of the groundnut farmers were from middle age group, having primary to middle school level of education (59.33 per cent), had 2.01 to 4.00 ha of land (50.00 per cent), having annual income up to ₹2,50,000.00 to ₹10,00,000.00 (70.67 per cent), had membership in one organization (51.33 per cent), had medium level of extension participation (66.00 per cent), had medium to high utilization level of information sources (81.33 per cent) and have medium scientific orientation (62.00 per cent).

Association between personal, socio-economic, communication and psychological characteristics of the groundnut growers with their level of knowledge regarding plant protection measures

Acceptance of recommended plant protection measures is not a unique act, but complex process involving sequence and thought of action. The action of an individual farmer is governed by personal, socio-economic, psychological and cultural factors involved in given situation. Some farmers adopt recommended plant protection measures more quickly than others because of the differences in personal characteristics. In order to ascertain the association between level of knowledge (dependent variable) of the groundnut farmers and their selected characteristics (independent variables), the correlation co-efficient ('r' values) were calculated. Empirical hypothesis was stated for testing the association and its significance was tested using zero order correlation. The results are given in Table 2.

Table 2 : Association between selected characteristics of groundnut growers with their level of knowledge of recommended plant protection measures

Sr. No.	Independent variables		Correlation coefficient ('r' value)
I	**Personal characteristics**		
	X_1	Age	-0.102^{NS}
	X_2	Education	0.299**
II	**Socio-economic characteristics**		
	X_3	Land holding	0.571**
	X_4	Annual income	0.507**
	X_5	Social participation	0.105^{NS}
III	**Communication characteristics**		
	X_6	Extension participation	0.449**
	X_7	Sources of information	0.387**
IV	**Psychological characteristics**		
	X_8	Scientific orientation	0.551**

* Significant at 0.05 level of significance **Significant at 0.01 level of significance
NS Not-Significant.

(1) Age and level of knowledge

It is apparent from data presented in Table 2 that the age of the groundnut farmers had negative and not-significant association ('r' = -0.102) with their level of knowledge about recommended plant protection measures. Thus, the null hypothesis was accepted. Hence, it is calculated that there is no association between the age of groundnut farmers and their level of knowledge. It is inferred, that all groundnut farmers did not have any concern with age and recommended plant protection measures. It means that knowledge level of all groundnut farmers did not relate with their age. The similar findings have been reported by Bansod (2016) and Patel (2019) Raval *et al*. (2021).

(2) Education and level of knowledge

The data presented in Table 2 reflect that the level of knowledge of the groundnut farmers regarding recommended plant protection measures had positive and highly significant ('r' = 0.299) association with their level of education at 0.01 level of significance. It indicates that the education plays an important role in influencing the level of knowledge about recommended plant protection measures among the groundnut farmers. Thus, the null hypothesis was rejected. The similar findings have been reported by Mane (2012) and Patel (2019).

(3) Land holding and level of knowledge

The data presented in Table 2 clearly indicate that land holding of the groundnut farmers had positive and highly significant association ('r' = 0.571) with their level of knowledge about recommended plant protection measures of groundnut at 0.01 level of significance. Thus, the null hypothesis was rejected. Thus, it is informed that the land holding had influence on level of knowledge about recommended plant protection measures in groundnut. Majority of the groundnut farmers were medium to large size farmers might be the proper reason for highly significant association with level of knowledge. The similar findings have been reported by Bansod, (2016) and Patel, (2019).

(4) Annual income and level of knowledge

It is apparent from the data presented in the Table 2 that annual income of the groundnut farmers had positive and highly significant association ('r' = 0.507) with their level of knowledge about recommended plant protection

measures of groundnut at 0.01 level of significance. Thus, the null hypothesis was rejected. The probable reason might be that sufficient income attract for purchasing mass media like T.V., Mobile, Newspapers etc., which might be useful to the farmers as sources of agricultural information. This leads them to new knowledge of technology and recommended plant protection measures. The similar findings have been reported by Mane, (2012) and Patel, (2019).

(5) Social participation and level of knowledge

The data presented in Table 2 indicate that social participation of the groundnut farmers had no association ('r' = 0.105) with their level of knowledge about recommended plant protection measures of groundnut. Thus, the null hypothesis was accepted. Therefore, it is inferred that social participation had no effect on their knowledge level. This might be because of majority farmers were members of only one organization i.e., milk cooperative society only. The similar finding has been reported by Thiyagrajan (2011) and Patel (2019).

(6) Extension participation and level of knowledge

It is apparent from the data presented in the Table 2 that extension participation of the groundnut farmers had positive and highly significant association ('r' = 0.449) with their level of knowledge about recommended plant protection measures of groundnut at 0.01 level of significance. Thus, the null hypothesis was rejected. Participation in various extension activities might have improved practical knowledge of the farmers. Hence, it had significant association with knowledge level. The similar findings have been reported by Patel (2019).

(7) Sources of information and level of knowledge

Data presented in Table 2 clearly indicate that sources of information of groundnut farmers had positive and highly significant association ('r' = 0.387) at 0.01 level with their level of knowledge about recommended plant protection measures of groundnut. Thus, the null hypothesis was rejected.The finding clearly indicates that exposure to various information source and contact with different personnel benefitted to the farmers in increasing the knowledge level of the groundnut farmers. The similar findings have been reported by Mane (2012) and Patel (2019).

(8) Scientific orientation and level of knowledge

Data presented in Table 2 clearly indicate that scientific orientation of groundnut farmers had positive and highly significant association ('r' = 0.551) at 0.01 level with their level of knowledge about recommended plant protection measures of groundnut. Thus, the null hypothesis was rejected. The finding clearly indicates that scientific orientation opens the mental horizon which increases the level of knowledge of groundnut farmers, which might have resulted in to its significant influence in level of knowledge about recommended plant protection measures of groundnut. The similar finding has been reported by Patel (2019).

CONCLUSION

The finding related to personal, socio-economic, communication and psychological characteristics of the groundnut growers indicate that nearly half of the groundnut farmers were from middle age group, having primary to middle school level of education, had 2.01 to 4.00 ha of land, having annual income up to ₹2,50,000.00 to ₹10,00,000.00, had membership in one organization, had medium level of extension participation, had medium to high utilization level of information sources and have medium scientific orientation.

While in case of association, independent variables viz., education, land holding, annual income, extension participation, sources of information and scientific orientation had positive and highly significantly association with level of knowledge about plant protection measures. Attitude had positive and significant association while age had negative and not-significant on other hand social participation had not-significant relationship with level of knowledge and with extent of adoption about plant protection measures.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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A STUDY ON ATTITUDE ASSESSMENT OF WOMEN TOWARDS KITCHEN GARDENING

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ABSTRACT

Food security is one of the leading issues of many nations globally. The magnitude of malnutrition necessitates the need for nutrition education. Kitchen gardening can play a significant role in improving food security for rural households as well as middle-class urban households in developing countries like India. The study was conducted in the Anand district of middle Gujarat. A total of 100 respondents were selected for the study. The ex-post facto research design was adopted. For measuring the attitude of women towards kitchen gardening, the scale developed by the department of agricultural extension and communication were used. Data were collected through personal interviews using the pre-tested structured interview schedule. The results of the study stated that about half (51.00 per cent) of the respondents had positive to highly positive overall attitude towards kitchen gardening,

Keywords: *attitude, kitchen gardening, women*

INTRODUCTION

A kitchen garden has numerous definitions. It is a more common French term; these gardens are meant to supply the household with some vegetables, fruits or herbs. When hearing the term "kitchen garden" it is easy to visualize a shelf full of little flowerpots containing a few herbs. This can include vegetables, fruits, berries, herbs and flowers. Kitchen gardens can be grown in the empty space available at the backyard of the house or a group of women can come together, identify a commonplace or land and grow desired vegetables, fruits, cereals etc., that can benefit the women and community as a whole (Bhimani *et al.,* 2020 & Soni *et al.,* 2020). Households and small communities take advantage of vacant land and contribute not only to their household food needs but also the needs of their resident city. This activity can also save our money and time and environment-friendly hobby for the whole family (Cheema, 2011). In low-income housing areas, kitchen gardens have proved a symbol of place, identity and sense of belonging for local low-cost flat residents (Ghazali, 2013).

Many social benefits have emerged from kitchen gardening practices, better health and nutrition, increased income, employment, food security within the household, and enhancement in community social life (Saran et al., 2020). Apart from having a good amount of production of vegetables at the national level, the per capita availability in the diet is quite low in our country. The daily requirement of vegetables is around 300 gms as per ICMR but the availability is very low. Food consumption mainly depends on production and distribution, determines the health and nutrition of the population (Gita, 2020). Many of the rural families used to grow vegetables in their backyards for their household consumption. But still, they lack in adequate consumption of vitamins and minerals because of the unorganized cultivation of vegetables. Keeping in view the importance of vegetables in daily diets and its low availability, the study has been conducted on the following objective:

OBJECTIVE

To measure the attitude of the women towards Kitchen gardening

METHODOLOGY

The study was conducted in Anand district of middle Gujarat. The Anand district comprises eight talukas out of which two talukas viz. Borsad and Anand were selected on the basis of higher area under vegetables. Subsequently, five villages from each selected taluka were randomly selected i.e. Anand, Navli, Vasad, Lambvel and Gamidi from Anand taluka and Ransol, Samarakha, Tarnol, Bedva and Ajarpura from Borsad Taluka. Using random sampling technique, equal numbers of respondents i.e., ten from each village were selected. A total of 100 respondents were selected for the study. The ex-post facto research design was adopted. For measuring the attitude towards kitchen gardening, the scale developed by Saini & Chauhan, (2017) were used. Data were collected through personal interviews using the pre-tested

structured interview schedule to bring out both qualitative and quantitative data.

RESULTS AND DISCUSSION

Attitude of women towards kitchen gardening:

Table 1: Distribution of respondents according to their overall attitude towards kitchen gardening

(n=100)

Sr. No.	Category	Frequency	Per cent
1	Highly Negative (up to 19 score)	11	11.00
2	Negative (20 to 28 score)	17	17.00
3	Neutral (29 to 37 score)	21	21.00
4	Positive (38 to 46 score)	35	35.00
5	Highly Positive (More than 46 score)	16	16.00

The result seen in Table 1 indicates that about half (51.00 per cent) of the respondents had positive to highly positive overall attitude towards kitchen gardening, while 21.00 per cent per cent of them were with a neutral attitude, 17.00 per cent with negative and 11.00 per cent per cent of them with highly negative overall attitude towards kitchen gardening. The result discloses that majority of the respondents had positive to highly positive feelings towards kitchen gardening as an important area of nutritious feed for the family. The results are in line with the study results of Akter *et al*., (2014) and Pooja and Geeta, (2021).

The result shown in Table 2 indicates that kitchen gardening positively or highly positively felt or considered as 'a kitchen gardening helps in saving money (93.00 per cent)', Its promotes greenery near residential areas (80.00 per cent), Kitchen gardening provides the opportunity to get fresh vegetables in all the seasons (77.00 per cent), Kitchen garden helps in promoting family fitness (59.00 per cent), Kitchen garden provides an opportunity to make a positive environmental impact (52.00 per cent), constructive approach to convert leisure time into productive one (48.00 per cent) and ideal medium to give the experience of nature to children (44.00 per cent). However, 48.00 per cent respondents think that kitchen gardening is hypocrisy than reality, Kitchen gardening promotes inter-personal conflict among family members (46.00 per cent), limited scopes of kitchen gardening (32.00 per cent), kitchen gardening is a tedious job (25.00 per cent). The findings are similar to the findings of Pooja and Geeta (2021).

