TECHNOLOGICAL GAP IN SUMMER BAJRA PRODUCTION TECHNOLOGY BY THE FARMERS OF BANASKANTHA DISTRICT

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BY

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ABSTRACT

TECHNOLOGICAL GAP IN SUMMER BAJRA PRODUCTION TECHNOLOGY BY THE FARMERS OF BANASKANTHA DISTRICT

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ABSTRACT

Technological gap is a major problem in increasing summer bajra production in the Banaskantha district. So far, no systematic effort was made to study the technological gap existing in various components of summer bajra cultivation in Banaskantha district. The present study entitled, "Technological gap in summer bajra production technology by the farmers of Banaskantha district" was therefore, planned with following specific objectives.

Objectives of the study

1) To study the selected characteristics of the summer bajra grower
2) To ascertain knowledge level of the summer bajra growers pertaining to recommended summer bajra production technology
3) To determine the extent of technological gap in recommended summer bajra production technology
4) To study the association between selected characteristics of the summer bajra growers and their Technological gap in recommended summer bajra production technology
5) To know the constraints faced by the summer bajra growers in adoption of recommended summer bajra production technology
6) To seek the suggestions from the summer bajra growers for maximum adoption of recommended summer bajra production technology

Methodology

"*Ex-post facto"* research design was used for the study. Banaskantha district of Gujarat State was selected purposively as it has covered maximum area under summer bajra cultivation. Using multistage sampling technique, three talukas *viz.*, Deesa, Tharad and Dhanera were selected purposively from the district as these talukas were having higher area under summer bajra cultivation. Five villages were selected randomly from each taluka. Thus, total 15 villages were selected. From each selected village, 10 farmers were selected randomly making a sample of 150 respondents.

Findings and conclusions

1. Slightly less than half of the summer bajra growers belonged to middle age group.
2. In this study, slightly more than one third of the respondents were educated up to primary school.
3. Nearly one-third of summer bajra growers had small size of land holding.
4. Little more than one-third of the summer bajra growers had annual income between ₹ 50,001 to ₹ 1,00,000.
5. Majority of the summer bajra growers had membership in social organization.

6. Majority of the summer bajra growers had medium yield index.
7. Majority of the summer bajra growers had medium level use of information sources.
8. Majority of the summer bajra growers had medium level of extension participation.
9. Majority summer bajra growers had high cropping intensity.
10. Majority of the summer bajra growers were using flood irrigation method.
11. More than three fifth of the summer bajra growers had medium level of knowledge.
12. Slightly more than two-third of the summer bajra growers were having medium technological gap.
13. The independent variables, six variables *viz.,* education, land holding, annual income, social participation, source of information and yield index had negative and significant correlation with overall technological gap of summer bajra growers. Whereas, one variable *viz.,* age of the summer bajra growers had positive and significant correlation with overall technological gap. Whereas two variables *viz.,* cropping intensity and method of irrigation had positive and non-significant correlation with overall technological gap of summer bajra growers, whereas, one variable *viz.,* extension participation had negative and non-significant relationship with the overall technological gap in summer bajra production technology.
14. Major constraints faced by the summer bajra growers in adoption of recommended summer bajra production technology were; shortage of labour, high wages of labour, non-remunerative price of production, lack of technical knowledge and wind lodging causes yield loss and damage by wild animals.
15. The most important suggestions expressed by summer bajra growers to overcome the constraints faced by the respondents in adoption of improved summer bajra production technology were; provision of support price to the farmers, Proper marketing facility should be established, to develop lodging resistance varieties, timely technical guidance should be provided and price of agricultural inputs should be reasonable.

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CERTIFICATE – I

Date: 13 /03 /2021

This is to certify that the thesis entitled, "**TECHNOLOGICAL GAP IN SUMMER BAJRA PRODUCTION TECHNOLOGY BY THE FARMERS OF BANASKANTHA DISTRICT**" submitted for the degree of **MASTER OF SCIENCE** in the subject of **AGRICULTURAL EXTENSION AND COMMUNICATION** is a record of bonafide research work carried out by **BHANDERI SAGAR DHIRAJLAL** under my guidance and supervision and that no part of this thesis has been submitted for any other degree, diploma, associateship, fellowship or other similar titles. The assistance and help received during the course of investigation have been fully acknowledged.

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This is to certify that **BHANDERI SAGAR DHIRAJLAL**, Department of Agricultural Extension and Communication, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar has made all corrections/modifications in the thesis entitled, **"TECHNOLOGICAL GAP IN SUMMER BAJRA PRODUCTION TECHNOLOGY BY THE FARMERS OF BANASKANTHA DISTRICT"** as suggested by the External Examiner and the Advisory Committee in the oral examination held on **04th SEPETEMBER, 2021.**

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(Bhanderi Sagar D.)

Place: Sardarkrushinagar
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LIST OF ABBREVIATIONS AND SYMBOLS

%	:	Per cent
₹	:	Rupee
et al.	:	et allii; and other
etc.	:	Et cetera
Fig.	:	Figure
FYM	:	Farm Yard Manure
g	:	Gram
ha	:	Hectare
i. e.	:	That is
kg	:	Kilogram
kg/ha	:	Kilogram per hectare
lit./ha	:	Litre per hectare
M.T.	:	Million Tonnes
S. K. Nagar	:	Sardarkrushinagar
S.D.	:	Standard Deviation
S.D.A.U.	:	Sardarkrushinagar Dantiwada Agricultural University
Sr.	:	Serial
Sr. No.	:	Serial Number
t/ha	:	Tonne per hectare
viz.,	:	Namely

SYMBOLS

=	:	is equal to
.	:	Full stop
×	:	Multiply
&	:	And
-	:	Minus
( )	:	Bracket
√	:	Square root
[ ]	:	Square bracket
,	:	Comma
%	:	Per cent
>	:	Greater than
<	:	Less than
/	:	Per
Σ	:	Summation
;	:	Semi colon
:	:	Colon

INTRODUCTION

I. INTRODUCTION

Agriculture has always occupied a pride place in Indian economy. The great significance of agriculture in the country's economy is well understood by the fact that it is mainstay of the people. Agriculture forms the backbone of Indian economy, as 70.00 per cent of its population is living in villages and majority of them are related to agricultural enterprise (The Hindu National, July 15, 2011). For improving their economic condition, agricultural production has to be increased through improved techniques suited to local condition. If the country has to attain self-sufficiency in agricultural production, farmer must be convincingly persuaded to accept new agricultural technology. Low agricultural production is due to the gap between the scientific knowledge devolved by the scientists and the extent to which it has found in practical application by the farmers.

India has exhibited a phenomenal growth in agricultural sector after independence. Our country witnessed "Green Revolution" in late sixties onward and it is a landmark in Indian agriculture resulting not only self-sufficiency in grain food but also in export of surplus produce to other countries. Being agriculture-based economy of the country, different crops like, cereal crops, fibre crops, oil seed crops, legume crops, fruits and vegetables crops *etc.*, are grown in our country. Among all these crops, cereal crops have a specific place in Indian agriculture. cereal crops comprising rice, wheat, bajra, jowar *etc.*, are important on global basis which play a pivotal role in agriculture and export trade of India.

Pearl millet (*Pennisetum glaucum* L.) is the most popular cereal crop grown in tropical semi-arid regions of the world and belongs to the family of Gramineae. The common name of Pearl millet over a large part of India is bajra or *bajri*. This grain is basically originated from India or Africa. Bajra is a coarse grain crop and considered to be the poor man's staple nourishment and suitable to cultivate in drylands. The nutritive value of bajra grain is fairly higher with carbohydrate (69.40%), fat (05.00%), marginal protein (09.00-11.00%) and minerals (02.70%). It is rich in vitamin A and B. In India, bajra ranks fourth in acreage after rice, wheat and sorghum. Bajra is extensively grown in the dry areas of western and Southern India and along Southern peripheries of the Sahara Desert in Africa. It is also grown as fodder crop in the South-Eastern USA, Australia, South Africa and other regions.

Pearl millet is one of the important crops grown in India and ranks fourth in area after rice, wheat and sorghum in India. India occupies the first position in area (7.8 million ha) and production (9.25 million tonnes) of pearl millet, with an average productivity of 12.70 qtl/ha (Pearl Millet News, 2016). Pearl millet is mostly grown in the states of Rajasthan, Uttar Pradesh, Haryana, Gujarat and Maharashtra, the average yield of pearl millet in Gujarat is 20.04 MT/ha which is almost double as compared to India, i.e., 11.54 qtl/ha. The average yield of pearl millet in Gujarat has increased at the growth rate of 5.29 per cent while it has increased by 4.08 per cent in India over the last ten years (2005 to 2016) (Directorate of Economics & Statistics). Among the different millets, pearl millet occupied highest area and production in Gujarat. In Gujarat, total millet average is 3.58 million hectares in which pearl millet accounted for 0.41 million hectares area in the year 2018-19. However, average of kharif pearl millet over the years is decreasing. But at the same time irrigated summer cultivation of pearl millet has increased, even though it is more than kharif pearl millet cultivation in the acreage (Directorate of Agriculture, 2012).

Gujarat, 8 districts accounted for almost 90 per cent of the area and production under summer pearl millet. Among these districts Banaskantha is the leading district with more than 40 per cent of the area and production followed by Anand and Kheda (Reddy *et al*. 2013). This trend is mainly due to the increase in irrigation facility in the region as a result of which cropping intensity also creased in the region as whole. There is a positive relation between percent area under summer pearl millet and percent area under irrigation (Reddy *et al.* 2013). Allocation of area un different crops in a season is dependent on various physical, economic and social factor such as diversity of weather, climate, types of soil, level of technology, irrigation relative prices, which play an important role in pearl millet production. Irrigate summer cultivation of pearl millet have an advantage of higher grain yield along will better quality, which is the major reason for shifting pearl millet cultivation in Gujarat.

Adoption of latest technology is most important for enhancing farm productivity. It primary depends on the transfer of technology and its application by the farmers by making the best use of the available resources as well as on attributes of the farmers.

Adoption is a decision to use continues an innovation. It is a mental process through which an individual passes from first hearing of an innovation to its final decision. Generally, people do not adopt new practice or idea as soon as they hear and know about

it. They may wait for several months or even years before trying the idea. Therefore, the wide time leg might be observed between the introduction of an innovation and its adoption, even though the best efforts of the extension agencies made in the process of transfer of farm technologies. Moreover, the farmers also facing various constraints in adoption which may hinder the adoption of recommended farm technology.

Major summer bajra growing districts of Gujarat States are Banaskantha, Anand, Kheda, Mehsana. Main bajra Research Station, Jamanagar has released various cultivation practices for bajra crop and are being communicated to the summer bajra growers through various extension agencies like transfer of technologies centre (TOTs), Krushi Vigyan Kendra (KVK), Farmer Training Centre (FTCs), Tribal Training Centre (TTCs), Tribal Research and Training Centre (TRTC), Tribal Farm Women Training Centre (TFWTC) *etc.* State Department of Agriculture (SDA) and State Agricultural Universities (SAUs). However, it is observed that there is a wide gap in adoption of summer bajra production technology. Personal, social, economic and situational factors of the farmers influence for non-adoption of farm practices. Looking to the importance and urgency of the problem, a study entitled "Technological gap in summer bajra production technology by the farmers of Banaskantha district" is planned.

1.1 Statement of the problem

The agricultural scientists are capable of producing appropriate technology in agriculture sector. Our scientists have focused on crop production technologies and is has impacted on increasing crop production which was witnessed of green revolution.

Banaskantha is important summer bajra growing district with an area 1.4 lakh ha and production 3.9 lakh MT (Directorate of Agriculture Gujarat State Gandhinagar) but the main problem as it exists today is that last few years Banaskantha district having decreasing way of area and production in summer bajra due to low awareness of new technologies and low yield as compare to different another crops.

Though summer bajra is assuming prime importance in cereal crop among the farming community, there exist a wide gap between average yield of common farmers and actual potential of the crop. This demands urgent attention to the reasons encountered. Keeping in view the low yield of summer bajra at farmer's level, it is realized to know the level of technological gap with respect to summer bajra production technology.

The 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. The several constraints influence the transfer of the technology on the farm. Such constraints may be technological, socio-economic, organizational, infrastructural facilities and extension service related. Considering all these aspects in view, the present study entitled "Technological gap in summer bajra production technology by the farmers of Banaskantha district" was carried out with following specific objectives:

1.2 Objectives of the study

The present study was conceived with the overall objective to study the technological gap in summer bajra production in Banaskantha district of Gujarat state.

1) To study the selected characteristics of the summer bajra grower
2) To ascertain the knowledge level of the summer bajra growers pertaining to recommended summer bajra production technology
3) To determine the extent of technological gap in recommended summer bajra production technology
4) To find out the association between selected characteristics of the summer bajra growers and their technological gap in recommended summer bajra production technology
5) To know the constraints faced by the summer bajra growers in adoption of summer bajra production technology
6) To seek the suggestions from the summer bajra growers for maximum adoption of recommended summer bajra production technology

1.3 Importance of the study

It is assumed that this study was provide an insight into the process of technological gap in summer bajra production technology. The study will focus on the personal, socio-economic, communicational and psychological characteristics of the summer bajra growers as well as their technological gap status along with its relationship.

The study was also be useful to know the various constraints faced by the summer bajra growers in technological gap. The suggestions offered by summer bajra growers was useful to all those who are engaged in promoting agricultural development in the state.

Likewise, the study was of immense importance to the planners, extension workers, administrators, teacher and students of extension education who are directly or indirectly

engaged with the development of cultivation technology in summer bajra crop as well as in agriculture as a whole.

The study was further useful for getting feedback to the agricultural scientists, planners and administrators of the state departments and agricultural universities about the problems of summer bajra production technology faced by the summer bajra growers. Further, the researcher can modify their present research agenda based on the feedback received from the summer bajra growers.

1.4 Limitations of the study:

1) The study was limited to the summer bajra growers of Banaskantha district of Gujarat state.
2) The study was limited to few selected characteristics of the summer bajra growers.
3) Findings of the study were based on verbally expressed opinions of the summer bajra growers and their honesty in providing required information for the study.

1.5 Operationalization of the concept used

1.5.1 Technological gap

The technological gap refers to the difference between technology recommended by the scientists and its adoption by the respondents.

1.5.2 Knowledge

It is a body of understood information possessed by the farmers in respect of recommended summer bajra production technology.

1.5.3 Adoption

Adoption means actually putting the recommended summer bajra production technology in to practices.

1.5.4 Respondents

The summer bajra growers who has been interviewed as per criteria of section for the study.

1.5.5 Age

It refers to the completed years of the respondents on the date of interview rounded off to the nearest years.

1.5.6 Education

Education is process of producing desired change in the behaviour of people. It is the ability of farmers to read and write or formal education received up to a certain standard. It is the formal literacy among the farmers.

1.5.7 Land holding

It is the number of hectares of land an individual farmer possesses and cultivates.

1.5.8 Annual income

This indicates about the total income which was earned by the respondents from both farming and allied fields put together.

1.5.9 Social participation

It refers to degree to which individual was associated with different formal social organization.

1.5.10 Yield index

It is a ratio of yield of summer bajra obtained by summer bajra growers during normal year and potential yield of summer bajra.

1.5.11 Source of information

It is a person, thing or place from which information comes, arises or obtained. Information sources can be known as primary or secondary. That source might then inform a person about something or provide information about it.

1.5.12 Extension participation

It is defined as the degree to which an individual participates in various non-formal educational activities including individual contact, group contact and mass contact methods with a view to obtain new information, knowledge and skills related to agriculture.

1.5.13 Cropping intensity

It denotes the intensity of land used by the farmers. In other words, it is a ratio of total cropped area to net cultivated area expressed in percentage.

1.5.14 Method of irrigation

It indicates the irrigation method adopted by farmers in his field to provide water to the bajra crop.

1.5.15 Constraints

This refers to the items of difficulties faced by the farmers in actual adoption of recommended summer bajra production technology.

1.5.16 Suggestions

This refers to the suggestions given by the summer bajra farmers in respect to overcome the constraints in adoption of recommended summer bajra production technology.

REVIEW OF LITERATURE

II. REVIEW OF LITERATURE

The main purpose of this chapter is to present a comprehensive and critical review of past researches to provide sound basis for scientific investigation. It helps researcher to develop theoretical framework to delineate the research methodology as well as to operationalise concepts and variables and gets support in the interpretation of the findings.

No research studies on technological gap in summer bajra production technology has been conducted so far in Banaskantha district. Hence, attempt has been made to present a brief review of literature related to present study under the following heads

2.1 Personal, socio-economic, communicational and situational characteristics of the farmers

2.2 Knowledge level of the farmers regarding to recommended crop production technology

2.3 Extent of technological gap in recommended crop production technology

2.4 Association between personal, socio-economic, communicational and situational characteristics of the farmers and their technological gap in recommended crop production technology

2.5 Constraints faced by the farmer in adoption of recommended crop production technology

2.6 Suggestions from the farmers for maximum adoption of recommended crop production technology

2.1 Personal, socio-economic, communicational and situational characteristics of the farmers

2.1.1 Personal characteristics

(a) Age

Kharat (2012) during his study on technological gap in cultivation of rabi sorghum in Buldana district of Western Vidarbha region, noted that higher proportion of rabi sorghum growers (43.33%) were appeared in the middle age group of 36 to 50 years followed by 36.67 per cent of respondents who were in the age category of above 50 years and 20.00 per cent of respondents were appeared in young age group below 35 years.

Laborte (2012) in his study on extent of gap in rice practices reported that most of the respondents (61.67%) were from medium farm experience, whereas 30.00 per cent of the respondents were high and 08.33 per cent respondents were from low farm experience category.

Magarwadia (2013) reported that the findings related to characteristics revealed that a great majority (84.17%) of the farmers were in middle to old age group.

Nirmala *et al.* (2013) in their study on hybrid rice technologies in Jharkhand concluded that out of total sample farmers 20.00 per cent were young, 64.00 per cent were middle aged and 16.00 per cent were old age group.

Parikh (2013) indicated that three fifth (60.00%) of respondents belonged to middle age group, followed by young age (25.84%) and old age (14.16%) groups, respectively.