Table 2: Statement wise attitude of women towards kitchen gardening (n=100)

Sr. No.	Statements	SA	A	UD	DA	SDA
1	Kitchen garden provides an opportunity to make a positive environmental impact. (+)	32 (32.00%)	20 (20.00%)	17 (17.00%)	16 (16.00%)	15 (15.00%)
2	I visualize limited scopes of kitchen gardening. (-)	16 (16.00%)	16 (16.00%)	36 (36.00%)	24 (24.00%)	8 (8.00%)
3	Kitchen gardening provides opportunity to get fresh vegetables in all the seasons. (+)	36 (36.00%)	41 (41.00%)	10 (10.00%)	8 (8.00%)	5 (5.00%)
4	I think kitchen gardening is tedious job. (-)	07 (7.00%)	18 (18.00%)	25 (25.00%)	37 (37.00%)	13 (13.00%)
5	I think kitchen gardening helps in saving money. (+)	36 (36.00%)	57 (57.00%)	05 (5.00%)	02 (2.00%)	00 (0.00%)
6	Kitchen gardening is hypocrisy than reality. (-)	28 (28.00%)	20 (20.00%)	12 (12.00%)	24 (24.00%)	16 (16.00%)
7	Kitchen gardening is an ideal medium to give experience of nature to children. (+)	16 (16.00%)	28 (28.00%)	16 (16.00%)	16 (16.00%)	24 (24.00%)
8	Kitchen gardening promotes inter-personal conflict among family members. (-)	13 (13.00%)	33 (33.00%)	17 (17.00%)	09 (9.00%)	28 (28.00%)
	Kitchen garden helps in promoting family fitness. (+)	27 (27.00%)	32 (32.00%)	37 (37.00%)	03 (3.00%)	01 (1.00%)
	Kitchen garden promotes greenery near residential areas. (+)	15 (15.00%)	65 (65.00%)	13 (13.00%)	03 (3.00%)	04 (4.00%)
	Kitchen gardening is constructive approach to convert leisure time in to productive one. (+)	28 (28.00%)	20 (20.00%)	08 (8.00%)	24 (24.00%)	20 (20.00%)

CONCLUSION

Nutrition is considered critical for women. Nutrition is input into development especially economic development and its neglect would adversely impact health, cognitive development. From the above findings, it can be concluded that most of the women had a favourable attitude towards kitchen gardening. It also indicates that efforts are needed to maintain the attitude status of women towards kitchen gardening. Hence, kitchen gardening along with nutrition intervention will improve the nutritional security in rural livelihoods, but the approach is normally slow and results are achieved over a long period of time.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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RELATIONSHIP BETWEEN ATTITUDE OF STUDENTS TOWARDS EXPERIENTIAL LEARNING PROGRAMME AND THEIR SELECTED INDEPENDENT VARIABLES

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ABSTRACT

India is under development country. About 65 per cent of population are living in rural area and they are related to agriculture as a main occupation. For improvement in living standard of rural people, Indian Council of Agriculture Research (ICAR) introduced Experiential Learning Programme in 2006 for students of Agricultural Universities. The study was conducted in three agriculture colleges of Junagadh Agricultural University. ELP conducted in three cluster under six different departments. Total 120 students were randomly selected from three colleges. The data were collected through structural interview schedule. The result of the research study found that innovativeness, leadership ability, agribusiness anxiety, achievement motivation, self-confidence, management orientation and aspiration had significant relationship with attitude of students towards ELP. Whereas, academic performance, family land holding, parental occupation, parental income, participation in extra-curricular activity and decision making ability had non-significant relationship with attitude towards ELP.

Keywords : *attitude, experiential learning programme,ug students*

INTRODUCTION

For improvement in agriculture education for employability, Indian Council of Agricultural Research developed and launched Experiential Learning Programme (ELP) launched during 10th Five Year Plan in the year 2006. Experiential learning is a business related endeavor which is interactive. In ELP, provide hands on training, scheme for creating facilities for establishment of experiential learning farms, model plant, veterinary, engineering workshops and plant clinics. The main aims of ELP are promoting entrepreneurship, knowledge, skill related to marketing, planning and production through meaningful hands on experience and working in project mode, from assembling input to sale of final produced.

The fourth Deans' committee headed by Dr. S. L. Mehta, that introduced ELP programme in all the state agricultural universities in India. The JAU has also implemented ELP with a load of 20 credits in the VIII semester of B. Sc. (Agri.) with its emphasis on moulding graduates from "job seekers to job providers" in all the constituent colleges (Anon., 2006).

This programme provided to undergraduate students of Agricultural Universities in final year. Through this programme, it was envisaged that basic knowledge and conceptual aspect will be integrated with hands on training and practices in real life work environment, development of confidence, competitive and competent graduates to meet the needs of self-employment and private sectors. In this, students engaged in critical thinking, problem solving and decision making in context that are relevant to individual and society (Katyal and Bisht, 2005). Vegad and Chauhan (2019) studied on attitude of postgraduate scholars towards e-extension employability and they said that it helps in showing the intensity of the postgraduate scholars to utilise the electronic gadgets and media for generating sustainable employment and working for the benefit of farming community in transfer of technology. Boppana *et al*. (2019) reflected in their study that post graduate students have favorable attitude towards research. Achievement motivation and innovativeness of post graduate students had a positive and significant correlation with their attitude towards research.

Darji and Patel (2017) study on comparison of attitudinal behaviour of post graduate boys and girls students towards the use of computer for their empowerment and finding showed that girls students has more positive attitude towards the use of computer for their empowerment than the boys' students as the boys has reluctance in learn about the computer for their empowerment and girls were active in learning, which developed positivism towards the use of

computer. The reason for this result might be the difference in psychology of the girls and boys. Girls are generally more conscious in nature about any type of work and do the work with precision, whereas boys are somewhat less conscious about their work.

OBJECTIVES

To know the attitude level of students towards ELP

To study the relationship between attitude of students towards experiential learning programme (ELP) and their selected independent variables

METHODOLOGY

Three agriculture colleges of Junagadh Agricultural University *viz*; College of Agriculture, Junagadh; College of Agriculture, Amreli and College of Agriculture, Porbandar were selected purposively for this study. The ELP was taken under the College of Agriculture, Junagadh. Last semester of B. Sc. (Hons.) agriculture students of year 2019-20 were purposively selected for study. ELP programme of the college are conducted in three clusters under six different departments. Each cluster covers two subjects. The students were selected randomly from each cluster. Out of total, 60 per cent of under graduate students were selected from each college. They were divided into 3 groups. Hence, 120 students were selected for study. The data were collected by structural interview schedule. For measuring attitude, teacher made scale was used. Total 42 statements with five-point continuum were used. The statistical tools such as frequency, percentage and spearman's rank coefficient of correlation were used for analysis of data. The scale was devloped using the methodology followed by Vinaya *et al.,* (2016 & 2018) and Yeragorla *et al.,* (2021)

RESULTS AND DISCUSSION

(A) Attitude level of students towards ELP

It refers to the degree of positive or negative feelings associated with any object or thing, it plays an important role in determining his behaviour. In order to measuring attitude of under graduate students towards experiential learning programme (ELP), teacher made attitude scale was used. Attitude of ELP students for investigation is given in Table 1.

Table 1 : Distribution of students according to their attitude towards ELP (n = 120)

Sr. No.	Category	Frequency	Percentage
1	Unfavourable attitude (Up to 75 score)	00	00.00
2	Less favourable attitude (76 to 109 score)	02	01.66
3	Favourable attitude (110 to 143 score)	19	15.84
4	High favourable attitude (144 to 177 score)	76	63.34
5	Very high favourable attitude (above 177 score)	23	19.16

The above Table 1 indicated that majority (63.34 per cent) of under graduate students had high favourable attitude towards ELP, followed by 19.16 percent had very high favourable attitude and 15.84 per cent of under graduate students had favourable attitude towards ELP. Whereas, only 01.66 per cent of students had less favourable attitude and none of them was found in unfavourable attitude towards ELP.

It can be concluded that nearly two third of the under graduate students had high favourable attitude towards ELP.

(B) Relationship between attitude of students towards ELP and their selected characteristics

The relationship between attitude of under graduate students towards ELP and their selected independent variables are presented in Table 2.

From the above Table 2 reflected that the variables *viz.*, innovativeness, leadership ability, achievement motivation and agribusiness anxiety had positive and highly significant relationship with attitude of students towards ELP. While, self confidence, management orientation and aspiration had positive and significant relationship with attitude towards ELP. It indicated that higher level of attitude of students towards ELP. This may be due to the fact that high innovativeness, leadership ability, achievement motivation and agribusiness anxiety drives the students towards the objectives and help the students to develop favourable attitude towards ELP as well as research.

Whereas, academic performance, family land holding, parental occupation, parental income, participation in extra-curricular activity and decision-making ability had positive and non-significant relationship with attitude towards ELP. Only place of residence of students had negative and non-significant relationship with attitude towards ELP.

Table 2: Relationship between attitude of students towards ELP and their selected independent variables (n = 120)

Sr. No.	Independent variable	'r' value
X_1	Place of residence	-0.022^{NS}
X_2	Academic performance	0.083 ^{NS}
X_3	Family land holding	0.068 ^{NS}
X_4	Parental occupation	0.051 ^{NS}
X_5	Parental income	0.102 ^{NS}
X_6	Participation in extra- curricular activity	0.058 ^{NS}
X_7	Innovativeness	0.403**
X_8	Management orientation	0.222*
X_9	Leadership ability	0.392**
X_{10}	Decision making ability	0.0606^{NS}
X_{11}	Self confidence	0.249*
X_{12}	Agribusiness anxiety	0.559**
X_{13}	Achievement motivation	0.346**
X_{14}	Aspiration	0.208*

* = Significant at 0.05 level** = Significant at 0.01 level
NS = Non significant

This finding was in conformity with the findings of Deshmukh and Kadam (2014), Saranya (2015), Kavitha (2018) and Priyanka (2019). The further this finding can be supported by the findings of Patel, *et al*. (2017) and Darji, *et al*. (2017) who reported that there was non-significant relationship between the AAU teachers' level of confidence and their attitude.

CONCLUSION

From the above finding, it can be concluded that majority (63.34 per cent) of UG students had high favourable attitude towards ELP, followed by 19.16 percent had very high favourable attitude and 15.84 per cent of student had favourable attitude towards ELP. While, attitude of students towards ELP were observed significantly with innovativeness, leadership ability, agribusiness anxiety, achievement motivation, self-confidence, management orientation and aspiration were significant related to attitude towards ELP. Whereas, non-significant with place of residence, academic performance, family land holding, parental occupation, parental income, participation in extra-curricular activity and decision-making ability.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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JOB STRESS AMONG EMPLOYEES OF ANAND AGRICULTURAL UNIVERSITY

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ABSTRACT

The present study was conducted with 105 teaching cadre employees (research and extension staff) of Anand Agricultural University, Anand to study the job stress among them. In regards with different components of job stress, the results revealed that majority of the employees of AAU had very low to low level of role isolation, role erosion, role expectation conflict and inter role distance. Majority of the employees had medium to high role overload while majority had low to very low role ambiguity and resource and personal inadequacy. However, majority of the employees had medium to low level job stress ascribed to organizational leadership, while very low to low level of job stress on account of technological change. Thus, majority of the employees of AAU had low to medium overall job stress. Correlation studies indicated that eight variables viz. age, annual income, job experience, training received, personality, self-confidence, departmental climate and interpersonal communication had negative and highly significant relationship with the job stress.

Keywords : *job stress, occupational stress, profile of employees*

INTRODUCTION

The Anand Agricultural University with its mandates of agricultural education, research and extension holds much significance for agricultural development of the state. For effective output from the employees of Anand Agricultural University, it is quite essential that the circumstances causing job stress which can hinder the employee performance should be minimized, if not eliminated. But many-a-time, performance of employees is affected by stress which they feel in their job. Thus, study of this job stress of employees is of vital importance for the organization. Keeping all of these things in view, the study on**"Job Stress among employees of Anand Agricultural University**" was carried out with the following specific objective:

OBJECTIVES

(1) To study the job stress among employees of Anand Agricultural University

(2) To study relationship between profile of employees of Anand Agricultural University and their job stress

METHODOLOGY

The study was conducted on teaching employees (including research and extension staff) of the cadre of Assistant Professor and its equivalents, Associate Professor and its equivalents and Professor and its equivalents. Total 150 employees were selected randomly for the study. A well thought out questionnaire was prepared and it was mailed/ personally given/sent to all of them. However, up to the end of April, 2022, the responses received were 105 in number. Thus, the results are based on 105 respondents.

Respondents' overall job stress index was determined by using the following formula:

Where,

JSI	:	Overall Job Stress Index of respondent
$\mathbf{R_1, R_2,\ldots..,R_n}$	:	Job stress score obtained by the respondent for the particular job stress indicator (received score for each indicator by each respondent)
$\mathbf{M_1, M_2,\ldots.,M_n}$	:	Potential score of the respondent for particular job stress indicator
$\mathbf{W_1, W_2,\ldots,W_n}$	:	Relative weight value of the particular job stress indicator

The coefficient of correlation was computed to find out the relationship between the variables. The correlation coefficient gives two kinds of information (i) degree of relationship and (ii) direction of the relationship (whether positive or negative) between any two variables. For computing the correlation coefficient 'r', the Karl Pearson's method was used as under.

$$r = \frac{\Sigma(XY) - \frac{\Sigma X \Sigma Y}{n}}{\sqrt{\left[\Sigma X^2 - \frac{(\Sigma X)^2}{n}\right]\left[\Sigma Y^2 - \frac{(\Sigma Y)^2}{n}\right]}}$$

Where,
r = correlation coefficient
Σ = Summation
X = Independent variable
Y = Dependent variable
n = Total number of respondent

RESULTS AND DISCUSSION

Components of job stress

Table 1 : Distribution of the employees of AAU according to different components of job stress (n=105)

Sr. No.	Job stress components	Categories with score	Frequency	Per cent
1	**Role ambiguity**	Very Low (Up to 04.80)	32	30.48
		Low (04.81 to 09.60)	54	51.43
		Medium (09.61 to 14.40)	18	17.14
		High (14.41 to 19.20)	01	00.95
		Very high (Above 19.20)	00	00.00
2	**Role overload**	Very Low (Up to 03.20)	02	01.90
		Low (03.21 to 06.40)	10	09.53
		Medium (06.41 to 09.60)	29	27.62
		High (09.61 to 12.80)	34	32.38
		Very high (Above 12.80)	30	28.57
3	**Role isolation**	Very Low (Up to 06.40)	39	37.14
		Low (06.41 to 12.80)	35	33.33
		Medium (12.81 to 19.20)	26	24.76
		High (19.21 to 25.60)	03	02.87
		Very high (Above 25.60)	02	01.90
4	**Role erosion**	Very Low (Up to 06.40)	44	41.90
		Low (06.41 to 12.80)	42	40.00
		Medium (12.81 to 19.20)	16	15.25
		High (19.21 to 25.60)	02	01.90
		Very high (Above 25.60)	01	00.95
5	**Resource and personal inadequacy**	Very Low (Up to 04.80)	38	36.19
		Low (04.81 to 09.60)	41	39.05
		Medium (09.61 to 14.40)	20	19.05
		High (14.41 to 19.20)	05	04.76
		Very high (Above 19.20)	01	00.95
6	**Role expectation conflict**	Very Low (Up to 03.20)	53	50.48
		Low (03.21 to 06.40)	34	32.38
		Medium (06.41 to 09.60)	13	12.38
		High (09.61 to 12.80)	02	01.90
		Very high (Above 12.80)	03	02.86

Sr. No.	Job stress components	Categories with score	Frequency	Per cent
7	**Inter role distance**	Very Low (Up to 05.00)	48	45.71
		Low (05.01 to 10.00)	47	44.77
		Medium (10.01 to 15.00)	08	07.62
		High (15.01 to 20.00)	02	01.90
		Very high (Above 20.00)	00	00.00
8	**Job stress on account of organizational leadership**	Very Low (Up to 06.40)	03	02.86
		Low (06.41 to 12.80)	30	28.57
		Medium (12.81 to 19.20)	43	40.96
		High (19.21 to 25.60)	27	25.71
		Very high (Above 25.60)	02	01.90
9	**Job stress on account of technological change**	Very Low (Up to 04.80)	63	60.00
		Low (04.81 to 09.60)	20	19.05
		Medium (09.61 to 14.40)	19	18.10
		High (14.41 to 19.20)	03	02.85
		Very high (Above 19.20)	00	00.00
10	**Overall job stress**	Very Low (Up to 20.00)	03	02.86
		Low (20.01 to 40.00)	59	56.19
		Medium (40.01 to 60.00)	38	36.19
		High (60.01 to 80.00)	04	03.81
		Very high (Above 80.00)	01	00.95

In relation to the query about various components of job stress, the data presented in Table: 1 indicate that slightly greater than half (51.43 per cent) of the employee had low level of role ambiguity, followed by 30.48 per cent and 17.14 per cent of them who had very low and medium level of role ambiguity, respectively. Only one employee had very high level of role ambiguity. This finding is in consonance with that reported by Patel *et al.* (2014).

In case of role overload, majority (60.95 per cent) of the employees had high to very high level of role overload followed by 27.62 per cent and 9.53 per cent who had medium and low role overload, respectively; while only 1.90 per cent had very low level of role overload. This finding is in line with those reported by Patel *et al.* (2014).

Majority (70.47 per cent) and (81.90 per cent) of the employees had very low to low level of role isolation and role erosion, respectively. Further, role isolation and role erosion were found medium in case of 24.76 and 15.25 per cent of the respondents, respectively. Very meager per cent of the respondents were found in the category of high to very high role isolation and role erosion. This finding is in agreement with that of Patel *et al.* (2014).

Slightly less than two-fifth (39.05 per cent) of the employees had low level of level of resource and personal inadequacy followed by 36.19 per cent, 19.05 per cent and 4.76 per cent who had very low, medium and high level of resource and personal inadequacy, respectively. Only 1 employee had very high level of resource and personal inadequacy. This finding is support from the finding of that reported by Patel *et al.* (2014).

Majority (82.86 per cent) and (90.48 per cent) of the employees had very low to low level of role expectation conflicts and inter role distance, respectively; followed by 12.38 per cent and 7.62 per cent of the respondents with the medium proportion of the same components, respectively.

Slightly greater than two-third (69.53 per cent) of the employees felt medium to low stress on account of organization leadership followed by 25.71 per cent, 2.86 per cent and 1.90 per cent of them who felt high, very low and very high level of stress on account of organizational leadership, respectively.

More than three-fourth (79.05 per cent) of the employees felt very low to low stress on account of technological change followed by 18.10 per cent and 2.85 per cent of them who felt medium and high level of stress on account of technological change, respectively. No employee was found in the category of very high level of stress due to technological change.

Form all the above nine components, overall job stress was measured and the data presented in Table: 1 indicate that majority (92.38 per cent) of the employees had low to medium level of overall job stress; while only 3.81 per cent and 2.86 per cent of them were found with high and very low level of overall job stress, respectively. Only one employee was observed with very high level of overall job stress.

The job stress of the employees of AAU may differ on account of their difference in personal, academic, psychological and organizational characteristics. Hence, an attempt was made in this investigation to ascertain the relationship if any, between personal, academic and psychological characteristics of the employees and their job stress by using Karl Pearson's coefficient of correlation (r). The results obtained are presented in Table 2.

Table 2: Relationship between the profile of the employees of AAU and their job stress (n=105)

Sr. No.	Independent variables	Correlation coefficient('r')
[I]	**Personal variables**	
X_1	Age	- 0.335**
X_2	Gender	0.063
X_3	Marital status	0.035
X_4	Work place	0.068
X_5	Family size	0.007
X_6	Annual income	- 0.385**
[II]	**Academic variables**	
X_7	Education level	0.195
X_8	Job experience	- 0.305**
X_9	Training received	- 0.392**
[III]	**Psychological variables**	
X_{10}	Personality	- 0.298**
X_{11}	Self confidence	- 0.286**
[IV]	**Organizational variables**	
X_{12}	Departmental climate	- 0.446**
X_{13}	Interpersonal communication	- 0.353**

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

Age and job stress

The data depicted in Table 2 reflect that age of the employees had negative and highly significant correlation (r = -0.335**) with their job stress. The results indicate that the magnitude of job stress among AAU employees decreased, as they got older. This finding is supported by Joshi (2012).

(1) Gender and job stress

The data clearly indicate that gender of the employees had non-significant correlation (r = 0.063) with their job stress.

(2) Marital status and job stress

As it is apparent from the data, the marital status of the employees had non-significant correlation (r = 0.035) with their job stress.

(3) Work place and job stress

A perusal of the data makes it clear that there was non-significant correlation between work place of the employees (r = 0.068) and their job stress. This finding is in line with the finding of Joshi (2012).

(4) Family size and job stress

The data reveal that family size of the employees had non-significant correlation (r = 0.007) with their job stress. This finding is supported by Joshi (2012).

(5) Annual income and job stress

It is apparent that annual income of the employees had negative and highly significant correlation (r= -0.385**) with their job stress. The results indicate that those employees who had higher income felt less job stress.

(6) Education level and job stress

The data clearly indicate that education of the employees and their job stress had no significant correlation (r = 0.195).

(7) Job experience and job stress

It is obvious from the data depicted that job experience of the employees had negative and highly significant correlation(r= -0.305**) with job stress. It can thus be concluded that with increase in job experience, job stress decreased. This finding is in line with the findings of Patel (2010) and Joshi (2012).

(8) Training received and job stress

A perusal of the data reveals that training received by the employees and their job stress had negative and highly significant correlation (r = -0.392**). The results are indicative of worth of trainings as the increase in trainings resulted in reduced job stress.

(9) Personality and job stress

The data reflect that personality of the employees and their job stress had negative and highly significant correlation (r = -0.298**). As the personality types were studied based on extroversion, it can be inferred that with increase in extroversion, the job stress decreased.

(10) Self-confidence and job stress

It is apparent from the data that self-confidence of the employees had negative and highly significant correlation(r = -0.286**) with their job stress. The results lead to conclude that self-confidence of the employees had significant influence on their job stress and with increase in self-confidence, the job stress decreased. This finding is in line with the finding of Joshi (2012).

(11) Departmental climate and job stress

A perusal of the data reveals that departmental climate of employees had negative and highly significant correlation(r = -0.446**) with their job stress. It indicates that the employees who had good departmental climate felt less job stress and vice-versa. Similar findings were also reported by Joshi (2012).

(12) Interpersonal communication and job stress

It is apparent from the data that interpersonal communication of the employees and their job stress had negative and highly significant correlation (r = -0.353**). The findings indicate that better interpersonal communication resulted in less job stress among the employees. Patel (2010), Joshi (2012) and Toor (2018) also reported similar findings.

CONCLUSION

The findings of the present investigation lead to conclude that majority of the employees of Anand Agricultural University had low to medium job stress. Out of all nine components, role overload seems relatively more important with more number of respondents in high to very high category; which might be on account of vacant posts and unfair distribution of work. This implies for due effort to be made at appropriate level to mitigate undue stress among employees. In case of relationship between profile of employees of Anand Agricultural University and their job stress and it leads to conclude that out of thirteen variables; eight variables *viz.* age, annual income, job experience, training received, personality, self-confidence, departmental climate and interpersonal communication had negative and highly significant relationship with their job stress.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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AGRICULTURAL DIVERSIFICATION AMONG THE FARMERS

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ABSTRACT

Agricultural diversification is slowly picking up momentum in favor of high value food commodities primarily to enhancement of income rather than the traditional concept of risk management. The nature of diversification differs across regions due to existence of wide heterogeneity in agro-climatic and socio-economic environments. It was considered interesting to delineate the key regions and sub-sectors of agriculture where diversification was catching up fast. Crops, livestock, horticulture and forestry constitute the core sectors of agriculture. Total 160 respondents were selected from sixteen villages belongs to Dhanera, Deesa, Vadgam and Lakhani talukas of Banaskantha district of Gujarat state. The data were collected by personal contact method with help of structured interview schedule and data were coded, classified, tabulated and analyzed in the light of objectives. The appropriate statistical methods were used for analysis of data. The result found that Vast majority of the respondents had medium to low level of crop diversification, had medium level of enterprise diversification and nearly three fourth of the respondents had medium to high level of agricultural diversification. Whereas, in case of nature of diversification two fifth of the respondents had diversified their agriculture by Shift from one crop to another crop from less remunerative crops to more remunerative crops both and majority of the respondents had diversified addition of new enterprises to exiting profile.

Keywords: *diversification, enterprise, commodities, remunerative crops*

INTRODUCTION

Agricultural diversification as measured by increase in the percent of non-food crops has grown; whereas diversification as measured by the concentration indices has remained consistent in the recent decade (Patel *et al.,* 2021). There have been significant changes in the pattern of agricultural diversification at the regional level. Within a region, smaller sub regions or pockets of specialization in certain crops and crop-groups have emerged. Farms do not remain diversified and the usual notion of crop diversification as a risk management practice is also belied in the present study. The study also found certain kind of structural changes in all sub-sectors of agriculture: crop, livestock, and fisheries.

Crop diversification is intended to give a wider choice in the production of a variety of crops in a given area so as to expand production related activities on various crops and also to lessen risk (Saran et al., 2020). Crop diversification in India is generally viewed as a shift from traditionally grown less remunerative crops to more remunerative crops, governmental policies and thrust on some crops over a given time, market infrastructure development and certain other price related supports, low volume high-value crops, higher profitability and also the resilience/stability in production and soil problems. The crop sector is the principal income-generating source in agriculture followed by the livestock sector. It is depicted a steady diversification herewith replacement of food-grain crops with nonfood-grain crops. Several non-food-grain crops such as fruits, vegetables, and medicines have substituted mainly coarse cereals in the farmers' business for higher income.