Jayabhaye (2014) observed that higher proportion of maize growers (44.17%) were appeared in the young age group up to 35 years followed by 36.66 per cent of respondents who were in medium age category of 36 to 50 years and 19.17 per cent of respondents were appeared in old age group i.e., above 50 years. Mean age of 120 respondents was found to be 39.22 years.

Raut (2014) concluded that 47.00 per cent of the respondent wheat growers belonged to middle age group.

Kale *et al.* (2015) observed that 42.50 per cent of the wheat growers were under middle age group category between 36 to 50 years followed by 35.50 per cent respondents old age category i.e., above 50 years and remaining 22.00 per cent respondents observed in young age category.

Machhar *et al.* (2015) showed that majority (73.33%) of soybean growers were found in middle age group, followed by old age (14.00%). Remaining 12.67 per cent soybean growers were found in young age.

Nirwan (2016) indicated that half (50.00%) of the paddy growers were found in the middle age group of 36 to 50 and 39.00 per cent appeared in old age category that is above 50 years. A very few (11.00%) of the paddy growers were observed in young age group of up to 35 years.

Samarpitha *et al.* (2016) reported that majority (68.33%) of the respondent paddy grower were middle aged group.

Bhabhor *et al.* (2017) reported that majority (50.67%) of the respondent tribal irrigated wheat grower were middle aged group.

Jakkawad *et al.* (2019) revealed that 61.25 per cent of the respondents were belongs to middle age group category, followed by 22.50 per cent of the respondents belonged to young age category.

Patel (2019) studied that slightly more than half (53.33%) of the pomegranate growers belonged to middle age group, followed by 32.00 per cent old age and 14.67 per cent young age group, respectively.

(b) Education

Darandle (2010) revealed that nearly one third (30.00%) of the tribal maize growers had education up to higher secondary, followed by 26.67 per cent, 24.17 per cent and 15.00 per cent of them who had secondary, collegiate level and primary level, of education, respectively.

Chaudhari (2011) in his study on technological gap in rice wheat production system reported that majority (65.83%) of the respondents were educated up to primary level followed by illiterate farmers up to (16.67%) and 09.16 per cent of them received high school and above education and only 08.34 per cent of them received higher education.

Kharat (2012) during his study on technological gap in cultivation of Rabi sorghum in Buldana district of Western Vidarbha region, observed that one third (33.33%) of the respondents were educated up to high school level followed by 23.34 per cent respondents were educated up to primary school level and one fifth (20.00%) of them were educated up to middle school. Further, it was found that 15.00 per cent respondents who could reach college level of education and 08.33 per cent respondents were found in the illiterate category.

Magarwadia (2013) that reported that more than one half (57.50%) education between primary school educations to high school education.

Nirmala *et al*. (2013) conducted study on hybrid rice technologies in Jharkhand and concluded that 36.00 per cent of the farmers were illiterate, 28.00 per cent had primary education, 22.00 per cent possessed secondary education and only 14.00 per cent of the sample farmers had college level of education.

Jayabhaye (2014) observed that slightly more than one fourth (26.66%) of the respondents were educated up to higher secondary level followed by 23.33 per cent respondents were educated up to secondary school level, slightly more than one fifth (21.67%) of them were educated up to senior college level. Further, it was found that 19.17 per cent respondents who could reach middle level of education and only 09.17 per cent respondents were found in the primary category.

Raut (2014) revealed that 36.00 per cent of the respondents were educated high school, followed by 27.00 per cent respondents who could reach primary school level of education. Further, it was found that 22.00 per cent of them were educated up to middle school and only 05.00 per cent respondents were educated up to college and 10.00 per cent respondents were observed illiterate.

Kale *et al*. (2015) observed that 38.00 per cent wheat grower had high school level education followed by 22.50 per cent had higher secondary school level education.

Sharma *et al.* (2015) observed that 60 per cent of the respondents were having medium level of education followed by 35.00 per cent with low level of education. Only 05.00 per cent of the respondents were in high level of education category.

Nirwan (2016) observed that 42.00 per cent of paddy growers were educated up to high school level followed by 19.00 per cent of paddy growers were educated up to college level. Further, it was found that 15.00 per cent of the paddy growers were educated up to higher secondary school level.

Samarpitha *et al*. (2016) reported that 39.17 per cent of the respondent paddy grower were educated up to SSC to intermediate level.

Bhabhor *et al*. (2017) reported that 42.67 per cent of the respondent tribal irrigated wheat had educated at secondary school level (8 to 10^{th} Standard).

Jakkawad *et al*. (2019) revealed that 11.25 per cent of the selected respondents were having high school education, followed by 16.67 per cent had higher secondary school level education, college level (47.50%) middle school (07.50%) primary (02.50%) and only 17.50 per cent illiterate have not attended formal schooling.

Patel (2019) studied that 28.67 per cent of the respondents were educated up to primary school. On the other hand, 26.00 per cent respondents had middle school level education, 16.67 per cent respondents were found in functionally literate and 12.00 per cent respondents had high school level education. It is fortune to note that 09.33 per cent respondents were illiterate and only 07.33 per cent respondents were found to be graduate.

2.1.2 Socio-economic characteristics

(a) Land holding

Kharat (2012) during his study on rabi sorghum in Buldana district of Westem Vidarbha region, observed that above one third (34.17%) of the respondents belonged to semi-medium category of land holding having land in between 2.01 to 4.00 ha, about one forth (24.17%) of respondents were belonged to medium land holding category

possessing land in between 4.01 to 10.00 ha 22.50 per cent respondents were belonged to small land holding category possessing land between 1.01 to 2.00 ha and 11.66 per cent respondents were belonged to large land holding category possessing land above 10.00 ha. and 07.50 per cent of respondents were belonged to marginal land holding category, have land up to 1.00 ha.

Magarwadia (2013) is found that 58.34 per cent of the farmers were comes under semi medium to medium category possessing land holding up to 2 to 10 hectares.

Jayabhaye (2014) observed that 45.00 per cent of the respondents belonged to semi-medium category of land holding having land in between 2.01 to 4.00 ha. followed by 28.33 per cent respondents were belonged to medium land holding category possessing land in between 4.01 to 10.00 ha, 16.67 per cent respondents were belonged to small land holding category possessing land between 1.01 to 2.00 ha and 06.67 per cent respondents were belonged to large land holding category possessing land above 10.00 ha.

Raut (2014) concluded that 44.00 per cent of the respondents wheat growers belonged to category of semi-medium land holding ranging from 2.01 to 4.00 ha.

Kale *et al*. (2015) observed that more than one third (34.00%) respondents were observed in small land holding, 26.50 per cent of respondents was having land between (2.01 to 4.00) ha (semi medium) and 25.00 per cent of the farmers having land between (4.01 to 10.00) hectares (medium). 10.00 per cent of respondents were marginal (up to 1.00ha.) land holders only 04.50 per cent large (above 10.00 ha) land holding category.

Sharma *et al*. (2015) reported that majority (63.33%) of the respondent's paddy grower had 2.5 to 3.0 ha of land holding.

Nirwan (2016) observed that 35.00 per cent of the paddy growers possessed small size land holding, followed by 31.00 per cent having marginal category of land holding and 23.00 per cents of the paddy growers who possessed land 2.01 to 4.00 ha. and belonging to semi medium land holding category. Further, it was found that 08.00 per cent of the paddy growers who possessed land 4.01 to 10.00 ha and belonging to medium land holding category. The percentage of the paddy growers belongs to large land holding above 10.00 ha. was only 03.00 per cent.

Jakkawad *et al*. (2019) observed that 16.25 per cent of respondents were small farmers (1.01 to 2.00 ha), 25.00 per cent of respondents were semi medium farmers (4.01 to 10.00 ha), 46.25 per cent of the respondents were medium level and 21.25 per cent large farmers (10.00 ha and above), respectively.

Patel (2019) indicate that 42.00 per cent of pomegranate growers had small size of land holding, while 41.33 per cent pomegranate growers had marginal size of land holding. The respondents with semi-medium and medium size of land holding were 14.67 and 02.00 per cent, respectively.

(b) Annual income

Chaudhari (2011) observed that majority (61.67%) of the farmers belong to medium income group whereas 20.83 per cent belongs to low-income group followed by 17.50 per cent of farmers from high income group.

Oladele (2011) in his study on technology and extension gap among rice farmers reported that 48.34 per cent had medium annual income followed by 43.33 per cent and 08.33 per cent farmers had low and high annual income, respectively.

Kharat (2012) during his study on technological gap in cultivation of rabi sorghum in Buldana district of Western Vidarbha region, noted that 44.17 per cent of the respondents had annual income between Rs. 50,001 to 1,00,000 followed by 40.83 per cent respondents who were found to have annual income up to Rs. 50,000. The percentage of the respondents having annual income above Rs. 1,00,000 were found to be 15.00 per cent.

Magarwadia (2013) found that majority (64.17%) of the farmers had medium annual income.

Jayabhaye (2014) noted that the percentage of the respondents having annual income above Rs. 2,00,000 were found to be 23.33 per cent, followed by 10.83 and 09.17 had annual income Rs. 1,50,000 to 2,00,000 and up to 50,000, respectively.

Raut (2014) observed that 45.00 per cent of the respondents belonged to Rs. 1,50,001 to Rs. 2,25,000 of annual income category

Nirwan (2016) concluded that majority (63.00%) of the paddy growers belonged to Rs. up to 1,00,000 of annual income category.

Bhabhor *et al*. (2017) found that 40.67 per cent respondents had annual income Rs. 25001 to Rs. 50000 annual income categories.

Jakkawad *et al*. (2019) revealed that, majority (60.00%) of respondents had annual income between Rs. 1,00,000 to Rs. 1,50,000.

Patel (2019) indicate that 66.00 per cent of the pomegranate growers had high level of annual income, followed by medium and low level of annual income of respondents were, 26.67 and 07.33 per cent, respectively.

(c) Social participation

Desai (2005) stated that majority (74.16%) of bajra growers had medium level utilization of information sources.

Kharat (2012) during his study on technological gap in cultivation of rabi sorghum in Buldhana district of Western Vidarbha region, inferred that 44.17 per cent of the respondents had not anticipated in any social organizations.

Sasane *et al*. (2012) reported that majority (52.50%) of the paddy growers were having medium level of social participation followed by 30.00 per cent of them had low level of social participation and only, 17.50 per cent had high level of social participation respectively.

Magarwadia (2013) reported that majority (71.67%) of the farmers had medium social participation.

Singh (2013) found that 38.33 per cent of the paddy growers had low social participation followed by 33.33 per cent found in medium social participation category and only, 28.34 per cent were in high social participation category.

Machhar *et al*. (2015) revealed that 64.00 per cent soybean growers had no membership in any organization while, 24.67 per cent had membership in more than one organization. Only 08.00 per cent soybean growers had membership in one organization. Remaining 03.33 per cent soybean growers were found holding position in various organizations.

Sharma *et al*. (2015) reported that 80.00 per cent of the respondent small paddy grower had no membership in social participation.

Bhabhor *et al*. (2017) reported that 50.00 per cent of the respondent small tribal irrigated wheat grower had no membership in social participation.

Chaudhary (2019) found that majority (63.34%) of the fennel growers were members in one organization. While 20.00 per cent of the tribal fennel growers were member in more than one organization. The equal number of the fennel growers (08.33%) were found holding position in various organizations and could not associated with any social organization.

Jakkawad *et al*. (2019) observed that, 48.75 per cent of respondents had medium level of social participation followed by high (24.44%) and low level (12.50%) of social participation.

Patel (2019) indicated that 57.33 per cent of the pomegranate growers were members in one organization. While 26.67 per cent of the pomegranate growers were member in

more than one organization. Only 08.67 per cent of the pomegranate growers were found holding position in various organizations and 07.33 per cent of the pomegranate growers could not associated with any social organization.

(d) Yield index

Prajapati (2012) revealed that 55.00 per cent of the potato growers obtained medium level of yield index, whereas 23.33 per cent potato growers had high level of yield index and 21.67 per cent potato growers had low yield index.

Patel (2014) revealed that slightly less than three-fourth (73.33%) of the groundnut growers had medium level of yield index, while 14.67 per cent respondents had low level of yield index and 12.00 per cent respondents had high level of yield index of the groundnut.

Chaudhari (2016) revealed that majority (67.78%) of the castor growers had medium level of yield index.

Desai (2016) revealed that 46.00 per cent of the potato growers had medium level of yield index, followed by 35.00 per cent of the respondents had low level of yield index and 19.00 per cent of the respondents had high level of yield index.

Chaudhary (2019) revealed that three-fourth (75.00%) of the carrot growers had medium yield index. Followed by 14.38 and 10.62 per cent of the carrot growers who had high and low yield index, respectively.

Patel (2019) indicate that majority (75.33%) of the pomegranate growers had medium yield index, followed by 13.33 and 11.34 per cent of the pomegranate growers had low and high yield index, respectively.

2.1.3 Communicational characteristics

(a) Source of information

Desai (2005) stated that nearly three-fourth (74.16%) of bajra growers had medium level utilization of information sources.

Kharat (2012) during his study on technological gap in cultivation of rabi sorghum in Buldana district observed that about three forth (74.17%) of respondents belonged to medium category of use of information sources. The percentage of respondents belonged to high category was 13.33 and 12.50 per cent of respondents were observed in low category of information sources.

Nirwan (2016) observed that majority (87.00%) of the paddy growers were having medium level sources of information, about 12.00 per cent of the paddy growers were having low level sources of information. Only 01.00 per cent of the paddy growers were

having high level sources of information about SRI method of paddy cultivation practices.

Madhavrao (2017) indicated that more than two third (70.00%) of respondents belongs to medium level of source of information followed by 16.67 per cent of the respondents belongs to high level of source of information and only 13.33 per cent of the respondents belongs to low level of source of information.

Singh (2017) indicated that nearly three fifth (58.30%) of respondents had medium level use of information sources followed by 21.67 and 20.00 per cent respondents high and low level of sources of information, respectively.

Uikey *et al*. (2018) in their study on analysis of technological gap in potato production technology in Gwalior district of Madhya Pradesh revealed that more than two third (68.33%) of the potato growers belonged to medium level of information source utilization followed by 21.67 and 10.00 per cent of potato growers belonged to low and high level of information source utilization, respectively.

Chaudhary (2019) described that more than two-three (66.66%) of the fennel growers had medium level of information source, while equal number (16.67%) of them had high and low level of information source.

Patel (2019) discovered that more than two-third (69.30%) of the pomegranate growers had medium level utilization of sources of information, while 14.67 and 16.00 per cent of them had high and low-level utilization of sources of information, respectively.

(b) Extension participation

Darandle (2010) revealed that 69.16 per cent of the tribal maize growers had medium level of contact with different extension agencies, followed by high (20.00%) and low level of (10.80%) extension contact.

Kumawat (2011) stated that 31.67 per cent of the paddy growers had low extension participation, followed by 54.17 per cent of the paddy growers had medium extension participation and 14.16 per cent of them had high extension participation.

Humbal (2012) observed that 68.33 per cent of the respondents had medium extension participation, whereas 21.67 and 10.00 per cent of them had low and high extension participation, respectively.

Naik (2012) revealed that, majority (56.25%) the respondents attended the Krishi mela and demonstrations (29.17%), then field visits (28.75%), educational tours

(23.33%), training programmers (21.67%), agriculture exhibition (18.75%), field days (17.50%), and group meetings (06.25%).

Machhar *et al*. (2015) revealed that 84.00 per cent of the soybean growers had medium extension participation, whereas 14.67 per cent had high extension participation. Only 01.33 per cent soybean growers had low extension participation.

Hattali (2019) observed that majority (90.83%) of the respondents had medium extension contact.

2.1.4 Situational characteristics

(a) Cropping intensity

Kumbhani (2009) revealed that 65.62 per cent of the coriander growers had medium cropping intensity followed by 15.63 per cent and 18.75 per cent of the respondents with high and low cropping intensity, respectively.

Mavani (2012) showed that 82.50 per cent respondent had medium cropping intensity followed by 17.50 per cent respondent with high cropping intensity.

Hadiya (2013) observed that 60.83 per cent of the groundnut growers had medium cropping intensity followed by 22.50 and 16.67 per cent of the respondents with high and low cropping intensity, respectively.

Wani *et al*. (2013) revealed that the cropping intensity with respect to cropped area was observed highest (152.8%) in adopter-farmers of northern region followed by the central region and the lowest (126.27%) in southern region.

Dholariya (2014) concluded that 75.00 per cent of the beneficiaries and (73.33%) non-beneficiaries had medium level of cropping intensity.

Bhabhor *et al*. (2017) studied on factors affecting the technological gap of tribal wheat growers, indicated that 70.00 per cent of the wheat growers had 151-200 per cent cropping intensity, whereas 14.00 per cent had 101-150 per cent, 08.00 per cent had 201-250 per cent and 06.00 per cent had more than 250 per cent cropping intensity, respectively. Only 02.00 per cent wheat growers had up to 100.00 per cent of cropping intensity.

(b) Method of irrigation

Patel (2015) revealed that majority (100.00%) of the pomegranate growers had adopted drip as a method of irrigation followed none of the flood and sprinkler irrigation system adopted by pomegranate growers for pomegranate production.

Kadu (2016) revealed that the majority (80.00%) of the respondents had adopted drip as a method of irrigation, followed by 12.00 per cent and 08.00 per cent orange

growers who had adopted flood irrigation method and double ring method as a method of irrigation, respectively.

Mane *et al*. (2017) revealed that more than three fifth (61.67%) of the potato growers had adopted drip as a method of irrigation followed by 20.83 per cent and 17.50 per cent potato growers who had adopted furrow irrigation method and sprinkler irrigation system as a method of irrigation, respectively.

Wankhede *et al.* (2017) revealed that majorly (63.00%) of orange growers have used drip as a method of irrigation and 37.00 per cent orange growers used double ring as a method of irrigation.

Baldaniya (2019) revealed that 49.38 per cent of the okra growers had used flooding irrigation method and rank first, 35.62 per cent of the okra growers had used drip irrigation method and ranked second and 15.00 per cent of the okra growers had used sprinkler irrigation method and ranked third.

2.2 Knowledge level of the farmers regarding the recommended crop production technology

Darandle (2010) revealed that majority (62.00%) of the respondents had medium level of knowledge regarding improved practices of maize cultivation, whereas 28.00 per cent and 10.00 per cent of the respondents had low and high level of knowledge regarding improved practices of maize cultivation, respectively.

Sasane *et al.* (2011) reported that almost all the chilli growers had complete knowledge about selection of soil and preparatory tillage operation, transplanting, irrigation management and harvesting. Majority of the chilli growers had complete knowledge about intercultural operation, selection of seed 95.00 per cent, spacing 89.17 per cent, varieties 88.73 per cent and planting methods 88.33 per cent.

Chaudhari (2012) reported that majority (70.00%) of wheat growers were having medium level of knowledge, followed by 19.00 per cent of them had low level of knowledge and 11.00 per cent of respondents had high level of knowledge.

Kharat (2012) conducted study on technological gap in cultivation of rabi sorghum in Buldana district of Western Vidarbha region and concluded that majority (60.84%) of the respondents were having medium level of knowledge of rabi sorghum cultivation. This was followed by 30.83 per cent of respondents who had high level of knowledge and 08.33 per cent were having low level of knowledge of rabi sorghum cultivation practices.

Rao *et al.* (2012) observed that more than half (57.00%) of the FFS respondents were in the high-level group had high level of knowledge.

Suman (2012) revealed that 35.00 per cent of the respondents showed satisfactory knowledge level about the use of bio-fertilizers. He further noted that half (50.00%) of them respondents showed poor knowledge and rest of them (15.00%) were having good knowledge of bio-fertilizer use.

Vashishtha *et al*. (2013) found that majority (57.50%) of the respondents had medium level of knowledge on rice production technology followed by 24.17 and 18.00 per cent had low and high levels of knowledge, respectively.

Jayabhaye (2014) revealed that majority (75.00%) of the respondents were having medium level of knowledge of maize cultivation. This was followed by 25.00 per cent of respondents who had high level of knowledge and no one observed in low level of knowledge of maize cultivation practices.

Raut (2014) found that, majority (51.00%) of the farmers possessing medium level of knowledge about wheat cultivation practices.

Singh *et al*. (2014) revealed that 45.00 per cent of the respondents had medium level of knowledge, followed by 33.33 per cent who had high level of knowledge and it was observed that 21.67 per cent had low level of knowledge.

Shah *et al*. (2015) found that majority (67.00%) of the of rice growers had medium level of knowledge and whereas only 07.00 per cent of rice growers had high level of knowledge and 16.00 per cent had low level of knowledge of scientific rice cultivation practices.

Nirwan (2016) observed that majority (64.00%) of the paddy growers were having medium level of knowledge of SRI method of paddy cultivation while, 25.00 per cent of the paddy growers were having high level of knowledge and 11.00 per cent of paddy growers were having low level of knowledge.

Wedge (2017) observed that 48.33 per cent of respondents had medium knowledge level followed by 36.67 per cent of them who had high knowledge level and 15.00 per cent had low knowledge level about kharif maize production technology.

2.3 Extent of technological gap in recommended crop production technology by the farmers

Sharma (2012) revealed that 49.88 per cent of technological gap was in case of winter rice when compared another cereal.

Jayabhaye (2014) concluded that more than four fifth (83.33%) of the respondents were observed in medium category of technological gap of recommended maize cultivation technologies followed by 10.00 per cent of the respondents who were observed in high technological gap category and 06.66 per cent were observed in low category of technological gap.

Patel *et al*. (2014) revealed that majority (65.00%) of respondents had low technological gap, followed by medium (32.50%), very low (02.50%) technological gap in adoption recommended maize seed production practices, respectively.

Singh (2014) revealed that 50.83 per cent of respondents had medium level of adoption gap regarding recommended rice production technology.

Nirwan (2016) concluded that 86.00 per cent of paddy growers were observed under medium level category of technological gap in adoption of recommended SRI method of paddy cultivation, followed by 10.00 per cent of paddy growers were observed in high level of technological gap and 04.00 per cent of paddy growers were found in low level category of technological gap.

Choudhary *et al.* (2018) reported that slightly more than half (51.20%) of the respondents were having medium level of mean technology adoption gap, 24.00 per cent were having low and 24.80 per cent were having high mean technology adoption gap in improved mustard cultivation practices.

Chaudhary (2019) clearly indicated that 55.63 per cent carrot growers had medium technological gap, followed by high (26.87%) and low (17.50%) technological gap in carrot cultivation technology, respectively.

Patel (2019) indicated that 71.33 per cent pomegranate growers had medium technological gap, followed by high (15.34%) and low (13.33%) technological gap in pomegranate cultivation technology, respectively.

2.4 Association between personal, socio-economic, communicational and situational characteristics of the farmers and their overall technological gap in recommended crop production technology

2.4.1 Age and overall technological gap

Suranse *et al.* (2011) observed that there was negative and non-significant association between age of soybean growers and overall technological gap in soybean cultivation practices.

Parikh (2013) indicated that there was positively and highly significant association between age of soybean growers and overall technological gap in soybean cultivation practices.

Mazhar (2016) reported that there was positive and highly significant relationship between age and their technology adoption gap.

Choudhary *et al.* (2018) reported that there was positive and highly significant relationship between age and overall technological gap in the improved rapeseed-mustard production practices.

Patel (2019) reported that age of the pomegranate growers had positive and non-significant correlation ('r' = 0.015^{NS}) with their overall technological gap.

2.4.2 Education and overall technological gap

Parikh (2013) reported that there was negative and significant relationship between education and overall technological gap in soybean cultivation practices.

Thombre *et al.* (2013) studied on technological gap in adoption of the improved practices of gram by the growers, observed that education had non-significant nature of relationship with technological gap.

Choudhary *et al.* (2018) reported that there was negative and highly significant relationship between education and overall technological gap in the improved rapeseed-mustard production practices.

Patel (2019) reported that education of the pomegranate growers had positive and highly significant correlation ('r' = 0.638**) with their overall technological gap.

2.4.3 Land holding and overall technological gap

Patel (2007) revealed that there was positive and significant relationship between size of land holding and overall technological gap in tribal maize growers.

Ram *et al*. (2010) conducted study on correlates of improved wheat production technology in the district of Varanasi, Uttar Pradesh and observed that size of land holding was positive and significantly related to the adoption of improved technologies by wheat growers.

Parikh (2013) reported that there was negative and highly significant relationship between size of land holding and overall technological gap in soybean cultivation practices.

Thombre *et al.* (2013) observed that land holding had negative and significant nature of relationship with technological gap.

Choudhary *et al.* (2018) reported that there was positive and highly significant relationship between size of land holding and overall technological gap in the improved rapeseed-mustard production practices.

Chaudhary (2019) reported that size of land holding of farmers had negative and non-significant correlation with their overall technological gap.

Patel (2019) reported that size of land holding of farmers had positive and significant correlation with overall technological gap ('r' = 0.281*).

2.4.4 Annual income and overall technological gap

Patel (2007) observed that annual income of the tribal maize growers had negative and significant association with overall technological gap.

Ram *et al*. (2010) conducted study on correlates of improved wheat production technology in the district of Varanasi, Uttar Pradesh and observed that annual average income was positive and significantly related to the adoption of improved technologies by wheat growers.

Parikh (2013) reported that income of the soybean growers had negative and highly significant relationship with technological gap in soybean production technology.

Choudhary *et al.* (2018) reported that there was positive but not significant relationship between annual income and overall technological gap in the improved rapeseed-mustard production practices.

Patel (2019) studied that annual income of the pomegranate growers had positive and significant correlation ('r' = 0.196*) with their overall technological gap.

2.4.5 Social participation and overall technological gap

Patel (2007) revealed that there was positive and significant relationship between social participation and overall technological gap in tribal maize growers.

Thombre *et al.* (2013) observed that social participation had negative and significant nature of relationship with technological gap.

Choudhary *et al.* (2018) reported that there was negative and highly significant relationship between social participation and overall technological gap in the improved rapeseed-mustard production practices.

Chaudhary (2019) reported that social participation of the tribal fennel growers had positive and non-significant correlation with their overall technological gap.

Patel (2019) studied that social participation of the pomegranate growers had positive and highly significant correlation with their overall technological gap.

2.4.6 Yield index and overall technological gap

Patel (2007) observed that yield index of the tribal maize growers had negative and significant association with overall technological gap.

Chaudhary (2016) reported that yield index of the castor growers had negative and significant correlation ('r' = -0.1762*) with their overall technological gap.

Patel (2019) studied that yield index of the pomegranate growers had positive and significant correlation ('r' = 0.165*) with their overall technological gap.

2.4.7 Source of information and overall technological gap

Thombre *et al.* (2013) observed that source of information had negative and significant nature of relationship with technological gap.

Choudhary *et al.* (2018) reported that there was negative and highly significant relationship between source of information and overall technological gap in the improved rapeseed-mustard production practices.

Patel (2019) studied that source of information of the pomegranate growers had positive and highly significant correlation ('r' = 0.428**) with their overall technological gap.

2.4.8 Extension participation and overall technological gap

Patel *et al.* (2010) reported that there was negative and significant relationship between extension participation and overall technological gap in safflower production technology.

Parikh (2013) revealed that there was negative and non-significant relationship between extension participation of soybean growers and overall technological gap in soybean production technology.

Markana *et al*. (2016) indicated that extension participation had negative and highly significant relationship with the technological gap in adoption of recommended practices of kharif groundnut.

2.4.9 Cropping intensity and overall technological gap

Gohil (2004) cleared that there was negative and non-significant relationship between cropping intensity of groundnut-pigeon pea inter-relay growers and overall technological gap in groundnut-pigeon pea inter-relay cropping system.

Naruka *et al*. (2010) indicated that there was negative and highly significant relationship between cropping intensity of soybean growers with overall technological gap in soybean cultivation practices.

Markana *et al*. (2016) indicated that cropping intensity had non-significantly related with the technological gap in adoption of recommended practices of kharif groundnut.

Bhabhor *et al*. (2017) indicated that there was negative and non-significant relationship between cropping intensity of tribal wheat growers and overall technological gap.

2.4.10 Method of irrigation and overall technological gap

Sakariya (1991) concluded that majority of respondents had non-significant relationship with method of irrigation and technological gap in cereal crops.

Patel (1995) reported that majority of the farmers highly significant had adopted in drip irrigation method in potato crop.

2.5 Constraints faced by the farmers in adoption of recommended crop production technology

Gorfad (2012) indicated that the most important constraint for adoption was unavailability of certified seeds from government authorized agencies at right time (90.55%), followed by shortage of labour during critical operations especially at harvest and post-harvest stages (89.44%), irregular, erratic and insufficient electric power supply at the time of critical stages of irrigation (87.78%), unreasonable price of farm produce (87.23%), difficulty in use of fertilizers due to increased prices (86.11%) and in time availability and genuine problem of damage caused by Neelgay and Bhund (13.00%), lack of sufficient micro irrigation facilities (sprinkler irrigation system) for providing supplemental irrigation (83.89%), high labour wages (82.78%), lack of awareness about recommended GPT (76.67%) and complicated recommendation to understand i.e. doses are on hectare bases (75.56%).

Thorat *et al*. (2012) noticed that the major constraints faced by the paddy growers in adoption of paddy production technology are no knowledge about seed treatment and plant protection measures (12.14%), non-availability of recommended quantity of FYM (45.71%), lack of knowledge about application of chemical fertilizers (34.29%) and non-availability of recommended soil for cultivation (07.86%).

Nirmala *et al*. (2013) in their study on hybrid rice technologies in Jharkhand concluded the main constraints in the hybrid rice technology were higher seed costs, lower pricing ability, lower profitability, poor grain quality and poor cooking quality with a garret score of 71.09, 66.45, 65.82, 62.18 and 57.73 per cent, respectively. The other constraints in adoption of hybrid rice cultivation were high management, high pest

and disease incidence, high grain shedding, lower head rice recovery and lack of demand with garret score of 52.55, 49.00, 48.82, 35.73 and 28.92 per cent, respectively.

Gopal *et al*. (2014) unbosomed lack of knowledge was perceived as the major constraint in adoption of IPM technologies in rice and was ranked first by the rice farmers followed by lack of skill, labour intensity, low practicability, lack of awareness, lack of capital, complexity of technology and non-availability of inputs were ranked. based on the constraint analysis, a strategy was designed with the components imparting knowledge, imparting skills, creating awareness, input availability, subsidized supply, technology assessment and refinement, credit availability and input quality standards by grouping the technologies suitable under different components.

Machhar *et al*. (2015) reveals that constraints faced by soybean growers in adoption of improved cultivation practices of soybean were shattering loss in existing varieties (44.67%) followed by unavailability of sufficient labour in time (39.33%), lack of technical guidance (23.33%), remaining constraints were high cost of insecticide/ pesticide and weedicide, fluctuating market price of soybean and high cost of fertilizer with 21.33, 20.00 and 13.33 per cent, respectively.

Shanmugasundaram *et al.* (2015) found that a large majority (81.00%) comprising farmers expressed "High labour cost" as the major economic constraint in the adoption of system of rice intensification while around one third of the respondents expressed high capital cost, as the constraint in the adoption of SRI cultivation. Major social constraints were difficulty in availability of system of rice intensification tools like cono weeder and markers. This was followed by lack of information on system of rice intensification technical know-how and need more labourers for adoption of system of rice intensification method, these three were the most important constraints faced by as high as 69.00, 63.00 and 49.00 per cent of the farmers respectively. With respect to psychological constraints, it was found that a vast majority of the farmers expressed lack of mental satisfaction during the initial stage due to the poor crop stand as the major psychological constraint in the adoption of system of rice intensification. This was followed by farmer's mind set for flooding in soil and resistance of labourers to adopt single seedling per hill expressed by 69.70 and 67.40 per cent of the farmers respectively. With respect to environmental constraints, it was found that the majority of respondents were confronted with Non suitability of System of Rice Intensification in the first season.

Biswas *et al*. (2017) reveals that the major constrains of high-quality protein maize production was noted in non-availability of quality seed by 89.50 per cent of the respondents which comes under infrastructural constraint.

Chaudhary (2019) studied that the major constraints faced by the tribal fennel growers in adoption of recommended fennel production technology were; unavailability of certified seed (77.50%), inadequate finance (74.16%), non-remunerative price of production (65.00%), high production cost (63.33%), high cost of fertilizer (61.00%), attack of pest and diseases (57.50%), high cost of seed (55.83%) and shortage and high wages of labour (38.33%) which ranked I, II, III, IV, V, VI, VII and VIII, respectively.

Patel (2019) studied that the major constraints faced by the pomegranate growers in adoption of recommended pomegranate production technology were; fluctuation in the price of fruits (85.33%), lack of technology for value addition (82.66%), lack of knowledge about marketing and export of the fruits (78.00%), lack of knowledge about bahar treatment (74.66%), lack of knowledge about timely application of pesticide and fungicide (72.66%), middlemen take more commission (65.33%), The visits of the extension personnel is not sufficient (58.00%), lack of availability of skilled labour (55.33%) and insufficient capital (52.66%) which were ranked as first to ninth, respectively.

2.6 Suggestions from the farmers for maximum adoption of recommended crop production technology

Darandle (2010) revealed that important suggestions endorsed by the tribal farmers were: supply of production inputs at subsidy rate (98.00%), supply of information about new agricultural technology by village level workers in time (94.00%), increase in irrigation facilities by government (92.50%), reduction in input cost (84.00%), training for improved technology (80.00%), availability of production inputs easily (75.00%), developing location specific varieties of crop (73.00%), regular supply of electricity for irrigation purpose (71.00%) and easy availability of recommended plant protection appliances (69.00%).

Rahman (2012) revealed the suggestions reported by the FFS farmers for increasing adoption of IPM practices which were (rank 1) establishment of more IPM school; (rank 2) arrangement of practical training for the farmers; (rank 3) introduction of IPM practices into school/college academic course; (rank 4) increasing the farmers' awareness on environmental pollution; and (rank 5) ensuring proper supervision of extension worker.

Salunkhe (2014) revealed the suggestions offered by the paddy growers were as; subsidy should be provided for purchase of farm machinery, agency should formed from where high cost inputs made available as cheaper rate, organized extension activities at each gram panchayats in rotation, obtaining crop loan procedure should be made easier, procedure of crop insurance should be made easier, recruit personnel at village level, provide quality seed at cheaper rate, develop structure for providing critical inputs in time, provide information about remunerative area of diversification, ascertain best market price for produce and canal should be routed in unreached area.

Chaudhary (2019) observed that the most important suggestions expressed by tribal fennel growers to overcome the constraints faced by them in adoption of recommended fennel production technology were; provision of remunerative price to the produce (86.66%), timely technical guidance should be provided (85.83%), certified seed should be freely available from co-operative society and government agency (81.66%), development high yielding varieties (78.33%) and crop loan should be provided to the farmers (63.33%) which were ranked I, II, III, IV and V, respectively.

Patel (2019) studied that the most important suggestions expressed by pomegranate growers to overcome the constraints faced by the pomegranate growers in adoption of recommended pomegranate production technology were; the export of fruits through co-operatives sector should be promoted (85.33%), provide training for value addition (78.00%), the co-operative organizations should be established for marketing of pomegranate (75.33%), rural youth should be trained for bahar treatment (72.66%), information about pomegranate price should be made available at proper time (68.00%), institutions and bank should provide loan at proper time (61.33%), the expertise visit of scientist of pomegranate should be made available (56.00%)and the pomegranate fruit processing industries should be established in the area (52.00%)which were ranked as first to eighth, respectively.

METHODOLOGY

III. METHODOLOGY

This chapter deals with the method of research design, tools and techniques of scientific investigation employed in the light of objectives of the study. It describes and clarifies methods for measuring the dependent and independent variables. It includes sampling procedure for data collection and statistical techniques for analysis of data. The methodology adopted for conducting the study is presented as under:

3.1 Plan of study

The study was conducted to know the technological gap among summer bajra growers of the Banaskantha district. So far, very few studies on technological gap in summer bajra crop in Banaskantha district has been conducted. Three talukas namely Deesa, Tharad and Dhanera have the higher area under summer bajra cultivation as compared to other talukas of Banaskantha district.