OBJECTIVE

To identify the extent of agricultural diversification

METHODOLOGY

The present study was confirmed to "Ex-post Facto" research design as the independent variables were already operated in the study area. The multistage sampling technique was used for select a representative sample of respondents for present investigation. The present investigation was carried out in Banaskantha district of Gujarat state among the 14 talukas of Banaskantha district four talukas *viz.,*Dhanera, Deesa, Vadgam and Lakhani were randomly selected for the study.Four villages were randomly selected from each selected taluka. Thus, total 16 villages were selected. The proportionate random sample size was drawn from each village by multiplying the total number of farmers of each

village to 40 (desired sample for each taluka) and divided by total number of farmers of the respective taluka. In this way 40 respondents were selected from each taluka. Thus, the sample size for the study comprised of 160 respondents. The data were collected by personal contact method with help of structured interview schedule. To measure the extent of agricultural diversification Simpson index of Diversification (1949) was used.

RESULTS AND DISCUSSION

I Extent of agricultural diversification

The extent of agricultural diversification can be measure by the study of crop diversification and enterprise diversification of the study area. The data in this regards were collected from the respondents and presented into following Table.1, Table.2, and Table.3.

The data presented in Table 1 reveal that more than two third (70.00 per cent) of the respondents had medium level of crop diversification with (0.413 to 0.773 SDI) followed by 19.38 per cent of them had high crop diversification with SDI Above 0.773 and 10.62 per cent of them had low level of crop diversification with up to 0.412 SDI. The probable reason of above finding might be that although majority of farmers had medium to big land holding but they have good cropping intensity which reflect the efficient use of land resource.

Table 1 : Distribution of the respondents according to their crop diversification at farm level (n = 160)

Sr. No.	Extent of crop diversification	SDI	Frequency	Per cent
1	Low level of crop diversification	Up to 0.412	17	10.62
2	Medium level of cropdiversification	0.413 to 0.773	112	70.00
3	High level of crop diversification	Above 0.773	31	19.38
Mean = 0.59				S.D.= 0.18

Table 2 : Distribution of the respondents according to their enterprise diversification (n=160)

Sr. No.	Extent of enterprise diversification	SDI	Frequency	Per cent
1	Low level of enterprise diversification	Up to 0.192	49	30.62
2	Medium level of enterprise diversification	0.193 to 0.391	67	41.88
3	High level of enterprise diversification	Above 0.391	44	27.50
Mean = 0.29				S.D.= 0.10

The data presented in Table 2 reveals that more than two fifth (41.88 per cent) of the respondents had medium level of enterprise diversification (SDI between 0.192 to 0.391) followed by 30.62 per cent of them had low level of enterprise diversification (SDI up to 0.192) and 27.50 per cent of them had high level of enterprise diversified (SDI above 0.391). The probable reason of above finding might be that majority of the farmers had medium to high land holding and high family income capacity to start other new enterprises in the initial investment. Moreover, training need was perceived one of the catalyzing factors in enterprises diversification.

Table 3 : Distribution of the respondents according to their agricultural diversification (n = 160)

Sr. No.	Extent of AgriculturalDiversification	SDI	Frequency	Per cent
1	Low level of agriculturaldiversification	Up to 0.374	44	27.50
2	Medium level of agricultural diversification	0.375 to 0.752	94	58.75
3	High level of agriculturaldiversification	Above 0.752	22	13.75
Mean = 0.56				S.D.= 0.19

The data presented in Table 3 shows that nearly three fifth (58.75 per cent) of the respondents had medium level of agricultural diversification (SDI 0.375 to 0.752) followed by 28.12 per cent of them had low level of agricultural diversification (SDI up to 0.374) and 13.75 per cent of them high level of agricultural diversification (SDI above 0.752). The probable reason of above finding might be that majority of the farmers had found crop as well as enterprise level of diversification.

II. Nature of agricultural diversification

The nature of agricultural diversification can be measure by the study of whether diversification takes place due to addition of new crops or enterprises to the existing one or due to the shift from less remunerative crops or enterprises more profitable one or due to both. Besides this study of cropping intensity of the study area also provides the information about the efficient utilization of available land resource. The data in this regards were collected from the respondents and presented into following Table 4, Table 5 and Table 6.

Table 4 : Distribution of the respondents according to their cropping intensity (n = 160)

Sr. No.	Level of cropping intensity	Frequency	Percent
1	Low cropping intensity (<215.67)	21	13.13
2	Medium cropping intensity (≥216.67 to <276.33)	107	66.87
3	High cropping intensity (≥276.33)	32	20.00
Mean = 246			S.D.= 30.33

The data presented in Table 4 indicates that more than two third (66.87 per cent)of the respondents had medium cropping intensity followed by 20.00 per cent of them had high cropping intensity and 13.13 per cent of them had low cropping intensity. The probable reason of above finding might be that majority of farmers had medium to big land holding, which requires efficient use of land resource for raising number of crops round the year to fulfill their basic needs.

Table 5 : Distribution of the respondents according to their nature of crop diversification (n = 160)

Sr. No.	Nature of crop diversification	Frequency	Percent
1	No change	00	00.00
2	Shift from one crop to another crop	67	41.87
3	Addition of new crops to exitingcrop profile	42	26.25
4	Both addition and shift of crops	51	31.88

The data presented in Table 5 shows that more than two fifth (41.87 per cent) of the respondents had diversified their agriculture by Shift from one crop to another crop from less remunerative crops to more remunerative crops both. Whereas, 31.88 per cent of them diversified their agriculture by both addition and shift of crops and 26.25 per cent go for addition of new crops to their existing crop profile. Moreover, none of the respondent found who had not gone through any change in their cropping pattern.

The data of Table 6 reveals that more than half (51.88 per cent) of the respondents had diversified through addition of new enterprises while, 20.62 per cent diversified through shifting from less remunerative enterprise to more remunerative enterprise and only 08.12 per cent of them diversified through both adding new enterprise and shifting to new more remunerative enterprise. Moreover 19.38 per cent of the respondents found who had not gone through any change in their enterprise level. The probable reason of above finding might be that majority of the farmers had milch animals as hereditary occupation along with farming to supplement family income; therefore, instead of shifting they try to add new enterprises in order to achieve diversification to increase income, reduce risk and secure livelihood of their family.

Table 6 : Distribution of respondents according to their nature of enterprise diversification (n = 160)

Sr. No.	Nature of enterprise diversification	Frequency	Percent
1	No change	31	19.38
2	Shift from one enterprise to another enterprise	33	20.62
3	Addition of new enterprises toexiting profile	83	51.88
4.	Both addition and shift of enterprises	13	08.12

The data of Table 6 reveals that more than half (51.88 per cent) of the respondents had diversified through addition of new enterprises while, 20.62 per cent diversified through shifting from less remunerative enterprise to more remunerative enterprise and only 08.12 per cent of them diversified through both adding new enterprise and shifting to new more remunerative enterprise. Moreover 19.38 per cent of the respondents found who had not gone through any change in their enterprise level. The probable reason of above finding might be that majority of the farmers had milch animals as hereditary occupation along with farming to supplement family income; therefore, instead of shifting they try to add new enterprises in order to achieve diversification to increase income, reduce risk and secure livelihood of their family.

Therefore, from the above results presented in table 1, 2, 3, 4, 5 and 6 inferred that general agricultural diversification of the study area were recorded medium (average SDI 0.59) due to good crop diversification with 246 per cent average cropping intensity. It reflected efficient use of available land resources by the farmers of the study area. The results also inferred that all most all the respondents were diversified at farm level by adoption of crop diversification either by addition of new crops to their existing crop profile or shifted from less remunerative crops to more remunerative crops or by both. On the other hand, results also indicated that majority of the respondents had medium diversification at enterprise level (average SDI 0.290).The enterprise diversification generally exists due to addition of new enterprises with existing one. It increases alarming concern about enterprise diversification in the study area.

The findings are similar with Rai *et al.* (2015), Basavaraj, (2016), Swaminathan, (2018), Malik, (2019) and Nyiatagher, (2019).

CONCLUSION

The finding related Extent of agricultural diversification the above result that more than two third of the respondents had medium level of crop diversification followed by high level crop diversification. Whereas, more than two fifth of the respondents had medium level of enterprise diversification. While majority of the respondents had medium to low level of agricultural diversification. In case of nature of diversification, two fifth of the respondents had diversified their agriculture by shift from one crop to another crop from less remunerative crops to more remunerative crops both and majority of the respondents had diversified addition of new enterprises to exiting profile.

RECOMMENDATION

The result also indicted that majority of the respondents had good crop diversification but medium enterprise diversification therefore; it is recommended that some other enterprises *viz;* animal husbandry, poultry, beekeeping, nursery management, mushroom production, duckery and sericulture etc. should be popularized among rural people by the Government and Non-Government organizations. This may help in contributing better and secure livelihood to the rural people.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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ATTITUDE OF PG SCHOLARS OF AGRICULTURAL EXTENSION TOWARDS APPLICATION OF MOBILE TECHNOLOGY USING ARTIFICIAL INTELLIGENCE TECHNIQUE

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ABSTRACT

Application of mobile technology is playing a vital role for the enhancement of understanding of agricultural market conditions and farmers business towards agricultural. In present days, data are growing rapidly in massive amount in every domain. One such domain of interest for researchers is application of mobile technology in agricultural extension field. To find interesting hidden patterns from the experimental datasets, artificial intelligence technique is used to build accurate algorithms for classification and prediction. In this paper classification and predictive models for attitude towards application of mobile technology in agricultural extension of the postgraduate scholars are built using machine learning classification algorithms viz; functions based multilayer perceptron and support vector machines; lazy based k-nearest neighbors and KStar; tree based J48 and random forest with respect to their accuracy of correctly classified instances, incorrectly classified instances and receiver operating characteristic (ROC) area. Experimental results explain that random forest algorithm is better than other fitted algorithms with 81 % predictability, followed by k-nearest neighbors with 78% predictability and Support vector machines algorithm has the lowest predictability with 69 %. The study also suggested that predictor variables namely extracurricular activities, information collection interpersonal communication and professional zeal have significant influence on attitude towards application of mobile technology in agricultural extension of the postgraduate scholars. Based on all the benchmarks used to measure the machine learning algorithms fitted in this study, it was discovered that Random Forest algorithm performance is the most appropriate in terms of predictability based on experimental dataset. Therefore focus was to design a predictive system on the most suitable algorithm which is random forest in this domain.

Keywords*: agricultural extension, mobile technology, artificial intelligence, machine learning*

INTRODUCTION

The attitude of the scholars pursuing post graduation in agricultural extension towards application of mobile technology for transfer of agricultural innovation is one of the key factors to decide and understand e-extension employability (Vegad *et al.,* 2021). The e-extension employee is expected with excellence leaning with Smartphone (Darji et al., 2017, & Yeragorla *et al.,* 2021). In the current study, attitude has been conceptualized as positive or negative feelings of postgraduate scholars towards used of mobile application in transfer of technology. It is assumed that optimistic feelings in the direction of any equipment, system, instrument means person is psychologically more concerned with them. To know psychological attachment of scholars towards mobile technology in extension job data were collected. Artificial Intelligence (AI) can be used cross disciplinary and it can also bring a model shift in how we see farming today. AI solutions will not only enable farmers to do more with less, it will also improve quality and make sure faster go-to-market for crops. AI is becoming the key drivers for providing the digital solution almost in all the fields and business sectors. Machine learning (ML) is a subfield of artificial intelligence, which is mostly concerned with the development of classification algorithms which allow a computer to study from the secondary data. Samuel, (١٩٥٩) said that ML enables a machine to automatically study from past data, improve performance from experiences, and forecast things without being clearly programmed. Manish, (2009) said that ML is a growing technology with the augmentation of AI and experimental database procedures which is used in different business organization to improve the effectiveness and significance of a business process. ML is a multidisciplinary domain that joins AI, data mining, mathematics algorithms, computer science and statistics (Liao, 2003). ML algorithm in agricultural was projected by Fathima and Geetha, (2014). ML technique uses classification algorithms to get valuable knowledge from large experimental data set, for agricultural operation (Witten

and Eibe, 2011). Kumari and Chitra, (2013) used support vector machine learning algorithm for forecasting diabetes. Their experimental results demonstrated that SVM can be successfully used for forecasting diabetes diseases. Willcock, (2018) demonstrated that ML algorithms take a data-driven technique to study useful relationships from experimental data set and provide a best way for improving predictions. Chlingaryan, (2018) explained that ML algorithms have some individual benefits like; they can model non-linear relationships between multiple data sources. The present study will be useful for researchers to know the attitude of postgraduate scholars of agricultural extension towards application of mobile technology.