3.2 Area of study

This study was conducted in Banaskantha district with following consideration: Area and production of summer bajra grown in the Banaskantha district is the highest in the

Gujarat state. This district is located in north Gujarat and bound by Marwar and Sirohi area of the Rajasthan, in the south by parts of Mehsana & Patan districts, in the east by Sabarkantha and Katch districts. Area under summer bajra crop was 1,40,474 ha and production were 3,90,027 tonnes in year 2018. (Directorate of Agriculture, Gandhinagar)

3.3 Research design

The present study was confined to *"Ex-post-facto"* research design. The literal meaning of ex-post facto is "from what is done afterwards". It means some time done or occurring after an event with a retrospective effect on the event.

Ex-post facto research is systematic empirical inquiry in which investigator does not have direct control over independent variables because their manifestations have already occurred or they are inherently not manipulable. Kerlinger (1976) stated that ex-post facto research design is worth to apply when the independent variables have already acted upon.

3.4 Sampling technique

Kerlinger (1976) have described several elaborated sampling techniques. The multistage sampling technique was used for the selection of district and talukas, For this study. While, random sampling technique was used for the selection of the villages and respondents were select from the selected villages. The sampling procedure applied for study is described as under.

3.4.1 Selection of district

Banaskantha district was purposively selected for the study with following consideration.

1) The area and production under summer bajra crop is highest as compared to the other district of the Gujarat State.
2) Banaskantha district has remarkable cultivation area, production and better potentiality of summer bajra.

Fig 3.1: Map of Gujarat state showing selected district under study

Fig. 3.2: Map of Banaskantha district showing selected talukas under study

Fig. 3.3: Map of Tharad taluka showing selected villages under study

Fig. 3.4: Map of Deesa taluka showing selected villages under study

Fig. 3.5: Map of Dhanera taluka showing selected villages under study

Table 3.1: District wise area, production and yield of summer bajra in Gujarat state (2017-18 & 2018-19)

Sr. No.	District	2017-18			2018-19		
		Area (00 ha)	Prod. (00mt'')	Yield (kg/ha)	Area (00 ha)	Prod. (00mt'')	Yield (kg/ha)
1	Kachchh	16.16	47.17	2919.00	18.10	26.76	1478.37
2	**Banaskantha**	**1449.82**	**4167.17**	**2874.27**	**1404.74**	**3900.27**	**2776.51**
3	Patan	41.42	124.91	3015.58	44.58	133.63	2997.46
4	Mehesana	122.98	396.61	3225.03	95.80	307.46	3209.40
5	Sabarkantha	31.90	105.98	3322.20	19.78	65.65	3318.90
6	Arvalli	27.35	83.75	3062.28	18.20	35.90	1972.77
7	Gandhinagar	67.53	233.31	3454.95	52.83	185.29	3507.27
8	Ahmedabad	7.17	20.64	2878.00	12.57	35.98	2862.00
9	Surendranagar	3.29	9.60	2919.00	2.13	6.20	2912.51
10	Morbi	1.35	3.94	2919.00	1.30	3.79	2912.51
11	Rajkot	2.73	7.97	2919.00	2.30	6.70	2912.51
12	Jamnagar	3.54	10.33	2919.00	0.00	0.00	0.00
13	Devbhumi Dwarka	0.15	0.44	2919.00	0.00	0.00	0.00
14	Porbandar	0.88	2.57	2919.00	0.20	0.58	2912.51
15	Junagadh	15.30	48.15	3147.00	10.31	30.88	2995.00
16	Gir Somnath	31.13	96.31	3093.85	32.87	105.07	3196.50
17	Amreli	10.70	31.23	2919.00	5.59	16.28	2912.51
18	Bhavnagar	15.66	50.95	3253.40	15.42	45.05	2921.60
19	Botad	0.90	2.63	2919.00	0.26	0.76	2912.51
20	Anand	263.51	820.22	3112.69	250.07	823.67	3293.75
21	Kheda	252.98	700.68	2769.72	210.89	730.24	3462.67
22	Panchmahal	7.51	15.77	2099.67	15.31	32.52	2124.27
23	Mahisagar	20.59	36.79	1786.81	22.50	46.13	2050.08
24	Dahod	0.05	0.15	2919.00	0.20	0.58	2912.51
25	Vadodara	41.81	97.93	2342.34	40.45	90.65	2241.15
26	Chhotaudepur	0.53	1.55	2919.00	0.00	0.00	0.00
27	Narmada	0.85	2.48	2919.00	1.75	5.10	2912.51
28	Bharuch	3.20	6.01	1876.92	2.20	6.41	2912.51
29	Surat	0.26	0.76	2919.00	0.00	0.00	2919.00
30	Dang	0.00	0.00	0.00	0.00	0.00	0.00
31	Navsari	0.00	0.00	0.00	0.00	0.00	0.00
Gujarat state		**2441.25**	**7126.01**	**2919.00**	**2280.35**	**6641.55**	**2912.51**

(Source: Directorate of Agriculture Gujarat State Gandhinagar)

3.4.2 Selection of talukas

Among 14 talukas of Banaskantha district, three talukas *viz,* Tharad, Dhanera and Deesa talukas were selected purposively due to the highest area under summer bajra cultivation among rest talukas of the district.

Table 3.2: Taluka wise area of summer bajra crop in Banaskantha district (Year 2019-2020)

Sr. No.	Taluka	Area (ha.)
1	**Deesa**	**34550**
2	**Tharad**	**34494**
3	**Dhanera**	**23619**
4	Palanpur	11,611
5	Amirgadh	1247
6	Danta	1669
7	Vadamgam	5128
8	Dantiwada	6820
9	Kankrej	10505
10	Diyodar	12904
11	Lakhani	16733
12	Bhabhar	7462
13	Vav	3612
14	Suigam	892
Total		**1,71,246**

3.4.3 Selection of villages

A list of villages of three talukas was prepared and five villages from each of selected talukas growing summer bajra crops were randomly selected for the study. Hence, the total 15 villages were selected for study.

3.4.4 Selection of respondents

A village wise list of the summer bajra growers was prepared with the help of official in the village and from the list of each selected village 10 summer bajra growers were selected randomly, thus total 150 summer bajra growers were selected for study.

Table 3.3: List of selected villages from selected talukas in Banaskantha district

Sr. No.	Taluka	Name of village	No. of respondents
1	Tharad	Duva	10
		Kiyal	10
		Denduva	10
		Dedudi	10
		Therwada	10
2	Deesa	Kansari	10
		Chora	10
		Tetoda	10
		Malgadh	10
		Vithodar	10
3	Dhanera	Karadhani	10
		Samarvada	10
		Valer	10
		Anapurgadh	10
		Runi	10
Total			**150**

3.5 Selection and measurement of dependent and independent variables

Keeping in view the objectives of the study, relevant variables for the study were selected on the basis of reviewed literature on the subject and consulting the experts and extension personnel of the Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar. The details of the selected variables and methods of their measurement are presented in Table 3.3.

Table 3.4: Measurement of variables

Sr. No.	Variables		Measurement
[A]	**Independent variables**		
(i)	**Personal**		
	a	Age	Chronological age of the respondents was recorded
	b	Education	Scale developed by Pandya & Pandya (2008) was used with due modification
(ii)	**Socio-economic**		
	a	Land holding	Land holding possessed by the respondents was recorded
	b	Annual income	Total annual earning of respondents from all sources was recorded as annual income
	c	Social participation	Structured schedule was developed
	d	Yield index	Structured schedule was developed
(iii)	**Communicational**		
	a	Sources of information	Structured schedule was developed
	b	Extension participation	Scale of Siddaramaiah and Jalihal (1983) was used with due modification
(iv)	**Situational**		
	a	Cropping intensity	Structured schedule was developed
	b	Method of irrigation	Structured schedule was developed
[B]	**Dependent variables**		
	a	Level of knowledge	Structured schedule was developed
	b	Technological gap	Structured schedule was developed

3.6 Operationalization of variables and measurement

3.6.1 Personal variables

(a) Age

Age was measured in terms of years completed by the respondents from birth to the date of interview. It refers to chronological age of respondents in complete years at the time of interview. On the basis of National Adult Education Programme (NAEP), the ministry of education, Government of India. The data regarding age of the respondents were collected and divided into three categories as under.

Sr. No.	Category	Age
1	Young age group	18 to 35 years
2	Middle age group	36 to 50 years
3	Old age group	Above 50 years

(b) Education

Education was operationalised as formal schooling completed by the respondents. The scale developed by Pandya and Pandya (2008) was used. The scoring procedure was following as under.

Sr. No.	Category	Score
1	Illiterate level of education	0
2	Functionally Literate level of education	1
3	Primary School level of education	2
4	Middle School level of education	3
5	High School level of education	4
6	College/Post-Graduation level of education	5

The frequency and percentage were also calculated for interpretation of the information on variable

3.6.2 Socio-economic characteristics

(a) Land holding

The actual land possessed by the respondents in hectares was considered as such for measuring this variable and on the basis of their land holding, respondents were categorized into four categories as given below.

According to the classification of farmers as per the state government norms, the respondents were categorised as under.

Sr. No.	Category	Size of land holding (ha)
1	Marginal land holding	Up to1.00 ha
2	Small land holding	1.01 to 2.00 ha
3	Semi Medium land holding	2.01 to 4.00 ha
4	Medium land holding	4.01 to 10.00 ha
5	Big land holding	Above 10.00 ha

(b) Annual income

Annual income refers to the total earning of family of the respondents from all sources. According to the scale of Pandya and Pandya (2008), the respondents were categorised.

Sr. No.	Category
1	Up to ₹ 50,000
2	₹ 50,001 to ₹ 1,00,000
3	₹ 1,00,001 to ₹ 1,50, 000
4	₹ 1,50,001 to ₹ 2,00,000
5	Above ₹ 2,00,000

(c) Social participation

Social participation refers to the degree of involvement of the respondents in formal organisations either as member or as office bearer. Structured schedule developed was used. In respect of the social participation, the respondents were assigned the score on the basis of following manner and categorised accordingly.

Sr. No.	Category	Score
1	No participation	0
2	Member in one organization	1
3	Member in more than one organization	2
4	Membership with office bearer	3

(d) Yield index

Yield index in this study was defined as ratio of yield of summer bajra taken by summer bajra growers during normal year and potential yield of summer bajra with improved practices. It was obtained by following formula;

$$\text{Yield index} = \frac{\text{Obtained yield (kg/ha)}}{\text{Potential yield (kg/ha)}} \times 100$$

The score obtained by each summer bajra growers was calculated by above mentioned formula. The summer bajra growers were grouped into three categories on the basis of the mean and standard deviation as follow.

Sr. No.	Category	Scores
1	Low yield index	≤ Mean – S. D.
2	Medium yield index	In between Mean ± S. D.
3	High yield index	≥ Mean + S. D.

3.6.3 Communicational variables

(a) Sources of information

Sources of information plays a major role in the diffusion of new ideas or innovations. Information sources were conceptualized as the sources through which farmers get information about new idea or method of farming.

For measuring use of information sources, a structure schedule was developed by listing all possible sources of information available to the respondent. The listed sources were placed on three continuums *viz.,* regularly, occasional and never. The respondents

were asked to indicate the various sources utilised by them three points continuums. The scoring procedure followed was as under.

Sr. No.	Continuum	Score
1	Regularly	3
2	Occasionally	2
3	Never	1

According to the source of information score of summer bajra growers on the basis of mean and standard deviation worked out and summer bajra growers were categorised into three categories using mean and standard deviation.

Sr. No.	Category	Range of score
1	Low utilization	≤ Mean – S. D.
2	Medium utilization	In between Mean ± S. D.
3	High utilization	≥ Mean + S.D.

(b) Extension participation

Extension participation was defined as the degree to which an individual participated in various non-formal educational activities including individual contact, group contact and mass contact methods, with a view to obtain new information, knowledge and skills related to improved summer bajra production technology.

It was measured with the scale of Siddaramaiah and Jalihal (1983) was used with due modification. the scale consisted of ten items having different scale values administered to the respondents and obtained information on the participation of summer bajra growers in different extension activities during the period of previous year. The extension participation score of summer bajra growers was the sum total of the scale value of the items in which summer bajra growers had participated.

According to the extension participation score of summer bajra growers, the mean and standard deviation were worked out and summer bajra growers were grouped into three categories.

Sr. No.	Category	Range of score
1	Low extension participation	≤ Mean – S. D.
2	Medium extension participation	In between Mean ± S. D.
3	High extension participation	≥ Mean + S. D.

3.6.4 Situational characteristics

(a) Cropping intensity

It denotes the intensity of land used by the farmers. In other words, it is a ratio of total cropped area to net cultivated area expressed in percentage. This was calculated with the help of given formula:

$$\text{Cropping intensity} = \frac{\text{Total cropped area in ha}}{\text{Net cultivated area in ha}} \times 100$$

The respondents were classified into following three categories.

Sr. No.	Category	Range of score
1	Low cropping intensity	≤ 100
2	Medium cropping intensity	100 to 200
3	High cropping intensity	> 200

(b) Method of irrigation

A list of methods of irrigation was prepared as per discussion with the professors of agronomy. Finally, three methods of irrigation *viz*., flood irrigation method, sprinkler and drip irrigation method were included in the structured interview schedule. Each respondent had asked to mention the method of irrigation used by him. Based on their responses, frequency and percentage were also worked out against each method of irrigation and ranked on the basis of higher percentage.

Sr. No.	Category	Score
1	Flood	1
2	Sprinkler	2
3	Drip	3

3.6.5 Measurement of dependent variables

(a) Level of knowledge of farmers about summer bajra cultivation technology

Knowledge in the present study was operationalised as a body of understood information possessed by an individual about summer bajra cultivation technology. To measure the knowledge level of the respondents about summer bajra cultivation technology, a battery of the objective questions concerning recommended summer bajra cultivation technology was prepared by consulting experts and referring literature and score was given as suggested by the experts. The 0 score for incorrect and 1 score for correct answer was given to each question. The maximum possible total score of a respondent could obtain was range a from 0 to 24 score. The score on each item was

then added to arrival at total knowledge score of the individual respondent. This procedure suggested by Mayani and Kumar (1980).

Knowledge was measured by following formula.

$$K_i = \frac{X_1 + X_2 + \ldots + X_n}{N} \times 100$$

Ki = Knowledge index

$X_1+X_2+\ldots\ldots\ldots X_n$ = Total no. of correct answer (i.e., total sum)

N = Total no. of item in test

The respondents based on their knowledge score were then grouped into three categories using mean and standard deviation as given below.

Sr. No.	Category	Scores
1	Low level of knowledge	≤ Mean – S. D.
2	Medium level of knowledge	In between Mean ± S. D.
	High level of knowledge	≥ Mean + S. D.

(b) Technological gap in summer bajra production technology

Technological gap has been defined as the proportion of gap in the adoption any technology and it was expressed in percentage. In the present study technological gap was operationalised as the proportion of gap in adoption of summer production technology by the summer bajra growers and expressed in percentage. To measure the technological gap of the summer bajra growers about summer bajra cultivation technology, a battery of the objective questions concerning recommended summer bajra cultivation technology was prepared and zero score for incorrect and one score for correct responses were assigned. The possible total score of a respondent could obtain was ranged 0 to 23 score. The score on each item was then added to arrival at overall technological gap score of the individual respondent.

The technological gap index of a particular practice expressed in percentage is:

$$Technological\ gap\ index = \frac{R - A}{R} \times 100$$

Where,

R = Total score of recommended practices

A = Score of practices actually adopted

Summer bajra growers were classified into three categories on the basis of mean and standard deviation as shown below

Sr. No.	Category	Scores
1	Low technological gap	≤ Mean – S. D.
2	Medium technological gap	In between Mean ± S. D.
3	High technological gap	≥ Mean + S. D.

3.6.6 Constraints faced by the summer bajra growers in adoption of summer bajra production technology

The constraints were operationally defined as the difficulties experienced by the farmers in adoption of recommended summer bajra production technology. To identify the constraints faced by the respondents in adoption of recommended summer bajra production technology, each respondent was asked to select his problems/difficulties from close ended measure constraints. The constraints offered were ranked on the basis of number and percentage of the respondents.

3.6.7 Suggestions from the summer bajra growers for maximum adoption of recommended summer production technology

Suggestions from the summer bajra growers to overcome constraints faced by them in adoption of summer bajra production technology were also collected. The summer bajra growers were asked an open-ended question to give their suggestions.

Frequency and percentage of each suggestion were worked out and ranks were assigned to each suggestion.

3.7 Tools and techniques used in data collection

3.7.1 Development of an interview schedule

The interview schedule was carefully prepared in view the objectives of the study and to collect relevant data. In formulating questions and statements for schedule the investigator had referred the review of related literature, popular articles, and research reports and consulted the members of advisory committee and teaching staff of department of agricultural extension and communication to seek and invite their opinion and suggestions to make interview schedule more scientific and meaningful.

Questions and statements on each and every aspect of the research problem were so framed, in order to study with maximum possible accuracy, clarity and objectivity.
The interview schedule was divided into three major parts.

First part	**:**	First part was developed to study the personal, socio-economic, communicational and situational characteristics of the summer bajra growers.
Second part	**:**	Second part was designed to ascertain the technological gap of recommended summer bajra production technology by the summer bajra growers.
Third part	**:**	Third part was aimed to study various constraints experienced by the summer bajra growers in adoption of recommended summer bajra production technology and the suggestions to overcome the constraints faced by them in adoption of recommended summer bajra production technology.

For effective administration of the interview schedule to the summer bajra growers, it was translated into local language i.e., Gujarati.

3.7.2 Pre-testing of the interview schedule

Pre-testing of interview schedule was done to find out whether the questions were clear to the respondents or not. Before finalizing the interview schedule, it was pre-tested with thirty non-sampled summer bajra growers. At the time of pre-testing of interview schedule the purpose of study was explained to the non-sampled summer bajra growers. On the basis of experienced gained the interview schedule was revised and finalised after incorporating necessary changes.

3.7.3 Collection of data

An interview schedule was used for collection of data. The data were collected through personal contact method by the researchers using the final interview schedule converted in to Gujarati language. The responses were recorded in the interview schedule as the verbal responses given by respondents. During the data collection, investigator has also gathered the useful information through observation and informal discussion with the farmers and extension workers, which were used at the time of interpretation of data.

3.8 Statistical methods

Adopting the methodology explained above, the study was conducted; data were gathered, processed and analysed. Some of the data were subjected to analyse in terms of percentage and frequencies whenever necessary, whereas at some place, mean score and standard deviation were calculated. The Pearson's coefficient of correlation was used to measure association between independent and dependent variables. (Sahu, 2010). All the responses in the interview schedule were transferred to the master sheet to describe personal, socio-economic, communicational, and psychological

characteristics and frequencies were marked and percentages were calculated. The outcome of the present investigation has been presented in the succeeding chapters.

3.8.1 Percentage (%)

Simple comparisons were made on the basis of percentage.

3.8.2 Mean

Mean was obtained by dividing the total score by the number of respondents. It was used for classification of respondents.

$$\overline{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

Where,

Xi = Individual score

$\overline{X}$ = Mean

n = Total number of respondents

3.8.3 Standard deviation (S.D.)

Standard deviation was used for classification of the respondents in the different categories. Standard deviation was calculated by using the following formula.

$$S.D. = \sqrt{\frac{\sum(Xi - \overline{X})^2}{n-1}}$$

Where,

S.D. = Standard deviation

Xi = Individual score

$\overline{X}$ = Arithmetic mean

n = Number of respondents

3.8.4 Correlation coefficient (r)

To find out association between dependent and independent variables the correlation coefficient was calculated by using the following formula.

$$r = \frac{\sum X_i Y_i - \frac{\sum X_i . \sum Y_i}{n}}{\sqrt{\left[\sum X_i^2 - \frac{(\sum X_i)^2}{n}\right]\left[\sum Y_i^2 - \frac{(\sum Y_i)^2}{n}\right]}}$$

Where,

r = Correlation coefficient

$\Sigma X_i Y_i$ = Sum of product of X and Y variables

ΣX_i = Sum of X variables

ΣY_i = Sum of Y variables

ΣX_i^2 = Sum of square of X variables

ΣY_i^2 = Sum of square of Y variables

n = Total number of respondents

3.9 Research hypotheses

In the light of the above referred objectives, the following null hypotheses (H_0) were formulated.

General

H_0:1: There is no association between selected personal, socio-economic, communicational, and situational characteristics of the summer bajra growers and their overall technological gap.

Specific

H_0:1.1: There is no association between age of the summer bajra growers and their overall technological gap.

H_0:1.2: There is no association between education of the summer bajra growers and their overall technological gap.

H_0:1.3: There is no association between size of land holding of the summer bajra growers and their overall technological gap.

H_0:1.4: There is no association between annual income of the summer bajra growers and their overall technological gap.

H_0:1.5: There is no association between social participation of the summer bajra growers and their overall technological gap.

H_0:1.6: There is no association between yield index of the summer bajra growers and their overall technological gap.

H_0:1.7: There is no association between source of information of the summer bajra growers and their overall technological gap.

H_0:1.8: There is no association between extension participation of the summer bajra growers and their overall technological gap.

H_0:1.9: There is no association between cropping intensity of the summer bajra growers and their overall technological gap.

H_0:1.10: There is no association between method of irrigation of the summer bajra growers and their overall technological gap.

3.10 Conceptual model of the study

The conceptual model of the study is presented paradigmatically. The model shown in Fig. 3.6 is a tentative and generalized one. The model shows that all the selected variables do not influence on technological gap. After testing the conceptual model/framework, the empirical model will be suggested based on the finding of the study in the chapter of "Results and Discussion"

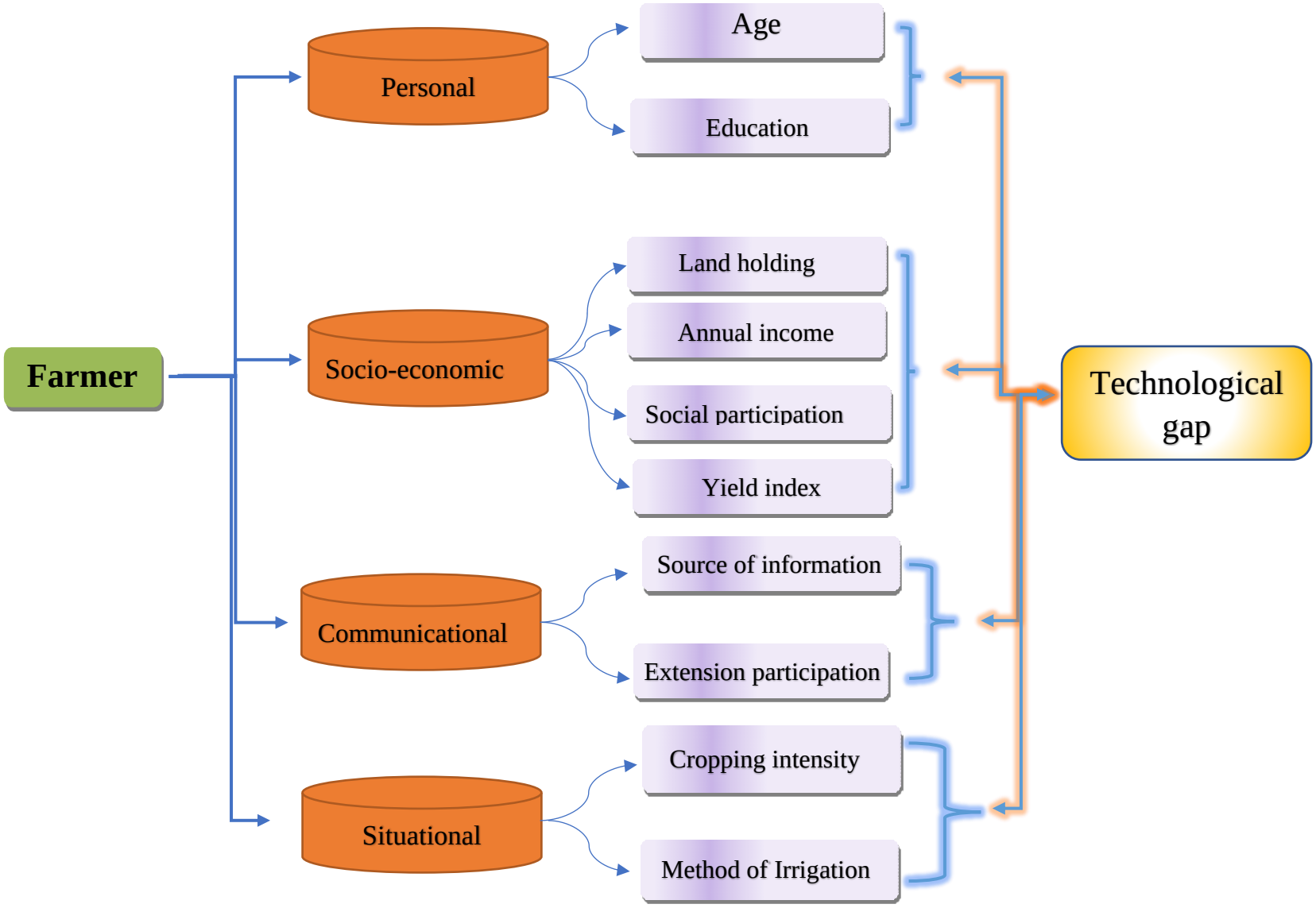

Fig. 3.6: Conceptuel model show no Relationship between Independent variable and Dependent variable

RESULTS AND DISCUSSION

IV. RESULTS AND DISCUSSION

This chapter deals with the entire findings and discussion of the present investigation, which have been arrived at after subjecting the data to statistical analysis.

The facts and findings of the study are presented under the following heads.

4.1 Personal, socio-economic, communicational and situational characteristics of the summer bajra growers

4.2 Knowledge level of the summer bajra growers pertaining to recommended summer bajra production technology

4.3 Extent of technological gap in recommended summer bajra production technology by the summer bajra growers

4.4 Association between personal, socio-economic, communicational and situational characteristics of the summer bajra growers and their overall technological gap in recommended summer bajra production technology

4.5 Constraints faced by the summer bajra growers in adoption of recommended summer bajra production technology

4.6 Suggestions from the farmers for maximum adoption of recommended crop production technology

4.1 Personal, socio-economic, communicational and situational characteristics of the summer bajra growers

4.1.1 Personal characteristics

The relevant literature pointed out that some personal, socio-economic, communicational and situational characteristics of the summer bajra growers would have considerable contribution to stimulate their adoption behavior. In the present study such characteristics *viz.,* age, education, land holding, annual income, social participation, yield index, source of information, extension participation, cropping intensity and method of irrigation were selected. The results of the same are presented as follows.

(a) Age

The data collected from the respondents about age were classified according to their age which are presented in Table 4.1.

Table 4.1: Distribution of the summer bajra growers according to their age

Sr. No.	Category	Frequency	Per cent
1	Young age (18 to 35 years)	37	24.66
2	Middle age (36 to 50 years)	67	44.67
3	Old age (above 50 years)	46	30.67
Total		**150**	**100.00**

The data in Table 4.1 indicate that little less than one half (44.67%) of the summer bajra growers belonged to middle age group followed by old age (30.67%) and young age group (24.66%), respectively.

From the above discussion, it can be concluded that little less than half of the summer bajra growers (44.67%) belonged to middle age group i.e., 36 to 50 years. The probable reason might be that, old respondents were retired and they transfer their occupation to an elder son. Young age respondents were engaged either in educational activities and diverted towards service sector.

The similar findings have been reported by Kharat (2012), Kale *et al.* (2015), Nirwan (2016) and Bhabhor *et al.* (2017).

(b) Education

Education is the process of producing the desired changes in the behavior of the farmers. Formal education is most essential for respondents, as it provides them with wide exposure, helps to accept new technologies in the right perspective and equips them to face challenges. It was measured with the help of education scale developed by Pandya and Pandya (2008). The data collected from the respondents in relation to their education were grouped into six categories which are presented in Table 4.2 and depicted in Fig. 4.2.

Table 4.2: Distribution of the summer bajra growers according to their education level

Sr. No.	Category	Frequency	Per cent
1	Illiterate level of education	15	10.00
2	Functionally literate level of education	28	18.67
3	Primary school level of education	53	35.33
4	Secondary level of education	31	20.67
5	Higher secondary level of education	13	08.66
6	College/Post-Graduation level of education	10	06.67
Total		**150**	**100.00**

The data in the Table 4.2 revealed that 35.33 per cent of the respondents were educated up to primary school. On the other hand, 20.67 per cent respondents had

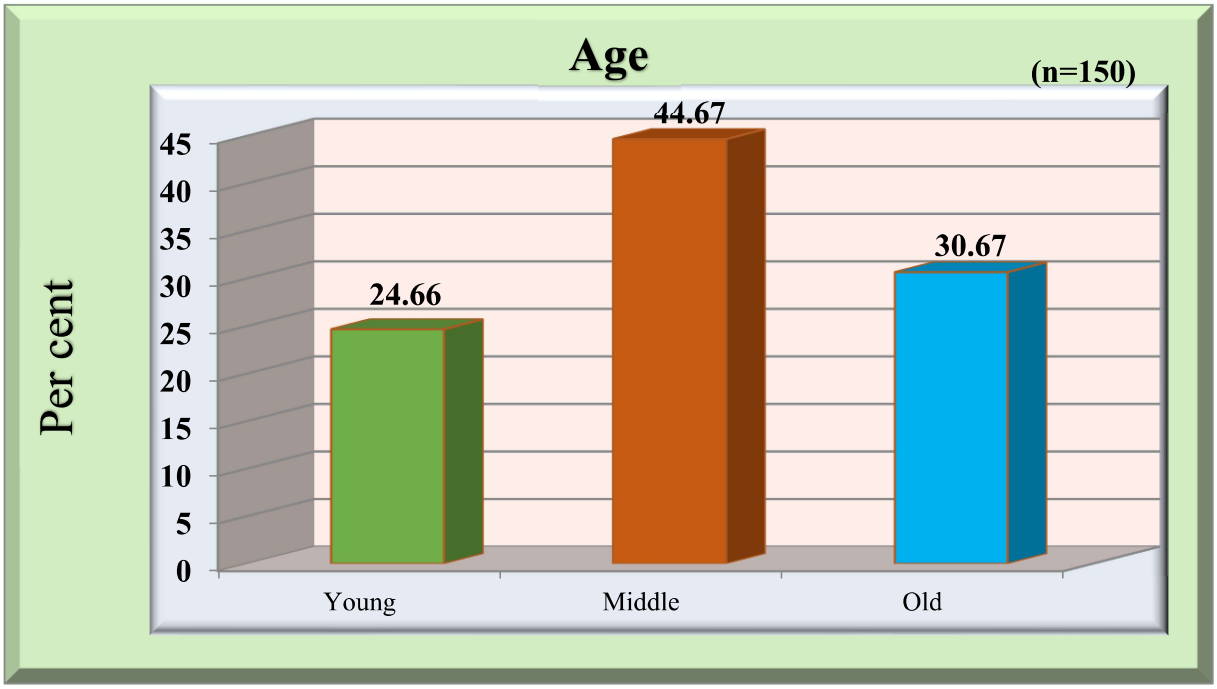

Fig. 4.1: Distribution of the summer bajra farmers according to their age

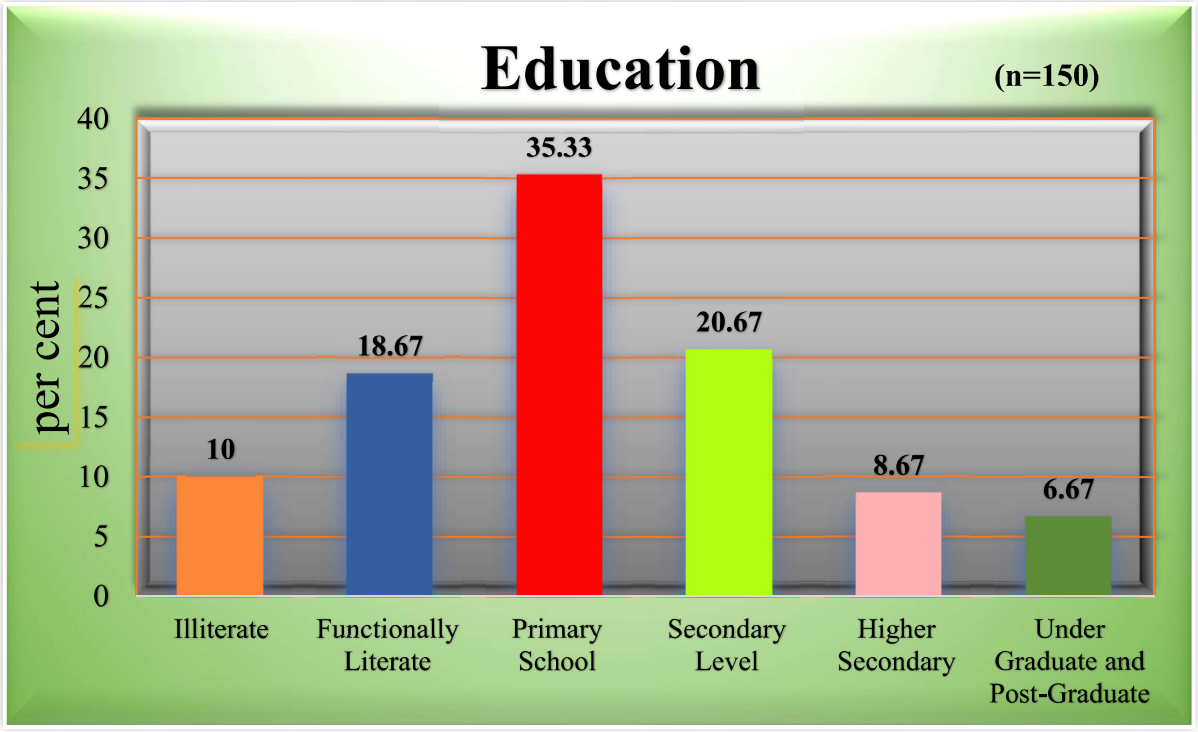

Fig. 4.2: Distribution of the summer bajra grower according to their education

secondary school level education, 18.67 per cent respondents were found functionally literate and 10.00 per cent respondents were found illiterate. It is important to note that 08.66 per cent respondents were found in higher secondary level education and only 06.67 per cent respondents were found to be graduate.

It can be interpreted from above findings that maximum summer bajra growers (35.33%) had primary school level of education. The possible reason for low level of education among the summer bajra growers may be due to the villages are having the educational facility up to primary school level and for getting higher studies one has go to cities which gives rise to different problems. Their common belief that instead of time devoted in school, it can be better utilized in some kind of income generating work to help the family.

The similar findings have been reported by Magarwadia (2013) and Patel (2019).

4.1.2 Socio-economic characteristics

(a) Land holding

Land holding has been considered as one of the important factors that determine the economic status and potentiality of farmers to go for new agricultural technology as well as other allied enterprises. The information in this regard was collected and farmers were grouped into five categories as per government resolution, *viz*.; (i) Marginal farmer (up to 1.00 ha), (ii) Small farmer (1.01 to 2.00 ha), (iii) Semi-medium farmer (2.01 to 4.00 ha) and (iv) Medium size of land holding (4.01 to 10.00 ha), (v) Large (Above. 10.00 ha) The information regarding land holding of the respondents is presented in Table 4.3 and depicted in Fig. 4.3.

Table 4.3: Distribution of the summer bajra growers according to their land holding

Sr. No.	Category	Frequency	Per cent
1	Marginal land holding (up to 1.00 ha)	39.00	26.00
2	Small land holding (1.01 to 2.00 ha)	47.00	31.33
3	Semi-medium land holding (2.01 to 4 ha)	44.00	29.33
4	Medium land holding (4.01 to 10.00 ha)	13.00	08.67
5	Big land holding (above. 10.00 ha)	07.00	04.67
Total		**150**	**100.00**

The data in Table 4.3 indicate that 31.33 per cent of summer bajra growers had small size of land holding, while 29.33 per cent summer bajra growers had semi-medium size of land holding. The respondents with marginal, medium and large size of land holding were 26.00, 08.67 and 04.67 per cent, respectively.