OBJECTIVE

To study the attitude of the scholars pursuing post graduation in agricultural extension towards application of mobile technology for transfer of agricultural innovation using artificial intelligence technique

METHODOLOGY

The present study was conducted in state agricultural universities of gujarat. The ex-post facto research design was used for the exploration. Experimental data were selected from a random sample of 120 scholars pursuing post graduation in agricultural extension in SAUs of Gujarat state. The experimental dataset having 18 independent variables viz; academic performance, native place, annual family income, father's education, mother's education, family occupation, involvement in extracurricular activity, medium of education, information collection behavior, job preference, attitude towards extension work, library exposure, self confidence, achievement motivation, interpersonal communication, innovativeness , willingness to work in rural area and professional zeal. An attitude towards application of mobile technology in agricultural extension of the postgraduate scholars is dependent variable. The dataset was created in excel sheet with .CSV extension for research work using weka software. Normalized algorithm was used to normalize the dataset. Chosen independent variables by variable evaluator namely "cfsSubsetEval" and search method namely "BestFirst" are additional activities, information collection behaviour, job preference, attitude towards extension work, achievement motivation, interpersonal communication and professional zeal. The Fig.1 shows the conceptual view of system. The raw data are used, which are then cleaned and sorted. The six machine learning classification algorithms viz; multilayer perceptron, support vector machines, k-nearest neighbors, KStar, J48 and random forest are then used over the trained data. The result of each algorithm is compared with each other. Correctly Classified Instances, Incorrectly Classified Instances, Receiver Operating Characteristic (ROC) Area, Precision Recall Curve (PRC) Area, Kappa Statistic, MAE, RMSE, RAE and RRSE. True Positive Rate, False Positive Rate, Precision, Recall, F-Measure and MCC values are taken into consideration for each algorithm. Thereafter performance is measured using three factors viz; precision, recall, and accuracy (Baby, 2021).

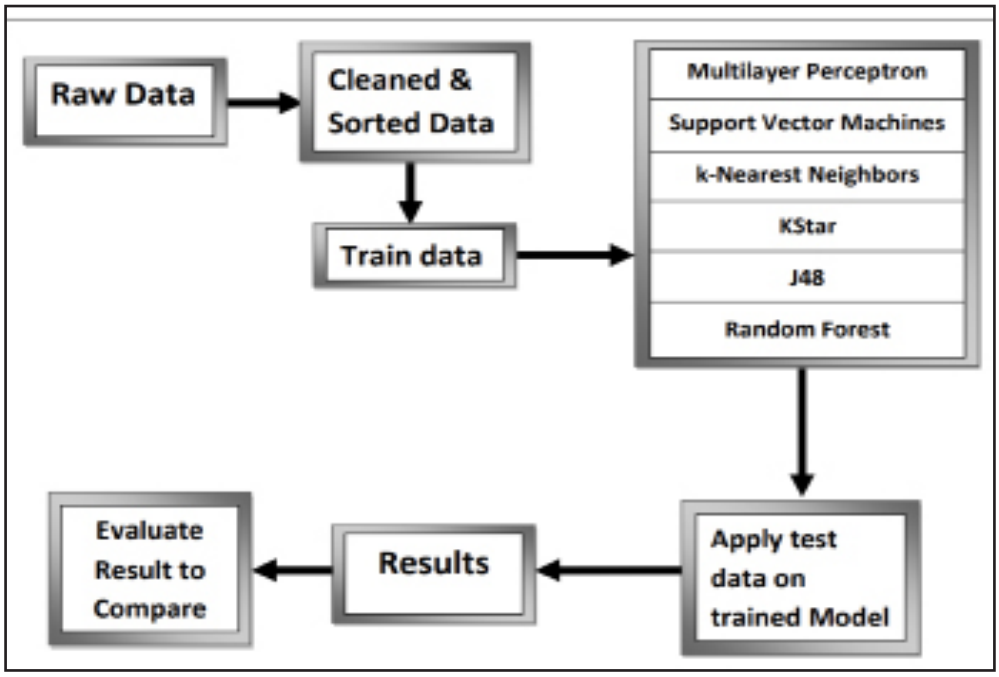

Fig. 1: Conceptual view of system

RESULTS AND DISCUSSION

The open source weka-3.8.5 software was used for data analysis. Weka has a number of classification algorithms. The results are discovered with 10 fold cross validation to avoid overlapping. Form 19 independent variables, important 7 variables namely extracurricular activities, information collection behaviour, job preference, attitude towards extension work, achievement motivation, interpersonal communication and professional zeal for classification were sorted out using "cfsSubsetEval" variable selection algorithm. For this research, the algorithms namely MLP, SMO, IBK, KStar, J48 and RF are studied. The performance of each algorithm is examined in terms of correctly classified instances, incorrectly classified instances, ROC area, PRC area, kappa statistic, MAE, RMSE, RAE and RRSE, TP rate, FP rate, precision, recall, F-measure and MCC.

Table 1: Comparison of the results for each Classification Algorithms (n=120)

Parameters	Classifier Algorithms					
	Function Based		Lazy Based		Tree Based	
	Multilayer Perceptron (MLP)	Support Vector Machines (SMO)	k-Nearest Neighbors (IBK)	KStar	J48	Random Forest (RF)
Correctly Classified Instances (%)	71	69	78	77	77	81
Incorrectly Classified Instances (%)	29	31	22	23	23	19
Kappa Statistics	0.50	0.42	0.63	0.60	0.60	0.67
Mean Absolute Error (MAE)	0.24	0.31	0.15	0.15	0.18	0.14
Root Mean Squared Error (RMSE)	0.40	0.41	0.38	0.36	0.38	0.31
Relative Absolute Error (%)	60.15	75.56	37.70	37.84	45.59	36.17
Root Relative Squared Error (%)	90.13	83.31	83.67	79.37	83.69	68.24

The Table 1 depicts the performance of six fitted classification algorithms based on correctly classified instances, incorrectly classified instances, kappa statistics, MAE, RMSE, RAE and RRSE to build the algorithms respectively. The RF algorithm classified instances correctly with a prediction accurate rate of 81 %. Thus, the results indicated that fitted RF algorithm can be relied on for predictions.

The Fig. 2 demonstrates the prediction accuracy for different fitted classification algorithms. Out of six algorithms used in this research work, RF has better predictability than other fitted classification algorithms with 81 %, followed by IBK with 78 % predictability. SMO classification algorithm has lowest predictability with 69 %.

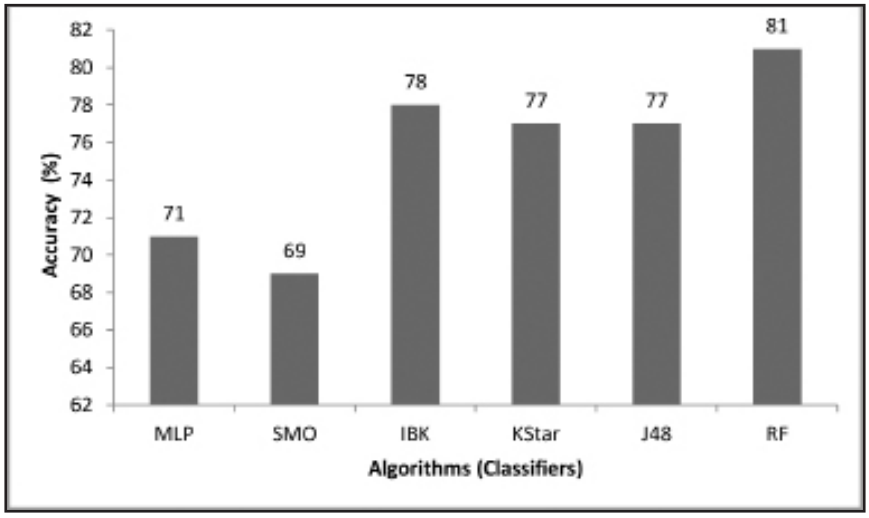

Fig. 2: Prediction Accuracy of Classification Algorithms

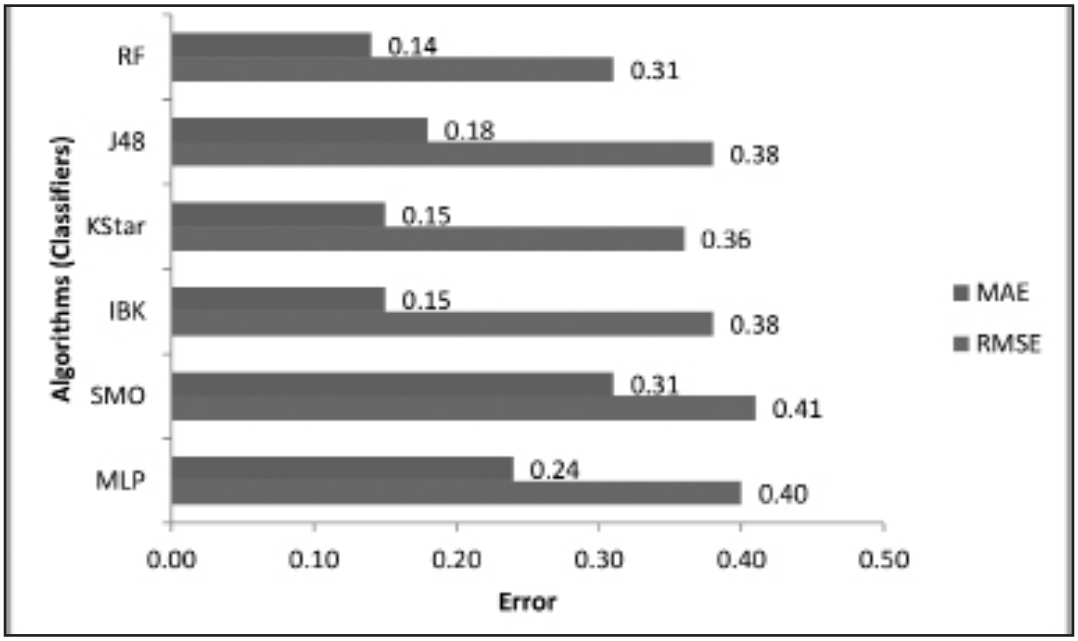

Fig. 3: Error results of classification algorithms

The Fig. 3 shows the error results of the different fitted classification algorithms. RF algorithm has MAE of 0.14 and RMSE of 0.31. This point out least error observed during the prediction processes. SMO classification algorithm has the highest error rate with 0.31 and 0.41 of MAE and RMSE respectively.

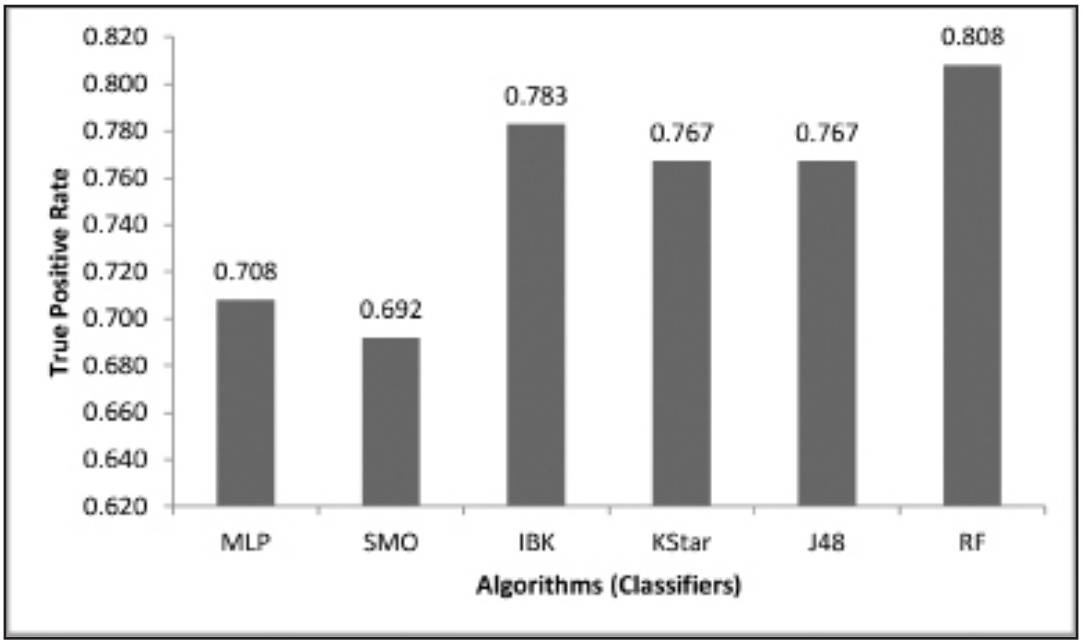

Fig. 4: True positive rate of classification algorithms

The Fig. 4 demonstrates the true positive rate for different fitted classification algorithms. Out of six algorithms used in this research work, RF has better true positive rate than other fitted classification algorithms with 0.808 followed by IBK with 0.783. SMO classification algorithm has the lowest true positive rate with 0.692.