It is thus, concluded that majority (60.66%) of the respondents were from small to semi-medium size of land holding. The possible reason for this might be due to the fragmentation of land holding among the members of family.

The similar findings have been reported by Kale *et al.* (2015) and Nirwan (2016).

(b) Annual income

Annual income refers to the yearly gross earning of beneficiary farmer from all sources. Normally, it is believed that higher income motivates any farmer for higher investment in farming development which brings-up higher adoption and higher techno-economic change. It also helps in optimum and timely procurement of inputs to run the agricultural enterprise successfully. The data in this context are presented in Table 4.4 and Fig. 4.4.

Table 4.4: Distribution of the summer bajra growers according to their annual income

Sr. No.	Category	Frequency	Per cent
1	up to ₹50,000	18	12.00
2	₹50,001 to ₹1,00,000	51	34.00
3	₹1,00,001 to ₹1,50,000	45	30.00
4	₹1,50,001 to ₹2,00,000	19	12.67
5	Above ₹2,00,000	17	11.33
Total		**150**	**100.00**

The data presented in Table 4.4 suggested that, 34.00 per cent of the summer bajra growers had annual income between ₹50,001 to ₹1,00,000, while 30.00 per cent of the summer bajra growers had annual income between ₹1,00,000 to ₹1,50,000, and 12.67 per cent summer bajra growers belonged to annual income from ₹1,50,001 to ₹2,00,000. Whereas 12.00 per cent of the summer bajra growers had annual income up to ₹50,000. Only 11.33 per cent summer bajra growers had annual income above ₹2,00,000.

It can be concluded that little more than one half (64.00%) of summer bajra growers had annual income between ₹50,000 to ₹1,50,000. Such findings are due to the reason that majority of the summer bajra growers were done mixed farming (Agriculture + Animal husbandry).

The similar findings have been reported by Chaudhari (2011), Oladele (2011) and Magarwadia (2013).

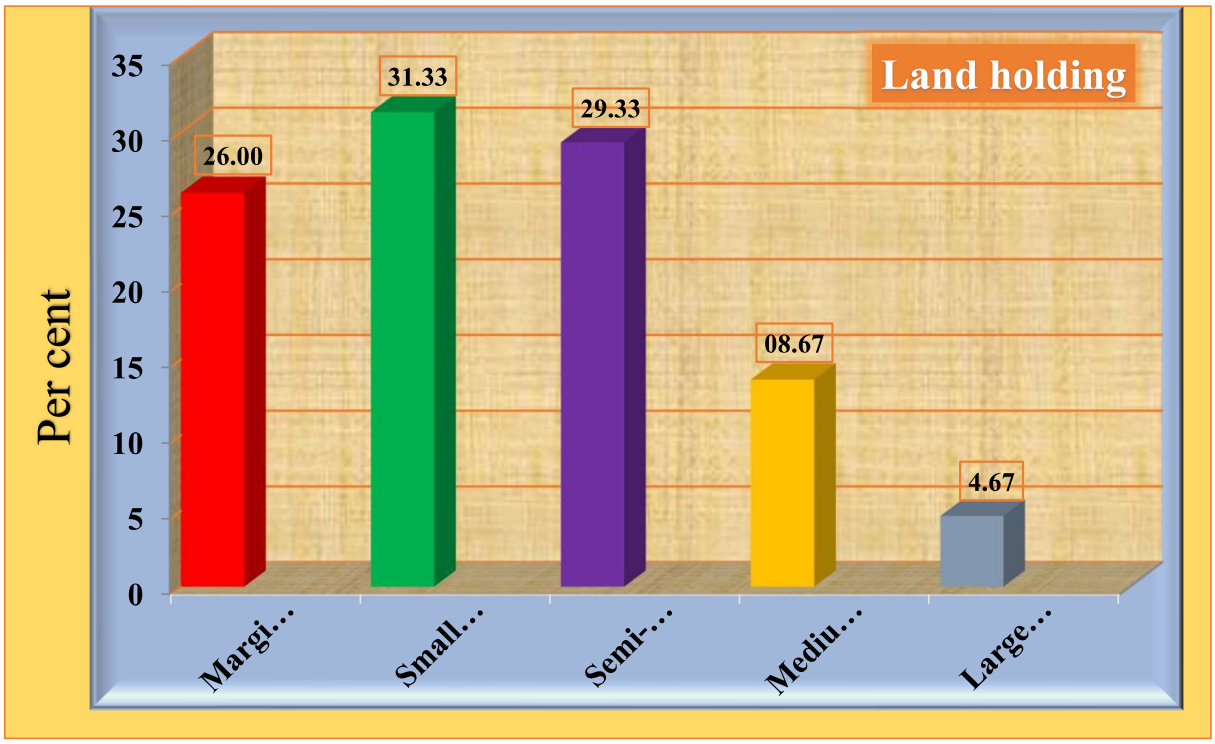

Fig. 4.3: Distribution of the summer bajra growers according to their land holding

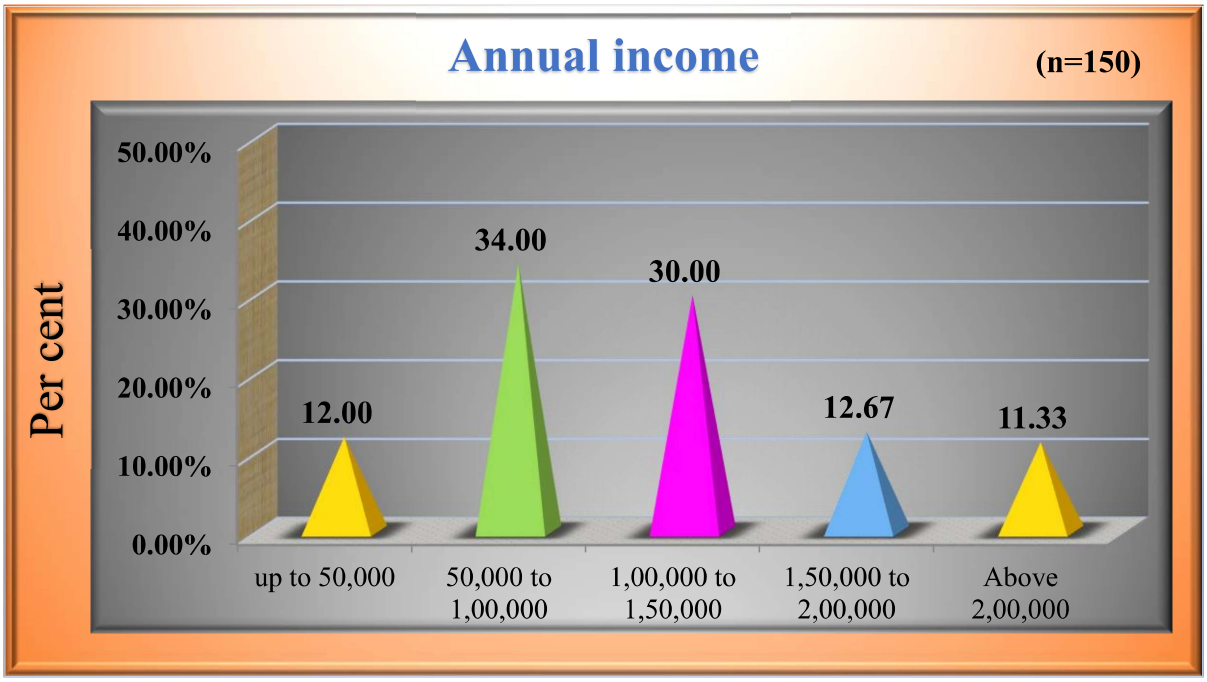

Fig. 4.4: Distribution of the summer bajra growers according to their annual income

(c) Social participation

It denotes the extent to which an individual is actively involved in the affairs of the community. These who have wider social contacts are probably more community oriented, knowledgeable and resourceful and hence, they may help in diffusion of innovations and may adopt innovations earlier. Keeping these in view, social participations of the summer bajra growers was studied. The data pertaining to social participation of the respondents are presented in Table 4.5 and depicted Fig. 4.5.

Table 4.5: Distribution of the summer bajra growers according to their social participation

Sr. No.	Category	Frequency	Per cent
1	No participation	29	19.33
2	Membership in one organization	79	52.67
3	Membership in more than one organization	28	18.67
4	Membership with office bearer	14	09.33
Total		**150**	**100.00**

The data presented in Table 4.5 indicate that 52.67 per cent of the summer bajra growers were members in one organization. While, 19.33 per cent of the summer bajra growers were not associated with any social organization. Only 18.67 per cent of the summer bajra growers were members in more than one organization and remaining 09.33 per cent of the summer bajra growers were found holding position in various organizations.

The above data indicate that majority of the summer bajra growers (80.67%) had membership in social organization. The possible reason might be that in all the villages under study a milk co-operative society was functioning and animal husbandry is being their secondary occupation most of the farmers sell the milk to the society for which they must have the membership. Secondly, in certain villages having different aspect of service co-operative society, farmer club *etc.,* were also working.

The similar findings have been reported by Sasane *et al*. (2012), Magarwadia (2013) and Patel (2019).

(d) Yield index

Yield of the crop has directly bearing with adoption of the crop production technology. Hence, yield data of the summer bajra was collected from the farmers. This is presented in Table 4.6 and Fig. 4.6.

Table 4.6: Distribution of the summer bajra growers according to their yield index

Sr. No.	Category	Frequency	Per cent
1	Low yield index (≤79.28 score)	30	20.00
2	Medium yield index (>79.28 to <95.64 score)	88	58.67
3	High yield index (≥95.64 score)	32	21.33
Total		**150**	**100.00**

Mean= 87.46 **S.D. = 08.18**

The data in Table 4.6 indicate that 58.67 per cent summer bajra growers had medium yield index, followed by 21.33 and 20.00 per cent of the summer bajra growers had high and low yield index, respectively. Hence, it is inferred that majority of summer bajra growers had medium yield index.

The similar findings have been reported by Prajapati (2012) and Chaudhari (2016).

4.1.3 Communicational characteristics

(a) Sources of information

Source of information is the physical bridge between research station and farmers. The farmers become aware by several different methods of communication such as formal, informal and mass media. There are various sources which help farmers to acquire information about farm technologies. From part of information sources, the farmers generally prefer very few information sources for getting information. Therefore, an attempt has been made to know the information sources generally utilized by the farmers for acquiring information. The results pertaining to information sources are depicted in Table 4.7 and Fig. 4.7.

Table 4.7: Distribution the summer bajra growers according to their utilization of sources of information

Sr. No.	Category	Frequency	Per cent
1	Low utilization (≤30.72 score)	26	17.33
2	Medium utilization (> 30.72 to < 44.58 score)	96	64.00
3	High utilization (≥ 44.58 score)	28	18.67
Total		**150**	**100.00**

Mean= 37.65 **S.D. = 06.93**

It is seen from Table 4.7 that majority (64.00%) of the summer bajra growers had medium level use of utilization information sources, while 18.67 and 17.33 per cent of them had high and low-level use of utilization information sources, respectively.

It can be concluded that majority of summer bajra growers had medium level utilization of information sources. The probable reason for this might be their medium

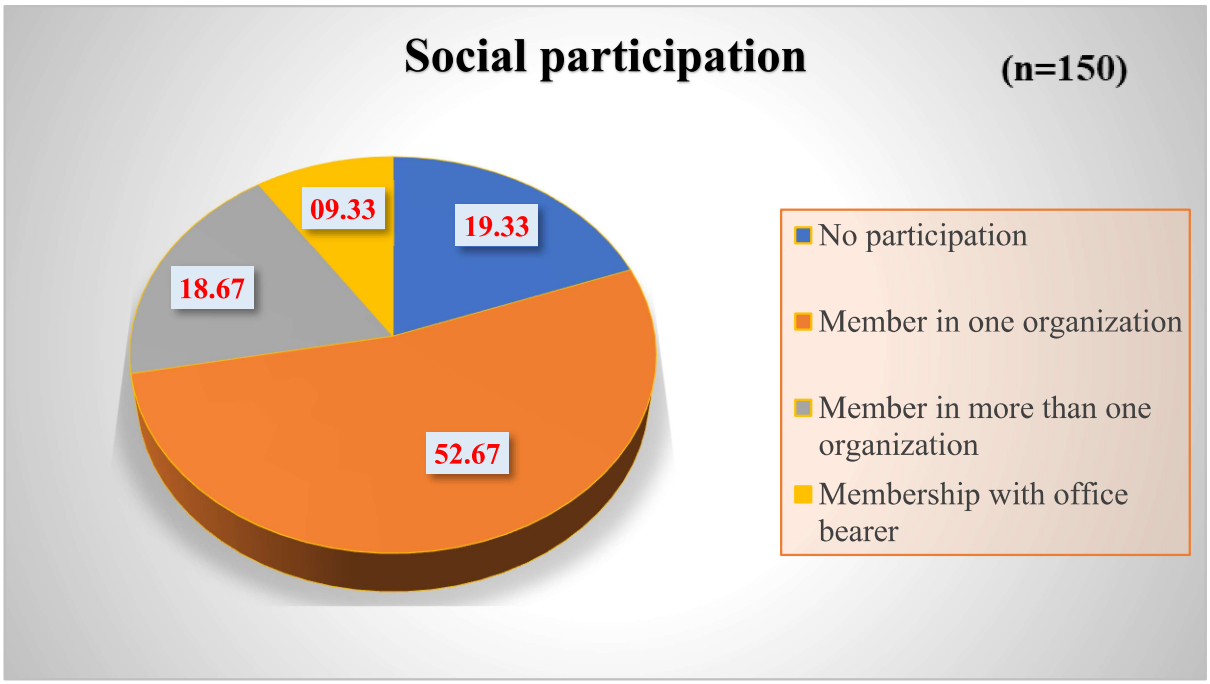

Fig. 4.5: Distribution of the summer bajra growers according to their social participation

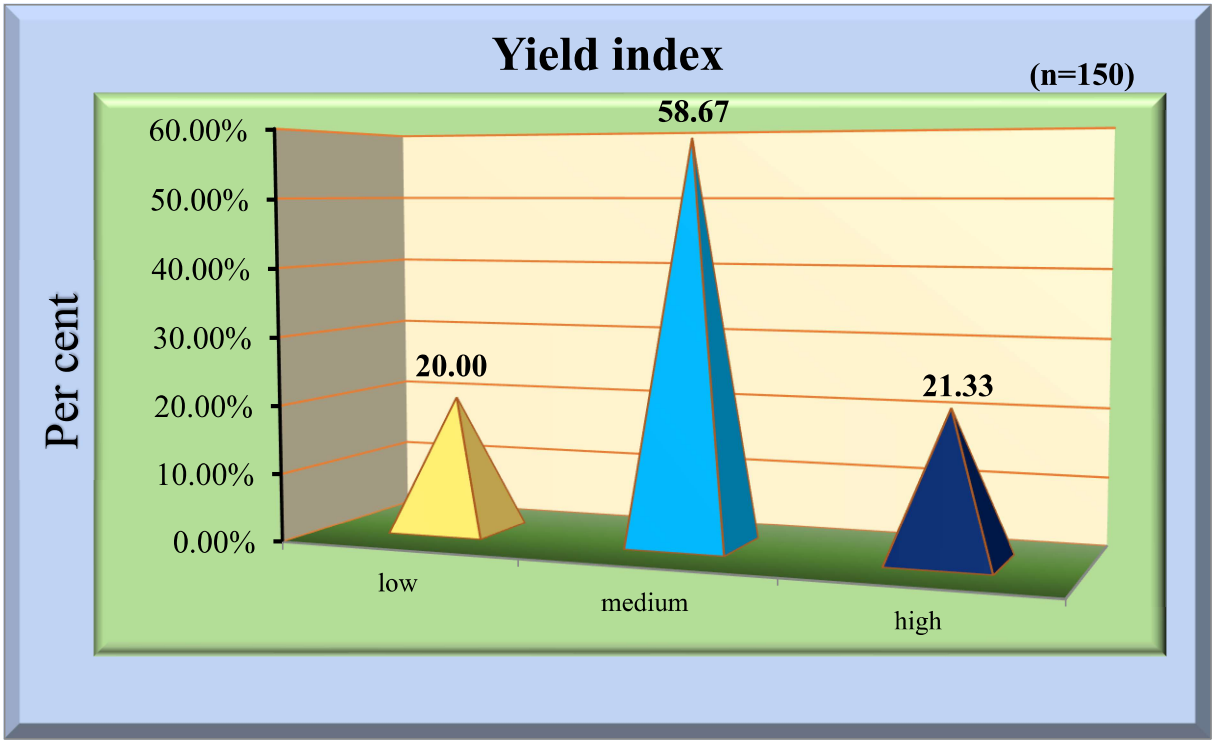

Fig. 4.6: Distribution of the summer bajra growers according to their yield index

income which would have put limitation to them to use information source to greater extent.

The similar findings have been reported by Kharat (2012), Nirwan (2016), Madhavrao (2017) and Chaudhary (2019).

(b) Extension participation

Extension participation refers to the degree of involvement of farmers in various extension activities with a view to obtain information, knowledge and skill, related to agriculture and allied fields. It was measured with the help of scale of Siddaramaiah and jalihal (1983) was used with due modification.

The scale was administered to the respondents for obtaining the information regarding their participation in different extension activities during previous years.

With respect to study of extension participation, the summer bajra growers were categorized as low extension participation, medium extension participation and high extension participation as shown in Table 4.8.

Table 4.8: Distribution of the respondents according to their extension participation

Sr. No.	Category	Frequency	Per cent
1	Low extension participation (≤16.78 score)	18	12.00
2	Medium extension participation (>16.78 to < 36.44 score)	103	68.67
3	High extension participation (≥ 36.44 score)	29	19.33
Total		**150**	**100.00**

Mean=26.61 **S.D.=09.83**

A glance at Table 4.8 shows that majority (68.67%) of the summer bajra growers had medium level of extension participation, followed by 19.33 and 12.00 per cent had high and low level of extension participation, respectively.

It can be pointed out that majority of the summer bajra growers had medium to high level of extension participation. It is obvious that the krushi mahotsav & other extension activities gave opportunities to the contact with extension agency as well as participation in various extension activities. That might certainly help the summer bajra producers to acquire more knowledge of summer bajra production technology.

The similar findings have been reported by Darandle (2010), Humbal (2012) and Machhar *et al*. (2015).

4.1.4 Situational characteristics

(a) Cropping intensity

On the basis of score obtained by the respondents, they were categorized into three groups with the help of mean and standard deviation. The data in these regards are presented in Table 4.9 and depicted in Fig. 4.9.

The data presented in Table 4.9 reveal that 92.67 per cent summer bajra growers had high cropping intensity, followed by 07.33 per cent summer bajra growers were medium cropping intensity, respectively.

Table 4.9: Distribution of the summer bajra growers according to their cropping intensity

Sr. No.	Category	Frequency	Per cent
1	Low cropping intensity (≤100)	00	00.00
2	Medium cropping intensity (>100 to <200)	11	07.33
3	High cropping intensity (≥ 200)	139	92.67
Total		**150**	**100.00**

From this finding it can be concluded that respondents are growing more than two crops of the year. might be due to the fact that the recommended cropping sequence ground nut-potato(mustard)-summer bajra have adopted by majority farmer that is more economical than other sequences.

The similar finding has been reported wani *et al. (*2013)

(b) Method of irrigation

The study area falls under arid and semi-arid region with erratic rainfall and traditionally crop irrigation is done through flooding of the fields. Keeping in the view, the method of irrigation was studied as a situational variable. The results are depicted in Table 4.10 and depicted in Fig. 4.10.

Table 4.10: Distribution of the summer bajra growers according to their method of irrigation

Sr. No.	Category	Frequency	Per cent
1	Flood irrigation	106	70.67
2	Sprinkler irrigation	44	29.33
3	Drip irrigation	00	00.00
Total		**150**	**100.00**

The data presented in Table 4.10 shows that vast majority 70.67 per cent of the summer bajra growers were using flood irrigation method followed by 29.33 per cent of

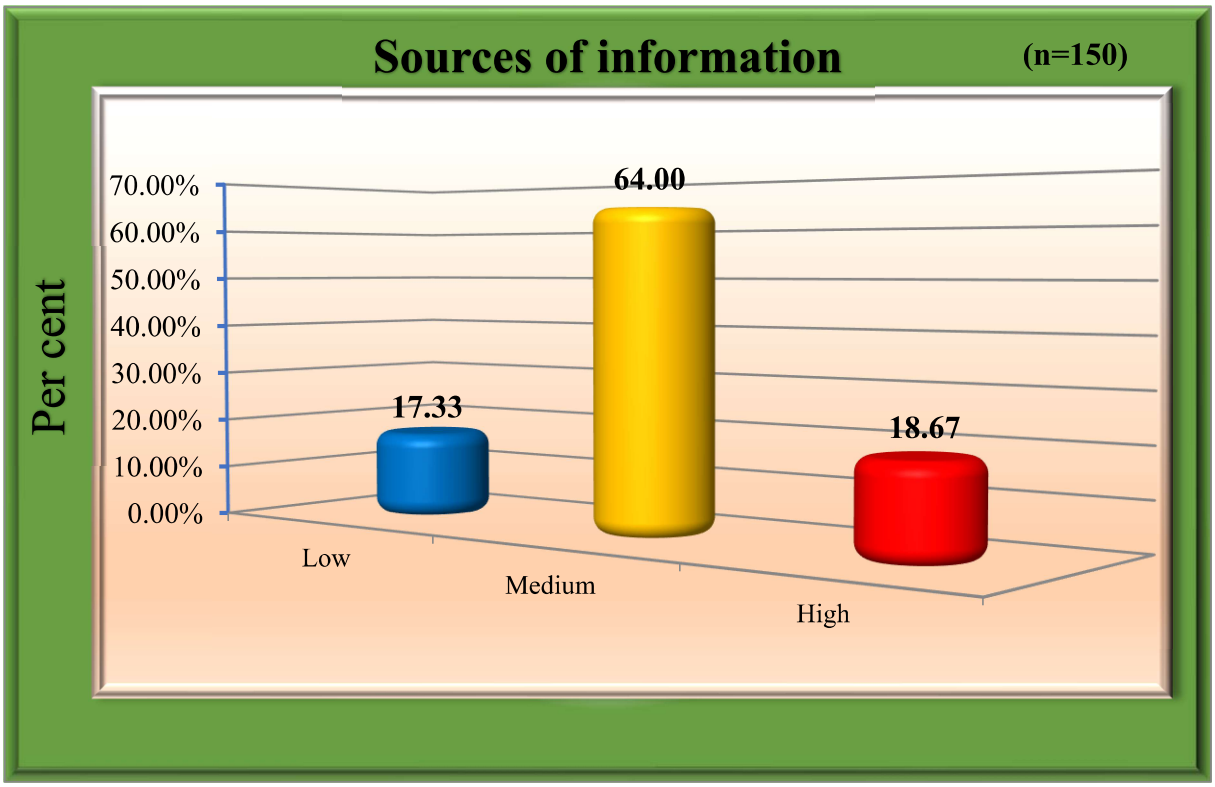

Fig. 4.7: Distribution of the summer bajra growers according to their sources of information

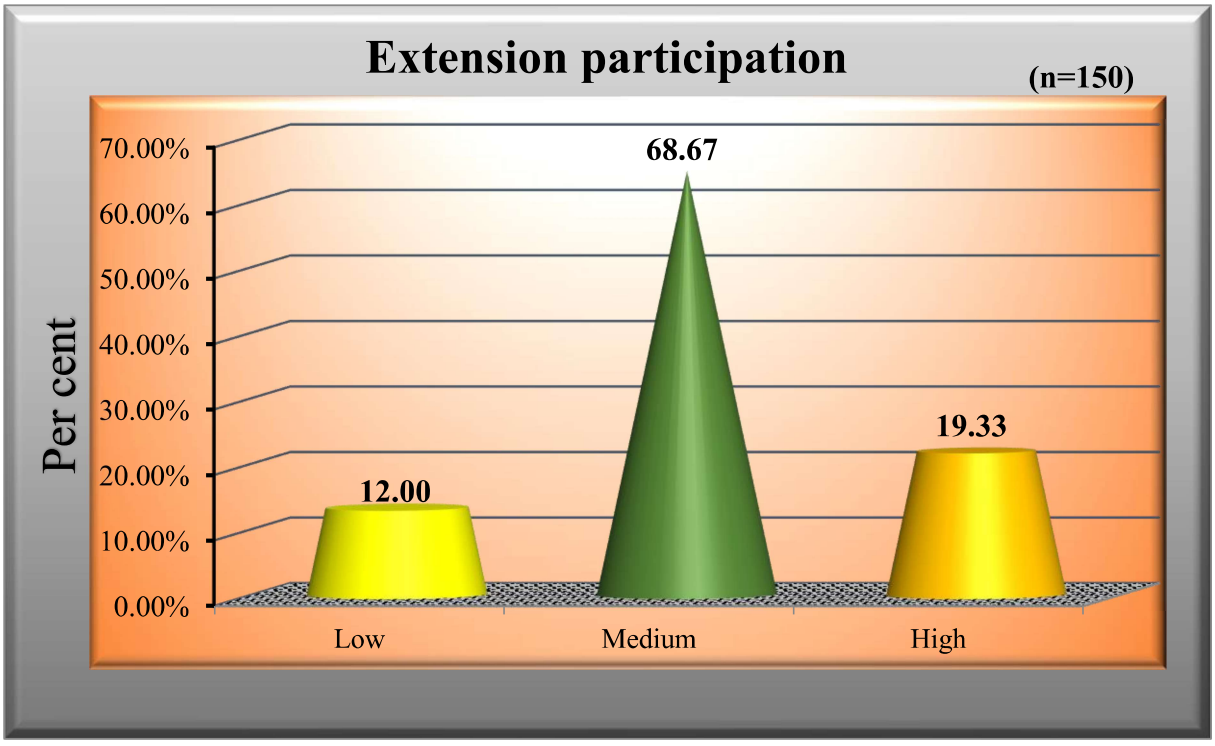

Fig. 4.8: Distribution of the summer bajra growers according to their extension participation

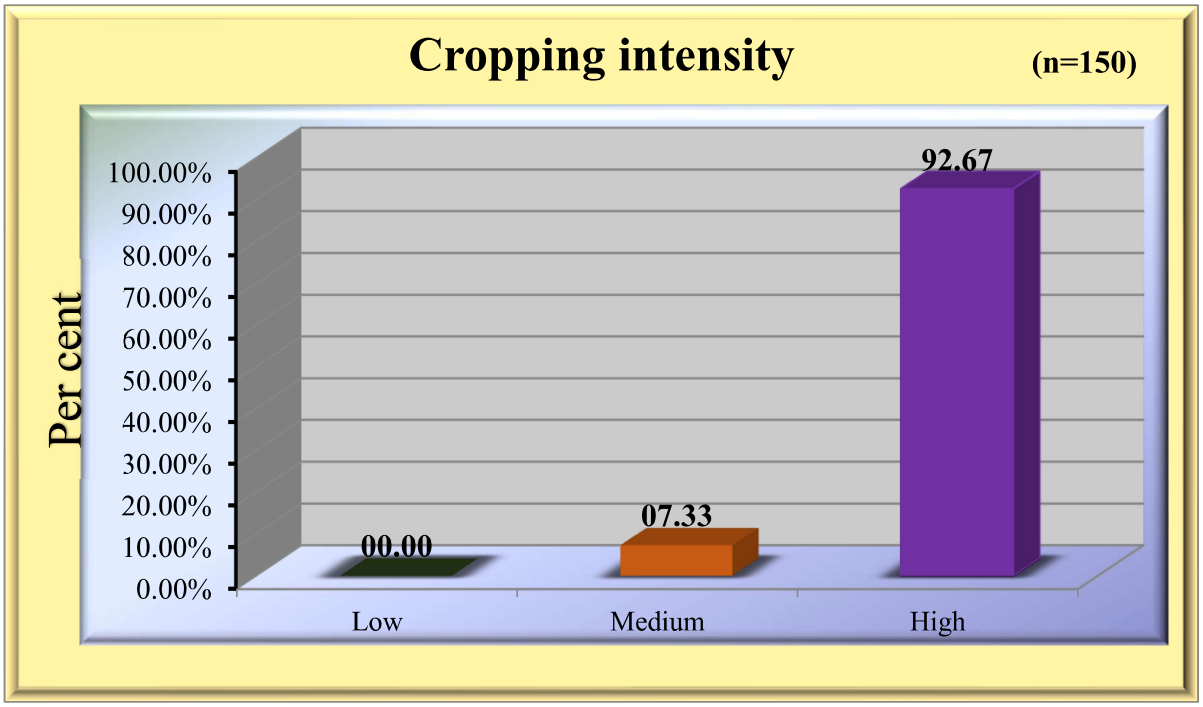

Fig. 4.9: Distribution of the summer bajra growers according to their cropping intensity

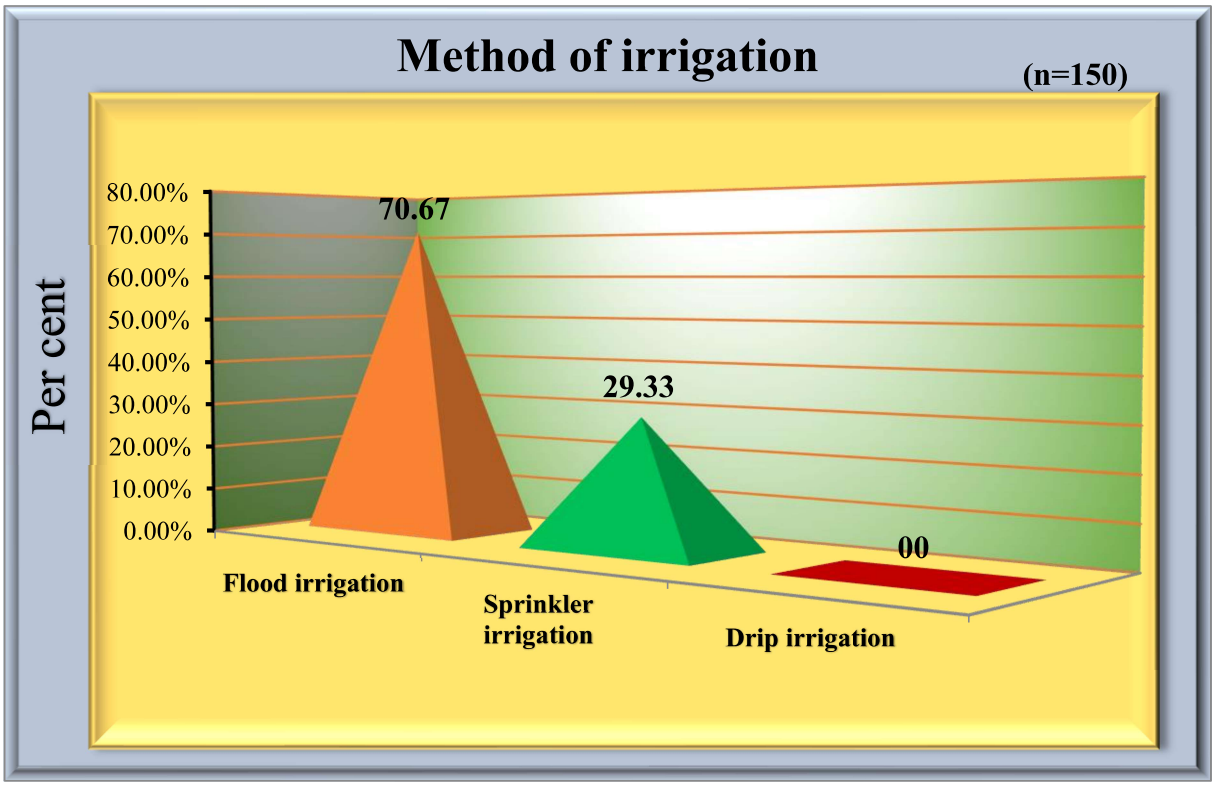

Fig. 4.10: Distribution of the summer bajra growers according to their method of irrigation

the summer bajra growers were using sprinkler irrigation method and none of the summer bajra growers was using drip irrigation method.

The similar findings have been reported by Prajapati (2005) and Baldaniya (2019).

4.2 Knowledge of summer bajra growers about recommended summer bajra production technology

Knowledge is the cognitive behavior of an individual. Knowledge plays an important role in covert as well as overt behavior of an individual. Knowledge was measured with the help of structure interview schedule. As discussed earlier, the knowledge index for each farmer was calculated and the respondents were grouped into three categories *viz.,* low, medium and high. Data regarding this aspect are presented in Table 4.11 and Fig. 4.11.

Table 4.11: Distribution of the summer bajra growers according to their knowledge regarding recommended summer bajra production technology

Sr. No.	Category	Frequency	Per cent
1	Low level of knowledge (≤11.39 score)	30	20.00
2	Medium level of knowledge (>11.39 to <21.03 score)	99	66.00
3	High level of knowledge (≥ 21.03 score)	21	14.00
Total		**150**	**100.00**

Mean= 16.21 **S.D. =04.82**

The result in Table 4.11 indicates that two third (66.00%) of the summer bajra growers had medium level of knowledge. On the other hand, 20.00 and 14.00 per cent of summer bajra growers were found having low and high level of knowledge of summer bajra cultivation technology.

From this finding, it can be concluded that majority (66.00%) of the respondents had medium level of knowledge of summer bajra cultivation technology. The probable reason might be that most of the respondents were educated so they could easily understand and acquire skills about summer bajra production technology.

The similar findings have been reported by Darandle (2010), Kharat (2012), Shah *et al.* (2015), Nirwan (2016) and Patodiya (2018).

4.2.1 Practice-wise knowledge level of the summer bajra growers regarding recommended summer bajra production technology

The practice wise knowledge of respondents regarding recommended summer bajra production technology was studied. The data in these regards in terms of frequency and knowledge level along with rank are presented in Table 4.12.

The data presented in Table 4.12 indicate that the practice wise knowledge level varied from practice to practice. The practice wise knowledge level among the summer bajra growers was ranging from 05.33 per cent to 100.00 per cent.

The data presented in Table 4.12 revealed that the high knowledge level was observed in practices of Recommended varieties (76.00%),the symptoms of maturity in summer bajra (75.33%), seed rate for cultivating summer bajra (74.66%), days after sowing summer bajra crop should be harvested (73.33%), crop rotation in cultivation of summer bajra in a year (72.66%), method use of irrigation is recommended for your area (69.33%), spacing for sowing summer bajra (61.33%) and method of sowing of seed for summer bajra (66.00%).

The medium knowledge level was observed in the practices of number of irrigations for summer bajra crop (54.66%), dose of farm yard manure for summer bajra (54.67%), herbicides used for weed control in cultivation of summer bajra (54.00%), the critical stages of summer bajra crop for irrigation (52.66%), recommended interval between two weeding for summer bajra crop (52.00%), diseases appear in summer bajra crop and measures are recommended for their control (51.33%), time for sowing of summer bajra (50.66%), yield of summer bajra (49.33%), insect-pests appear in summer bajra crop and measures are recommended for their control (47.33%) and interculturing in cultivation of summer bajra (45.33%).

The low knowledge level was found in the practices *viz.,* How many times hand weeding in cultivation of summer bajra (40.00%), seed treatment of summer bajra (24.00%), chemical fertilizer (38.66%), chemical fertilizer did you applied as top-dressing dose (09.33%), interval between two irrigations for summer bajra crop (39.33%) and gap filling should be done in summer bajra (05.33%).