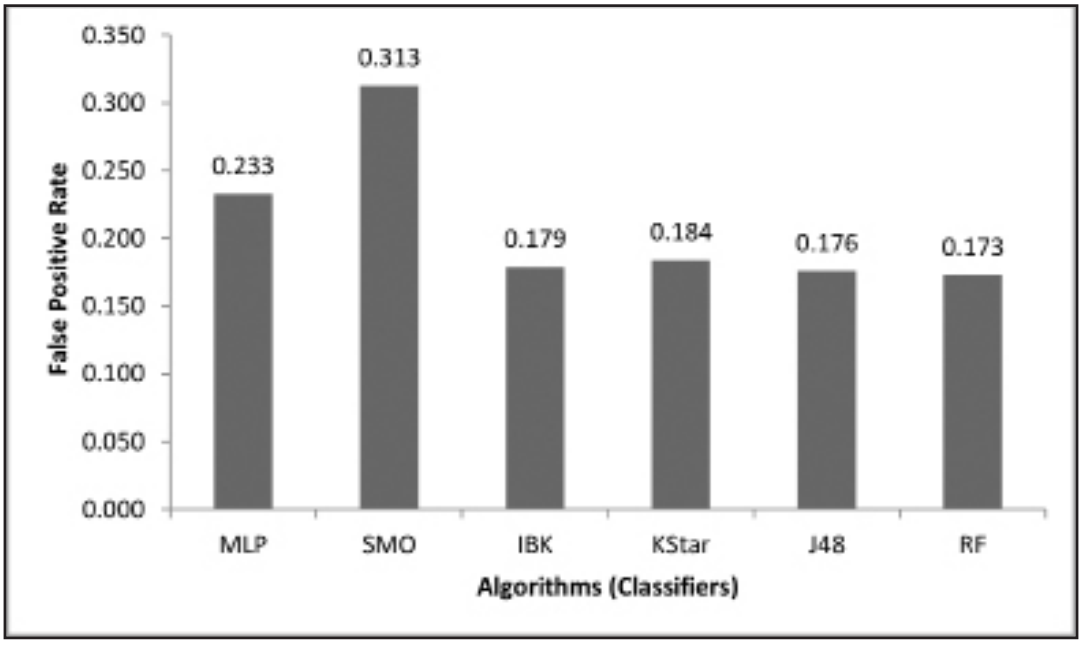

Fig. 5: False positive rate of classification algorithms

The Fig. 5 explains the false positive rate for different fitted classification algorithms. Out of six algorithms used in this research work, RF has lowest false positive rate with 0.173 followed by J48 with 0.176. SMO classification algorithm has the highest false positive rate with 0.313.

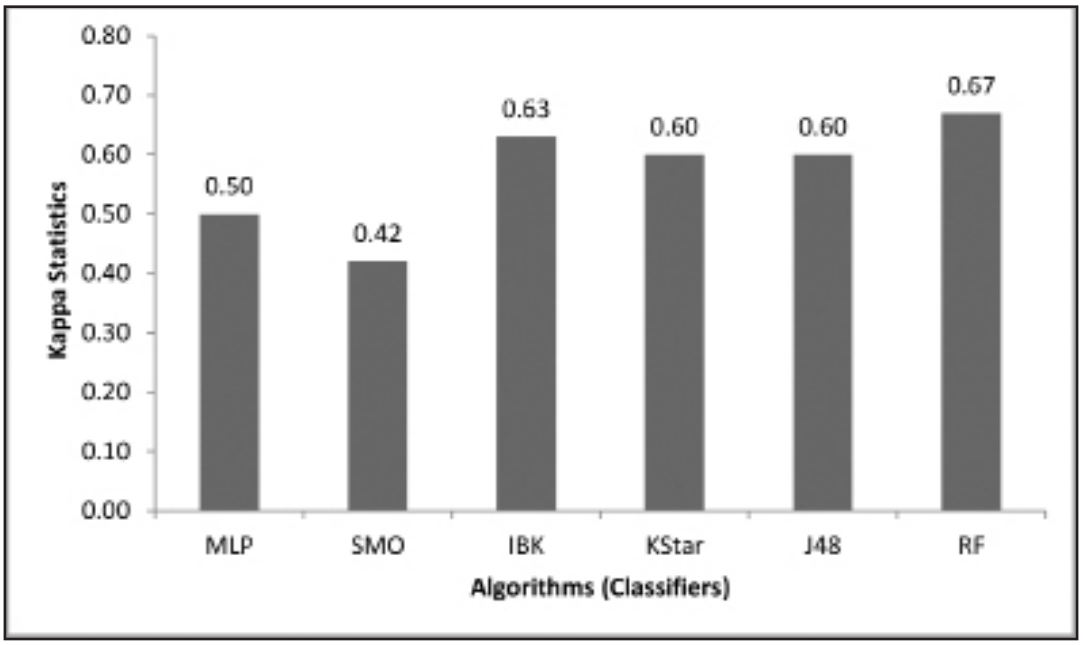

Fig. 6: Kappa Statistics of Classification Algorithms

The Fig. 6 shows the kappa statistics for different fitted classification algorithms. Out of six algorithms used in this research work, RF has better kappa statistics than other fitted classification algorithms with 0.67, followed by IBK with 0.63. SMO classification algorithm has the lowest kappa statistics with 0.42.

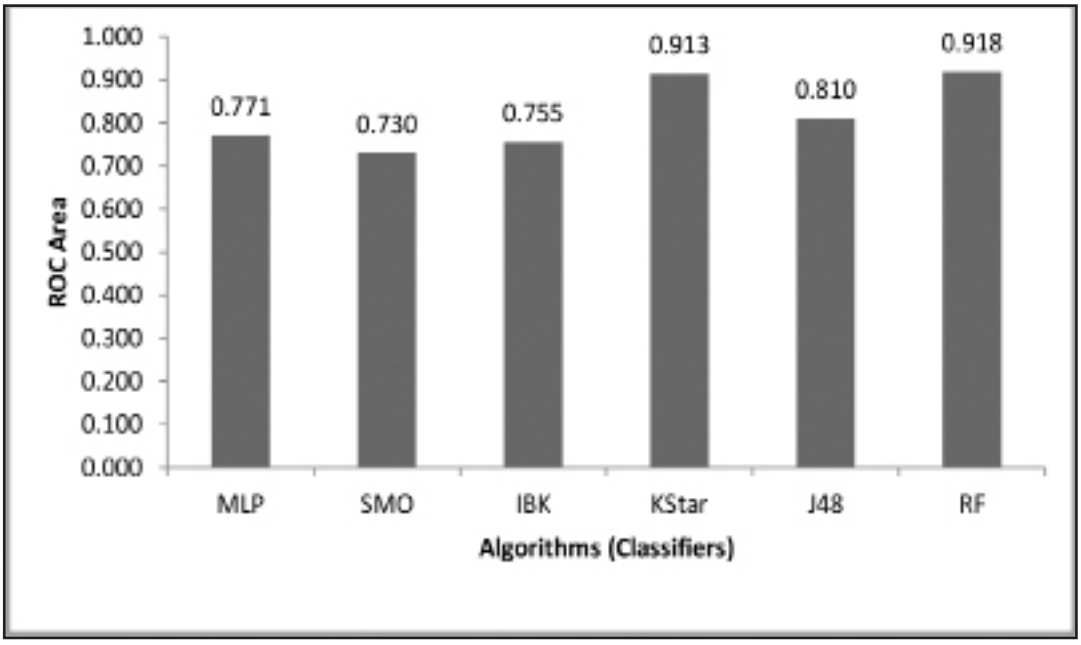

Fig. 7: ROC Area of classification algorithms

The Fig. 7 depicts the ROC area curve for different fitted classification algorithms. RF has the highest ROC area with 0.918 followed by KStar with 0.913. SMO has the lowest ROC area with 0.730.

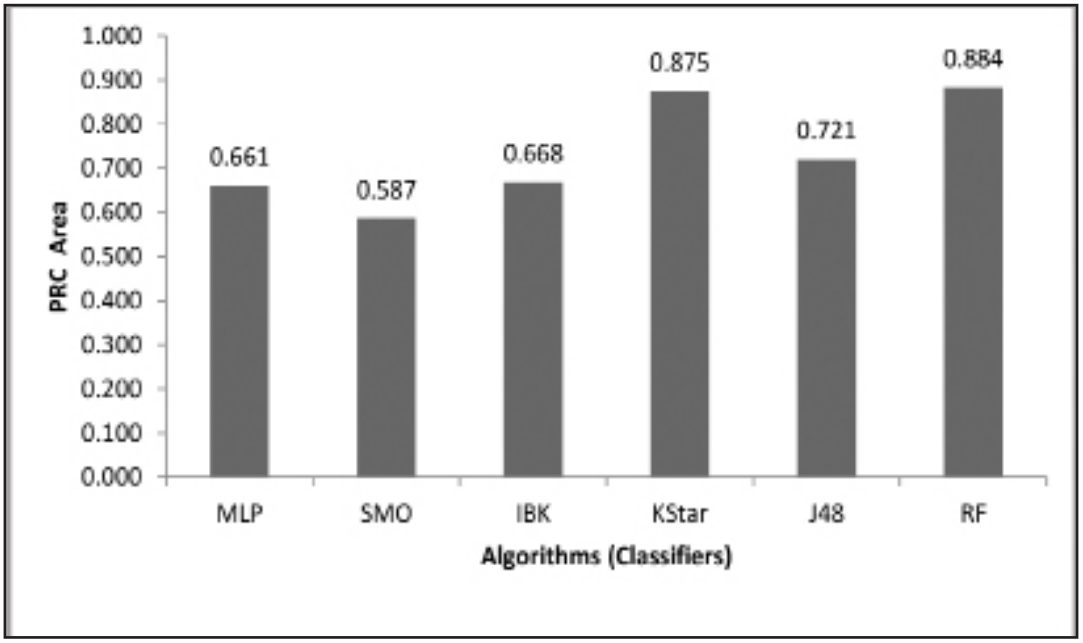

Fig. 8: PRC area of classification algorithms

The Fig. 8 explains the PRC area for different fitted classification algorithms. RF recorded a high PRC area with 0.884 followed by KStar with 0.875. SMO has the lowest PRC area with 0.587.

The Table 2 shows the result obtained after fitting the six classification algorithms on experimental dataset. The fitted RF algorithm has obtained the highest prediction accuracy of 0.81, precision of 0.82 and recall of 0.81. The SMO has obtained the lowest prediction accuracy of 0.69, precision of 0.66 and recall of 0.69. The F1 score and Mathews Correlation Coefficient (MCC) were figure out to measure the test accuracy and quality of fitted classification algorithm respectively. The RF has obtained the highest F1

score of 0.80 and MCC of 0.68. The SMO has obtained the lowest F1 score of 0.65 and MCC of 0.46.

Table 2: Comparison of the results for each classification algorithms

Parameters	Classifier Algorithms					
	Function Based		Lazy Based		Tree Based	
	Multilayer Perceptron (MLP)	Support Vector Machines (SMO)	k-Nearest Neighbors (IBK)	KStar	J48	**Random Forest (RF)**
Accuracy	0.71	0.69	0.78	0.77	0.77	0.81
Precision	0.69	0.66	0.78	0.76	0.76	0.82
Recall	0.71	0.69	0.78	0.77	0.77	0.81
F1 score	0.70	0.65	0.77	0.76	0.76	0.80
MCC	0.49	0.46	0.63	0.60	0.61	0.68

CONCLUSION

The attitude of the scholars pursuing post graduation in agricultural extension towards application of mobile technology for transfer of agricultural innovation is one of the important factors to decide and understand e-extension employability. The aim of this research is to fit and compare six different machine learning classification algorithms namely multilayer perceptron (MLP), support vector machines (SMO), k-nearest neighbors (IBK), KStar J48 and random forest (RF) for prediction of attitude towards application of mobile technology in agricultural extension of the postgraduate scholars. The fitted algorithms, using artificial intelligence technique suggested that that predictor variables namely extracurricular activity, information collection behaviour, job preference, attitude towards extension work, achievement motivation, interpersonal communication and professional zeal have influence on *attitude* towards application of mobile technology in agricultural extension of the postgraduate scholars. The experimental results revealed that the fitted RF classifier algorithm performed better by obtaining the highest prediction accuracy (0.81), precision (0.82) and recall (0.81) than other fitted algorithms. In terms of test's accuracy (F1 score) and quality (MCC) also RF classifier algorithm demonstrated the highest prediction accuracy and best quality of classification. The RF classifier algorithm explained 81% of total variation in attitude towards application of mobile technology in agricultural extension of the postgraduate scholars. In general, it can be concluded that fitted RF classifier algorithm used on the experimental dataset should be recommended for development of an attitude towards application of mobile technology in agricultural extension of the postgraduate scholars prediction model.

CONFLICT OF INTEREST

"We, The Authors declare that there is no conflict of interest."

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EFFECTS OF STUDENTS RESIDENTIAL LOCATION ON PUNCTUALITY AND ACADEMIC PERFORMANCE: A CROSS-SECTIONAL ANALYSIS OF STUDENTS AT KOGI STATE UNIVERSITY OF ANYIGBA

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ABSTRACT

The study was set to determine the extent to which distance affects the academic performance of students at Kogi State University. Global, economic and social development are increasingly driven by the advancement and application of knowledge. Education in general and higher education in particular, are fundamental to the construction of a knowledge economy and society in all nations. The main objective of this study was to investigate how students' residential location affects their academic performance. To achieve this objective data was through a questionnaire. One hundred and sixty questionnaires were distributed and one hundred and fifty-three copies of the questionnaire were retrieved for analysis. The hypothesis tested resolve around students' residential locations and their academic performance. The Pearson chi-square test was used to test the hypothesis. The findings of this research work showed that Students' residential location played an effective role in their academic performance and there was a relationship between students' residential location and academic performance, Student on-campus enjoyed electricity, water, security and close proximity to the lecture area more than those living off-campus. Given the findings from this study, it was recommended that the private sector should be allowed to construct accommodation for students while their hostel accommodation rent is billed inside their school fees for agreed years and finally, Student's punctuality and lectures attendance should form part of the continuous assessment in grading student in a particular subject.

Keywords : *students, residential, location, punctuality, academic performance*

INTRODUCTION

From a global perspective, economic and social development is increasingly driven by the advancement and application of knowledge. Education in general, and higher education in particular, are fundamental to the construction of a knowledge economy and society in all nations. Thus, knowledge has become the most important factor for economic development as it can augment productivity and forms the constituent foundation of any country's competitive advantage. It is often considered to be the only way to get to the top in Nigeria and so, failure brings untold hardship and frustration to the individual (Ayodele and Adebiyi, 2013). This has potentially increased the number of students who seek higher educational knowledge (Drucker, 2017). The transition from secondary to higher education may be a challenging time for students especially adjusting to a new social environment with different pedagogical and learning approaches, and more autonomy accustomed to more responsivity (Laakkonen and Nevgi, 2017). Interestingly one of the pivotal roles of school management in an academic environment setting is the provision of an enabling conducive environment and facilities for learning. Therefore, dormitories otherwise known as hostels or halls of residences are built for students in order to cater for their accommodation needs and they are often in great proximity to classroom blocks in order to make learning more suitable and reduce the stress of commuting. Students residing in the school dormitories are often expected to be more comfortable and thus translating into a better academic performance compared to their counterparts residing outside the school environment. In view of this, student affairs organization of higher institutions strive to ensure that their citadel of learning is not devoid of essential facilities especially housing for their students and lecturers in most cases. This expectation of enhanced performance of students residing on the campus dormitories is attributable to factors such as closer proximities to classrooms of learning, easy accessibility to libraries, campus wide internet connectivity, quick laundry services, social interaction with fellow hall residents, greater bonding opportunities, participation in University social activities,

sporting arenas for relaxation, and many more which off campus students might not be privilege to experience in a greater sense. Likewise, it is considered very favorable for new entry students and those single students in terms of marital status to reside in the school premises for better academic performance. This perception have equally raised the numbers of students who seek for hostel accommodations amidst of limited hostels for the teeming students population experienced in most Universities like Kogi State University Anyigba (Moyo, 2013 and Sawyerr *et al.*, 2017).

Irrespective of students' proximity to classrooms or school premises the primary goal is to attain a higher level of academic excellence. The trend of record of low academic achievement is not limited to secondary schools but also rampant among students of tertiary institutions. This has been a subject of major concern to educational planners, administrators, stakeholders in education and the students themselves. When considering study success in higher education (mostly known as academic achievement, such as grades and credit points) in general, many factors need to be considered. It is inadequate to merely gauge the performance of student based on the assimilation of lectures or the difficulty of the lectured delivered in the institution, as other factors such as punctuality for lectures, residential locations, health, motivation, anxiety, their environment, adequacy of infrastructures, student's intellectual capacity amongst others contributes immensely. Therefore, this project investigates the effect of student's residential location on punctuality and academic performance using Kogi State University Anyigba as a case study.

OBJECTIVES

(1) To ascertain how punctuality is affected by residential distance and its consequences on the performance of the students

(2) To proffer possible solutions to the negative effects of student residential location and punctuality (if any) on the academic performance of students of Kogi State University

METHODOLOGY

Population of the Study

Population means, all cases or individuals that fit a certain specification. population is defined as "all members of any well-defined class of people, events, or subjects which can be living or non-living things" (Drake, 2017). The population of this study will be undergraduates of Kogi State University Anyigba campus students from Inikpi (female) and Ocheja (Male) and Bliss and Godswill lodge to represent the off campuses.

Each of the selected hostel (Inikpi and Ocheja) has 126 rooms with capacity of accommodating 6 students each. Bliss lodge has 87 rooms which are self-contained while Godswill lodge has 46 rooms and all these forms the population of the study as shown in Table1 & 2.

Table 1: Population of the study

Sr. No.	Name of Hostel	Type	Capacity
1	Inikpi (Female hostel)	On Campus	756
2	Ocheja (Male hostel)	On Campus	756
		Total population	**1512**

Source: Researcher's information obtained directly from the facilities (2020)

Table 2 : Population of people in off campus

Sr. No.	Lodge by Name	Type	Capacity
1	Bliss lodge	Off Campus	87
2	Gods will lodge	Off Campus	46
		Total population	**133**

Source: Researcher's information obtained directly from the facilities (2020)

Sampling Technique/ Sample Size

Sample is a portion of a population selected for the study and sample size is the method of selecting the samples from the population (Etikan *et al.*, 2016). It is a small group of elements or subjects drawn from a definite procedure of a specified population.

Formula for sample size is

$$S= (D\times 50\%) \div (M\%\div C)^2$$

3.1 Sample size = (Distribution 50%) ÷ (Margin error%÷ Confidence level score)^2

Where: The Confidences Level for the population = 95%

Confidence Level Score =1.96

Margin Error= 5%

Finite Population Correction

3.2 True sample = (Sample Size X Population) ÷ (Sample Size + Population-1)

Using equation 3.1

Sample Size = $(0.5X(1-0.5) \div (0.05\div 1.96)^2$

Sample Size = 384.16

From equation 3.2

True Sample = 384.16X1645(384.164) + (1645-1)

True Sample = 312

Therefore, the sample size for this population is 312

The descriptive survey research was adopted in this study. In the survey, a representative sample of 312 was chosen from the 1645 students' population and studied. Findings made from the representative sample were used to generalize for the whole students' population. The respondents were a mixture of students residing in the school's hostels (Inikpi and Ocheja) and off campus (Bliss and Godswill lodge) to represent those living in farther places away from the University environment. A set of structured questionnaires was designed and developed for the purpose of data collection. The questionnaires were meant to elicit responses from the students regarding the impact their accommodation locations had on their academic performance. The questionnaires were administered to the students and consequently retrieved upon providing answers to the questions asked. After collection, descriptive statistics was used to describe the structure of the respondents and their different composition.

Method of data collection and analysis

Data was collected using the questionnaire which the researcher administered face to face to the respondents. One hundred and sixty (160) copies of questionnaire were distributed and one hundred and fifty-three (153) copies were retrieved.

Simple tables, frequency and percentages were adopted in the presentation and analysis of the data generated for the study. The evidence or the information on the table was sociologically interpreted. These statistical tools were used because they were suitable means of breaking down and analyzing the generated data.

RESULTS AND DISCUSSION

Academic performance

Table 3 : The last CGPA of respondents (n=153)

Sr. No.	CGPA	Frequency	Percent
1	4.50-5.00	9	5.9
2	3.50-4.49	62	40.5
3	2.50-3.49	66	43.1
4	1.50-2.49	16	10.5

Source: Researcher's Field Work, 2020

From table 4.1.1 above, for the last CGPA, 9 respondents represent 5.9% were between the range of 4.50-5.00, 62 respondent represent 40.5% were between the range of 3.50-4.449, 66 respondent represent 43.1% were between the range of 2.50-3.49 while 13 respondents represent 8.5% were between the range of 1.50-2.49. This implies that majority of the students representing 83% of the respondents are in second class lower.

Residential location

Table 4 : Where would you have preferred to live?

Sr. No.	Location	Frequency	Percent
1	Off Campus	70	45.8
2	On Campus	83	54.2

Source: Researcher's Field Work, 2020

From the table above, 70 respondents represent 45.8% preferred to live off campus, while 83 respondents represent 54.2 preferred to stay on campus. It implies that majority of the students preferred to live on campus.

Table 5 : How do you rate the facilities at where you live?

(n=153)

Sr. No.	Rate	Frequency	Percent
1	Excellent	31	20.3
2	Very Good	79	51.6
3	Good	33	21.5
4	Poor	04	02.0
5	Very Poor	06	04.6

Source: Researcher's Field Work, 2020

From the table above, 20% of the respondents rate the facilities where they live as excellent, 51.9% of the respondent rate very good, 21.5% of the respondents' rate good, 2.0% of the respondent's rate poor, while 4.6% of the respondents rate the facilities of where they live as very poor. It implies that majority of the respondent's rate where they live as very good.

Table 6 : Annual family income (n=153)

Sr. No.	Income	Frequency	Percent
1	120,000 - 240,000	54	35.3
2	252,000 - 360,000	80	52.2
3	372,000 - 480,000	14	09.2
4	491,000 - 600,000	05	03.3

Source: Researcher's Field Work, 2020

From the table on the Annual family income, 54% of the respondents represent 35.3% received 120,000- 240.000 as their family annual income, 80 respondents represent 52.2% of the respondents received 252,000 – 360.000 as the annual family income.

Punctuality

Table 7: How long does it take from your residence to lecture hall? (n=153)

Sr. No.	Location	Frequency	Percent
1	5-10mins	04	02.6
2	11-15mins	29	19.0
3	16-20mins	82	53.5
4	21-25mins	34	22.2
5	above 25mins	04	02.7

Source: Researcher's Field Work, 2020

From the table above, 2.6% of the respondents take 5-10mins from their residence to lecture hall, 19.0% of the respondents takes 11-15mins from their residence to lecture hall, 53.5% of the respondents takes 16-20mins from their residence to lecture hall, 22.2% of the respondents take 21-25mins from their residence to lecture hall while 2.7% of the respondent stake above 25mins from their residence to lecture hall.

Table 8 : How punctual are you in class? (n=153)

Sr. No.	Rating	Frequency	Percent
1	Very punctual	13	8.4
2	Not punctual	71	46.4
3	Punctual	60	39.2
4	Can't say	09	06.0

Source: Researcher's Field Work, 2020

From the above, 8.4% of the respondents are very punctual in class, 46.4% of the respondents are not punctual in class, 39.3% of the respondents are punctual in class while 6.0% of respondents can't say how punctual they go to class

Table 9 : Means of getting to the lecture hall (n=153)

Sr. No.	Location	Frequency	Percent
1	Car	22	14.4
2	Motor cycle	76	49.7
3	Bicycle	9	5.9
4	Foot	41	26.7
5	Others	5	3.3

Source: Researcher's Field Work, 2020

From the table above, 14.4% of the respondents uses car to get to the lecture hall, 49.7% of the respondents uses motor cycle to get to the lecture hall, 5.9% of the respondents uses bicycle to get to the lecture hall, 26.7% of the respondents uses foot to get to the lecture hall while 3.3% of the respondents uses other method to get to the lecture hall.

Table 10 : Are there time you could not meet up for lecture time (n=153)

Sr. No.	Response	Frequency	Percent
1	Yes	93	60.7
2	No	54	35.3
3	Can't Say	06	04.0

Source: Researcher's Field Work, 2020

From the table above, 60.7% of the respondents say yes that they are sometimes they can't meet up will lecture hall, 35.3% of the respondents say no that they no, that they don't miss lecture while 4.0% of the respondents say that they can't say.

Table 11 : Reasons for punctuality (n=153)

Sr. No.	Reasons	Frequency	Percent
1	Availability of water	03	2.0
2	Waking up early	36	23.5
3	Having fuel	38	24.8
4	Availability of motor cycle	27	17.6
5	No family pressure	20	13.1
6	No health problems	11	07.2
7	All of the above	18	11.8

Source: Researcher's Field Work, 2020

From the table above, 2% of the respondents are punctual to class because of the availability of water, 23.5% of the respondents are punctual to class because they wake up early, 24.8% of the respondents are punctual in class because they have fuel. 17.6% of the respondents are punctual to class because of the availability of motor cycle, 13.1% of the respondents are punctual in class because of no family pressure. While 7.2% of the respondents are punctual to class of not having any health problem.

Table 12 : Problems associated with residential location as it affects punctuality and academic performance (n=153)

Sr. No.	Location	Frequency	Percent
1	Water problem	10	8.6
2	Electricity problem	49	32.0
3	Security problem	66	43.1
4	All of the above	28	18.3

Source: Researcher's Field Work, 2020

From the table above, 8.6% of the respondents see water problem as a reason that affect their punctuality and academic performance, 32.0% of the respondent see electricity as a problem that affects their punctuality and academic performance, 43.1% of the respondents sees security

as a problem that affect their punctuality and academic performance, 18.3% of the respondents see the above reasons a problem that affect their academic performance in school.

Test of hypothesis

Hypothesis $_1$

H_O: There is no significant difference between student's residence and academic performance.

H_i: There is a significant difference between student's residence and academic performance.

Since Tx^2 is greater than Cal x2 you reject the null hypothesis and accept the alternative hypothesis.

This means that there is a relationship between student's residence and academic performance, that is to student residential area affect their academic performance.

Table 13 : What is your CGPA? Where do you live?

What is your CGPA	Where do you live		Total
	Campus	Off campus	
4.50 – 5.00	03	06	09
3.50-4.49	23	20	43
2.50-3.39	25	24	49
1.50-2.49	04	09	14
Non response	18	20	38
Total	**55**	**59**	**153**

Source of variable	n	X	SD	DF	Tx^2	$CALX^2$	DECISION
	153	2.5789	79706	4	9.49	7.791	REJECT H_O ACCEPT H_I

Source: Researcher's field work, 2020.

Hypothesis $_2$

H_o: there is no significant difference between students' distance and their academic performance.

H_i: there is a significant difference between students' distance and their academic performance.

Table 14 :What is your CGPA? How punctual are you in class?

What is your CGPA	How punctual are you in class?				Total
	Very punctual	Punctual	Not punctual	Can't stay	
4.50-5.00	02	06	0	1	09
3.50-4.49	16	27	15	1	59
2.50-3.39	10	40	15	0	65
1.50-2.49	03	06	03	0	12
Non response	02	02	03	1	08
Total	**33**	**81**	**36**	**3**	**153**

Source of variable	N	x	SD	DF	Tx2 0.05	Cal x2	Decision
	150	2.5533	.73764	12	21.026	9.363	Reject H_o ACCEPT H_I

Source: Researcher's field work, 2020

Since Tx^2 is greater than Cal x^2 you reject the null hypothesis and accept the alternative hypothesis.

This means that there is a relationship between student punctuality and students' academic performance, majority of the students failed because they are not always punctual in class or lecture.

Discussion on findings

H_1:

The first hypothesis in this study indicates that there is a relationship between student's residence and academic performance.

From the finding it was discovered that student's residential location affect their academic performance.

H_2:

The second hypothesis in this study indicates that there is a relationship between students residential and their academic performance

Effect of longer walking distance to school as it was identified by respondents of this study, make students perform poorly because of reaching school late and tired.

This was further supported by Oyeachu, 2008. All found similar situation faced students in different contexts of their studies. The researcher acknowledged that longer distance to the University where students are to access education has made them reach late, tired and with empty stomach to lecture halls.

From the finding it was discovered the major reasons why students are not always punctual in class is because of scarcity of motorcycle, in some areas it is difficult to get bike on time, not waking up early scarcity of water. All these problems affect one's punctuality and academic performance in school.

CONCLUSION

The primary goal of all students in any institution is to graduate in flying colors but however this research has examined one of the causes for the decline in student performance. It has been established that student's residential location and punctuality have effect on the academic performance. It therefore becomes essential for student affairs organization of higher institutions to strive to ensure that their citadel of learning is not devoid of essential facilities especially housing for their students and lecturers in most cases. This expectation of enhanced performance of students residing on the campus dormitories are attributable to factors such as closer proximities to classrooms of learning, easy accessibility to libraries, campus wide internet connectivity, quick laundry services, social interaction with fellow hall residents, greater bonding opportunities, participation in university social activities, sporting arenas for relaxation, and many more which off campus students might not be privilege to experience in a greater sense.

RECOMMENDATIONS

Providing hostel accommodation for all the student in higher institution is not feasible due to the huge capital requirement amidst of scarce resources. More so, since these institutions are publicly owned by the government, it becomes cumbersome providing the necessary fund for constructing hostel accommodation thus the following option are recommended

(1) Public private partnership accommodation construction: The private sectors should be allowed to construct accommodation for student while their hostel accommodation rent is billed inside their school fees for an agreed year.

(2) The government can provide buses at a cheaper rate to convey students to the various lecture halls

(3) Student's punctuality and lectures attendance should form part of the continuous assessment in grading student in a particular subject.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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ANALYSIS OF FACTORIAL EXPERIMENTS FOR AGRICULTURAL RESEARCH USING DIGITAL TOOL

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ABSTRACT

Factorial experiments involve simultaneously more than one factors and each factor is at two or more levels. Several factors affect simultaneously the characteristic under study in factorial experiments and the researcher is interested in the main effects and the interaction effects among different factors. Digital tool is transforming institutions, learning processes and creating innervates systems. Nowadays digital tool has become a powerful tool to carry out empirical investigation, collection of qualitative and quantitative data for further analysis. Digital tool namely SPSS is a widely used for analysis of factorial experiments for agricultural research like Factorial CRD and Factorial RBD and also for illustration purposes in the classroom teaching as well as for the researchers with interest in factorial experimental designs. The present study will be useful for researchers to know the analysis of factorial experiments for agricultural research using digital tool.

Keywords*: factorial experiments, digital tool, spss, factorial crd, factorial RBD*

INTRODUCTION

In agricultural research, factorial experiments has two or more factors, each with distinct possible levels and whose experimental units take on all possible combinations of these levels across all such factors. Such a research allows the researcher to study the effect of each factor on the dependent variable, as well as the effects of interactions between factors on the dependent variable. For the majority of factorial experiments, each factor has only two levels. Suppose in 2^2 factorial experiments, we have two factors each at two levels, a factorial experiment would have four treatment combinations in total, and is usually called a 2×2 factorial design. In factorial experiments, the interaction between the factors is often the most significant. This applies even to situations where a main effect and an interaction are there. Factorial designs were used in the 19th century by John Bennet Lawes and Joseph Henry Gilbert of the Rothamsted Experimental Station (Yates and Mather, 2009). Fisher, (١٩٢٦) argued in 1926 that "complex" designs such as factorial designs were more efficient than studying one factor at a time. Fisher wrote, "No aphorism is more frequently repeated in connection with field trials, than that we must ask Nature few questions, or, ideally, one question, at a time. The writer is convinced that this view is wholly mistaken." Oehlert, (2000) and Montgomery, (2013) examined the effect of only a single factor or variable. Compared to such one-factor-at-a-time (OFAT) experiments, factorial experiments offer several advantages. The digital tool in this era of globalization has accentuated new modes of knowledge transformation and communication patterns (Parmar, 2016). Digital tool has opened up uncommon opportunities for developing countries in terms of providing low cost access to information. This is the fastest growing tool of communication. Digital tool is transforming institutions, learning processes and creating innervates systems. Nowadays digital tool has become a powerful tool to carry out empirical investigation, collection of qualitative and quantitative data for further analysis. Eliciting reliable data facilitates planning process to be more systematic. Whereas, monitoring and evaluation exercises throw better insights into the functioning of the schemes/ programmes at every stage. In this context, use of digital tool like SPSS will aid the end-user to infer the results in a simple and orderly manner to make quick decisions. The present study will be useful for researchers to know the analysis of factorial experiments for agricultural research using digital tool.

OBJECTIVE

To know the analysis of factorial experiments for agricultural research using digital tool SPSS

METHODOLOGY

Statistical package for the social sciences (SPSS) is the set of modules that are combined together in a single digital tool. SPSS is proprietary digital tool. The basic application of this digital tool is to analyze experimental data

related with the agricultural science. This digital tool can be used for agricultural research, surveys, data mining, etc. User need to import raw data into digital tool SPSS through excel file. Once user imports the data, the SPSS will analyse it. Based on what user want to study, user can give desired commands as per the requisitions in the SPSS tool. SPSS is a sophisticated digital tool originally designed to support analysis and management of experimental data. Factorial ANOVA allows the researcher to test the effectives of two independent factors; hence, this method is called Two-Way ANOVA. Researcher can simultaneously assess the effects of two or more independent factors on a single dependent variable within the same analysis. Factorial ANOVA also allows the researcher to determine the possible combined effects of the independent factors. In two-way ANOVA generates three F-values: one to test the main effects of each factor, and a third to test the combined effect of the two factors. In the two-way ANOVA, four different sets of contributors would be required. If the first factor is Nitrogen and the second factor is Varieties, four combinations would be required to permit a factorial ANOVA (Table 1).

Table 1: Factorial combination of nitrogen and varieties

Nitrogen Varieties	n_o	n_1
p_0	$n_o p_0$	$n_1 p_0$
p_1	$n_o p_1$	$n_1 p_0$

This factorial combination will allow us to compare the n_o vs. n_1 (Nitrogen) and p_0 vs. p_1 (Varieties) on a given dependent variable. This would be the same as if we did two separate studies and conducted two t-tests (one comparing the n_o vs. n_1, and one comparing p_0 vs. p_1). But it would be more economical and efficient, because we would get the same information from one study and one analysis (the 2 x 2 ANOVA). What is crucial to the factorial combination of these two independent variables is that we are also able to assess the possible interaction effect of the two independent variables combined. If $p < .05$ for the main effect of a particular factor then there is a significant effect for that factor. The interpretation of the interaction effect is more complex. If the F-value of the interaction effect is not significant (i.e., $p > .05$), then our conclusion would be that nitrogen differences in varieties did not depend on the level of varieties. If the F-value for the interaction *is* significant ($p < .05$), then we would conclude that nitrogen differences in varieties depend on the level of varieties.

RESULTS AND DISCUSSION

Suppose an experiment was conducted by using factorial RBD with the following details.

Factor	Level
Sowing Dates (S)	s_1,s_2 and s_3
Doses of Nitrogen (N)	n_o,n_1,n_2 and n_3

Procedure for Factorial Design using digital tool SPSS as under:

1 Row data :

Treatment Combination	Replication					
	I	II	III	IV	V	VI
s_1n_0	8.3	10.3	8.0	8.0	6.0	8.5
s_1n_1	9.3	9.0	9.5	11.7	11.3	10.7
s_1n_2	11.3	11.5	11.3	11.7	14.7	15.0
s_1n_3	10.5	15.7	10.5	11.7	10.3	15.0
s_2n_0	5.7	4.5	8.3	8.5	5.3	4.3
s_2n_1	4.7	5.3	8.0	9.3	5.3	6.7
s_2n_2	5.3	5.5	8.0	8.7	8.5	11.3
s_2n_3	6.5	8.3	8.0	9.0	6.3	8.5
s_3n_0	5.0	4.7	1.5	3.0	3.7	4.5
s_3n_1	7.0	8.3	2.5	3.5	6.7	4.5
s_3n_2	3.3	3.3	2.5	1.0	6.3	8.0
s_3n_3	2.7	4.3	1.3	2.5	4.0	7.7

Data Arrangement in SPSS Data Editor Window

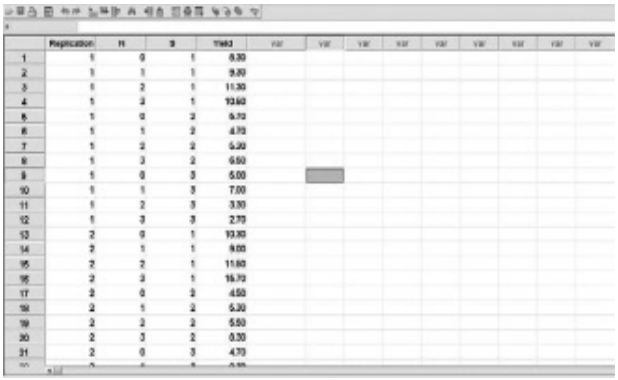

Fig. 1: SPSS data editor window