Table 4.12: Practice wise knowledge level of the respondents regarding the recommended summer bajra production technology

Sr. No.	Practices	No. of Respondents	Knowledge level (%)	Rank according to knowledge level
1	Recommended varieties	114	76.00	**I**
2	Seed rate for cultivating summer bajra	112	74.66	**III**
3	Spacing for sowing summer bajra	92	61.33	**VIII**
4	Method of sowing			
	a) Line sowing	-	-	**VII**
	b) Broadcasting	99	66.00	
5	Seed treatment of summer bajra	36	24.00	**XXII**
6	Time for sowing of summer bajra	76	50.66	**XV**
7	Dose of farm yard manure for summer bajra	82	54.67	**IX**
8	Application of Chemical fertilizer	58	38.66	**XXI**
9	Chemical fertilizer did you applied as top-dressing dose	14	09.33	**XXIII**
10	The critical stages of summer bajra crop for irrigation	79	52.66	**XII**
11	Method of irrigation	104	69.33	**VI**
12	Number of irrigations applied	82	54.66	**X**
13	Interval between two irrigations for summer bajra crop	59	39.33	**XX**
14	Gap filling should be done in summer bajra	8	5.33	**XXIV**
15	Interculturing in cultivation of summer bajra	68	45.33	**XVIII**
16	Recommended interval between two weeding for summer bajra crop	78	52.00	**XIII**
17	How many times hand weeding in cultivation of summer bajra	60	40.00	**XIX**
18	Herbicides used for weed control in cultivation of summer bajra	81	54.00	**XI**
19	Crop rotation in cultivation of summer bajra in a year	109	72.66	**V**
20	Insect-pests appear in summer bajra crop and measures are recommended	71	47.33	**XVII**
21	Diseases appear in summer bajra crop and measures are recommended for their control	77	51.33	**XIV**
22	Days after sowing summer bajra crop should be harvested	110	73.33	**IV**
23	The symptoms of maturity in summer bajra	113	75.33	**II**
24	Yield of summer bajra	74	49.33	**XVI**

4.3 Extent of Technological gap in recommended summer bajra production technology by the summer bajra 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 4.13: Distribution of the summer bajra growers according to their overall technological gap

Sr. No.	Category	Frequency	Per cent
1	Low technological gap (≤ 24.48 score)	25	16.67
2	Medium technological gap (>24.48 to <58.14 score)	91	60.66
3	High technological gap (≥58.14 score)	34	22.67
Total		**150**	**100.00**

Mean= 41.31 **S.D. = 16.83**

The data presented in Table 4.13 is indicate that slightly more than two-third (60.66%) of the summer bajra growers were having medium technological gap followed by 16.67 and 22.67 per cent having low and high technological gap, respectively (Fig. 4.12).

The possible reason for this might be that the farmers could not get the message of improved package of practices in time in acceptable form. Further, farmers might have tried their best to use and adopt the summer bajra cultivation but some constraints might have hindered them to do so, and hence, technological gap might have been observed.

The similar findings have been reported by Jayabhaye (2014), Singh *et al.* (2014), Nirwan (2016), Choudhary *et al.* (2018) and Patel (2019).

4.3.1 Extent of technological gap in recommended summer bajra production technology by the summer bajra growers

The extent of technological gap in adoption of different recommended summer bajra production technology among the summer bajra growers are summarized in Table 4.14. The data presented in Table 4.14 indicate that the practice-wise technological gap varied from practice to practice. The practice-wise technological gap among the summer bajra growers was ranging from 00.00 to 100.00 percent.

The data presented in Table 4.14 revealed that the high technological gap was observed 100.00 per cent recommended variety and Gap filling or thinning, also

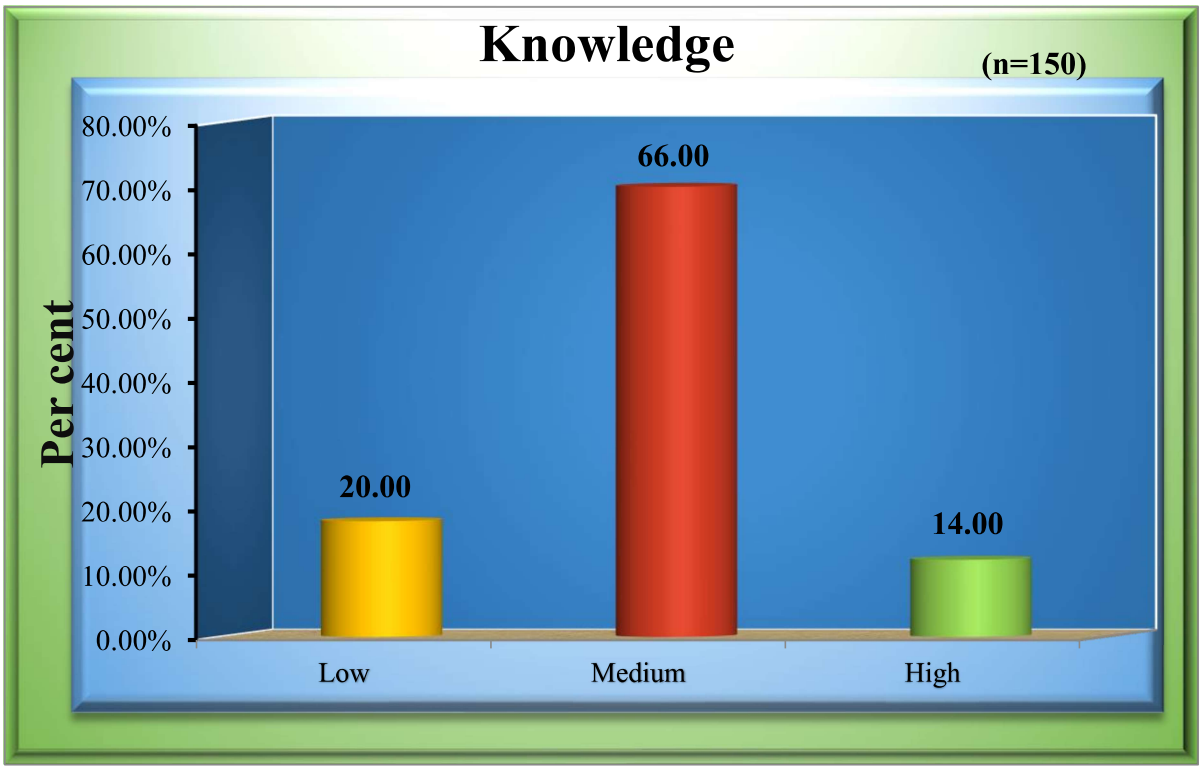

Fig. 4.11: Distribution of the respondents according to their knowledge level regarding the recommended summer bajra production technology

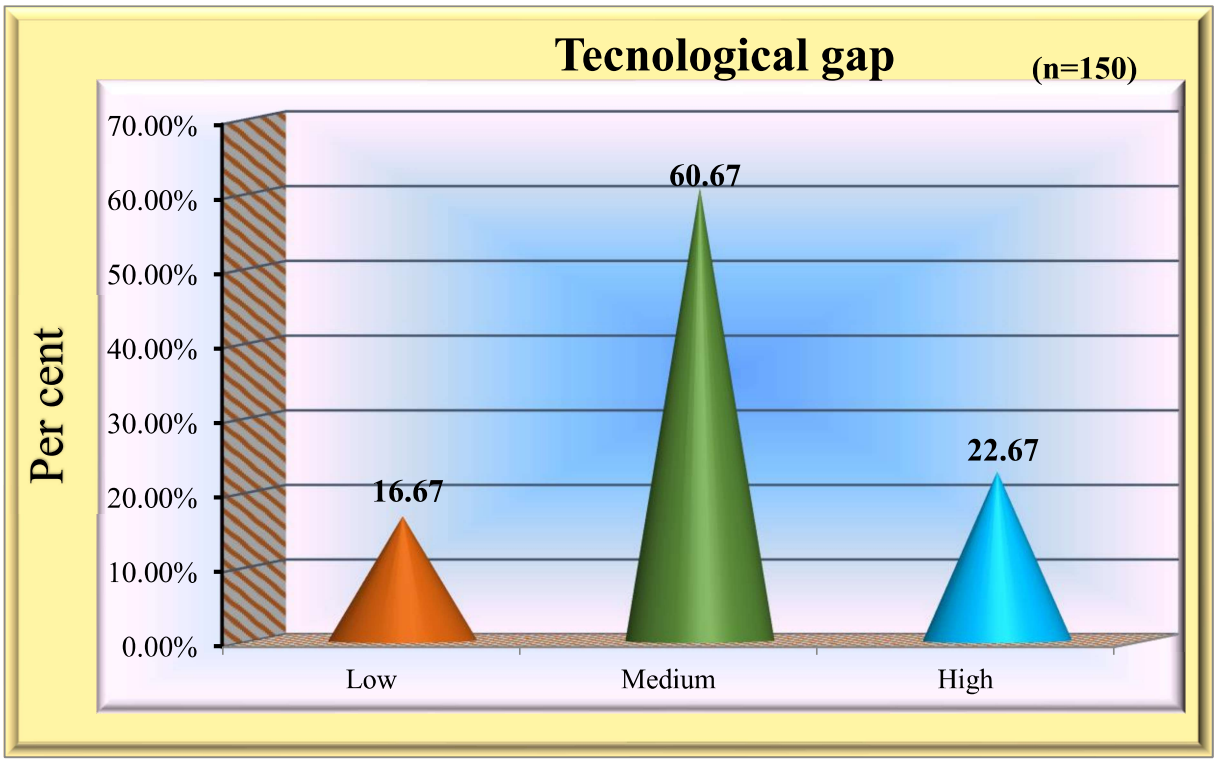

Fig. 4.12: Distribution of the respondents according to their overall technological gap

technological gap was observed 100.00 per cent in Line sowing, plant protection 91.30 per cent, seed treatment 84.75 per cent, FYM/ chemical fertilizer 78.63 per cent, interculturing 54.00 per cent, seed rate 38.00 per cent, harvesting 28.00 per cent, weed control 21.57 per cent, sowing time 18.34 per cent, crop rotation 10.44 per cent, irrigation schedule 08.75 per cent, spacing (broadcasting) zero per cent. which were ranked as first to thirteen, respectively.

The probable reason might be summer bajra growers were not using recommended varieties of universities because the seed of such varieties was not available in the market.

Summer bajra growers avoiding thinning because they growing summer bajra for dual purpose crop like grain as well as fodder and also not following gap filling.

In spacing practices, summer bajra growers mostly used broadcasting method but they don't use line spacing. that why in line spacing technological gap was 100.00 per cent.

Table 4.14: Extent of technological gap in recommended summer bajra production technology by the summer bajra growers

Sr. No.	Different practice wise of recommended summer bajra production technology	Adoption (%)	Technology gap (%)	Rank according to technological gap
1.	Recommended variety	00.00	100	**I**
2.	Seed rate	62.00	38.00	**VII**
3.	Method of sowing			**XIII**
	Line sowing	00.00	100	
	Broadcasting	100	00.00	
4.	Seed treatment	15.25	84.75	**IV**
5	Sowing time	81.66	18.34	**X**
6.	FYM/ Chemical fertilizer	21.37	78.63	**V**
7.	Irrigation schedule	91.25	08.75	**XII**
8.	Gap filling or thinning	00.00	100	**II**
9.	Interculturing	46.00	54.00	**VI**
10.	Weed control	78.43	21.57	**IX**
11.	Crop rotation	89.56	10.44	**XI**
12.	Plant protection	08.75	91.30	**III**
13.	Harvesting	72.00	28.00	**VIII**
Overall Technological gap		**51.25**	**48.75**	

This finding supported by the earlier findings of Sharma (2012), Jayabhaye (2014), Nirwan (2016) and Patel (2019).

4.4 Association between personal, socio-economic, communicational and situational characteristics of the summer bajra growers and their overall technological gap in recommended summer bajra production technology

Personal, socio-economic, communicational and situational characteristics of the farmers play very important role in the process of adoption and diffusion of innovations. With this hypothecation, it was thought appropriately to study their association with overall technological gap. To examine association, correlation coefficient was computed. The data in this respect are presented Table 4.15 and Fig.4.13.

Table 4.15: Association between selected characteristics of summer bajra growers and their overall technological gap in summer bajra production technology

Sr. No.	Independent variables	Correlation coefficient (r value)
1	Age	0.1732*
2	Education	-0.1618*
3	Land holdings	-0.1792*
4	Annual income	-0.1750*
5	Social participation	-0.1625*
6	Yield index	-0.1656*
7	Source of information	-0.1601*
8	Extension participation	-0.1003^{NS}
9	Cropping intensity	0.0670^{NS}
10	Method of irrigation	0.1375 ^{NS}

* = Significant at 5 per cent levels of significance. NS = non-Significant
** = Significant at 1 per cent levels of significance.

4.4.1 Age and overall technological gap

It is clear from the Table 4.15 that age of the summer bajra growers had positive and significant correlation (r = 0.1732*) with their overall technological gap. Thus, the null hypothesis (H_0:1.1)"There is no relationship between age of the summer bajra growers and their overall technological gap" was rejected. Thus, the age had established positive and significant relationship with the overall technological gap indicating that as age increases technological gap also increases and vice-versa.

The probable reason for having higher technological gap among elder summer bajra growers might be due to their traditional outlook.

This finding is in line with finding of Parikh (2013) and Chaudhary (2016).

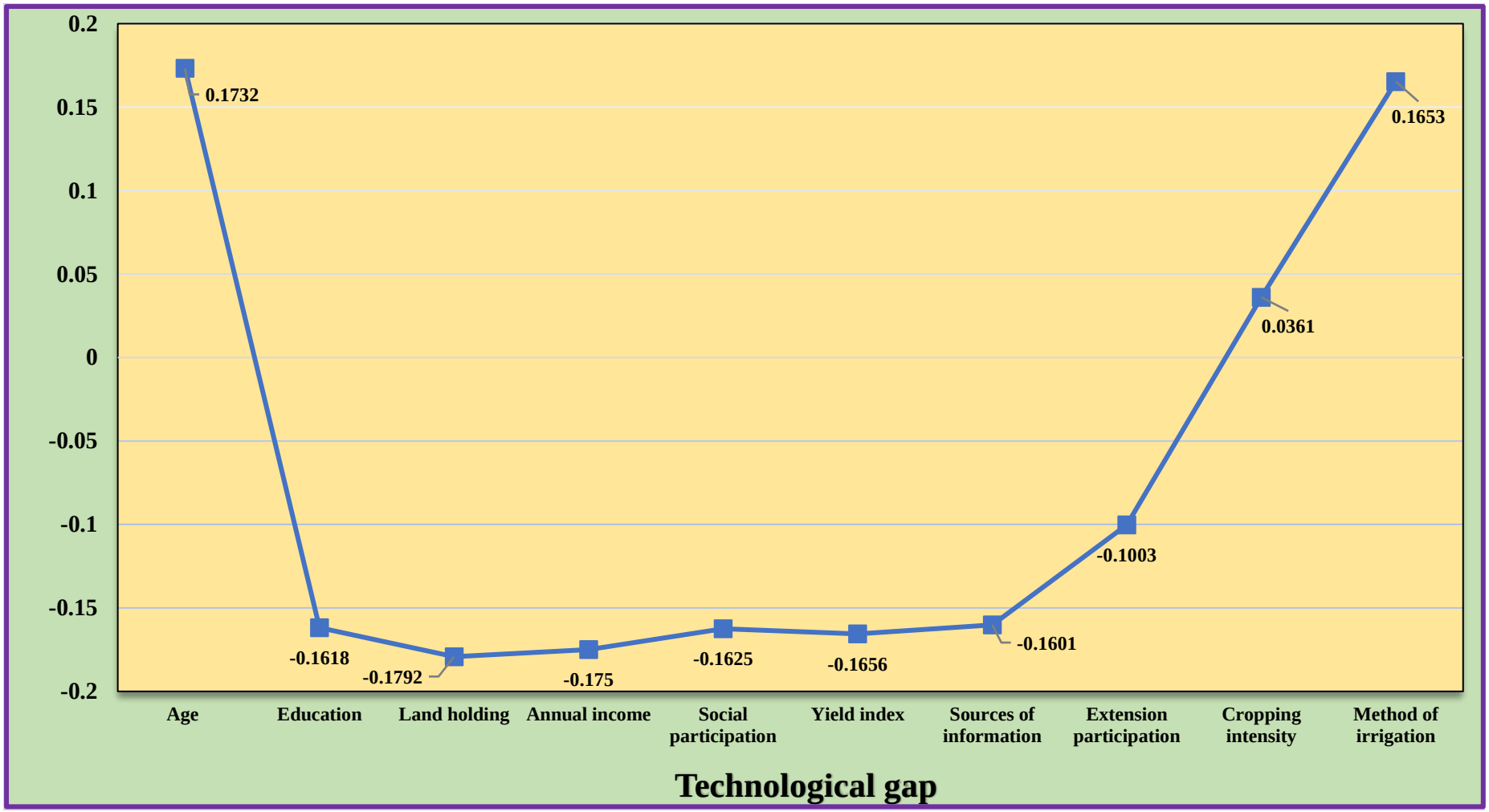

Fig. 4.13: Association between selected characteristics of summer bajra growers and their overall technological gap in summer bajra production technology

4.4.2 Education and overall technological gap

It is clear from the Table 4.15 that education of the summer bajra growers had negative and significant correlation (r = -0.1618*) with their overall technological gap. Thus, the null hypothesis (H_0:1.2)"There is no relationship between education of the summer bajra growers and their overall technological gap" was rejected. It shows that as education increases, overall technological gap decreases and mutual element.

The probable reason might be that education is the production of desirable change in human behavior. It helps the individual to make progress in right direction. Educated summer bajra growers had greater skill, progressive outlook and ability to adopt new innovations than less educated and illiterate summer bajra growers. This may be the reason of for above finding.

This finding is in line with findings of Parikh (2013) and Markana *et al.* (2016).

4.4.3 Land holding and overall technological gap

It is clear from the Table 4.15 that land holding of summer bajra growers had negative and significant correlation (r = -0.1792*) with their overall technological gap. Thus, the null hypothesis (H_0:1.3)"There is no relationship between land holding of summer bajra growers and their overall technological gap" was rejected.

Adoption of innovation as a matter of risk taker is not possible by marginal and small farmers, because many innovations require a substantial amount of capital, which is beyond the resource of marginal and small farmers. So, as the size of land holding increases the technological gap was found increases. This may be the proper explanation for the above finding.

These findings are in line with findings of Patel (2007), Ram *et al.* (2010) and Patel (2019).

4.4.4 Annual income and overall technological gap

It is clear from the Table 4.15 that annual income of the summer bajra growers had negative and significant correlation (r = -0.1750*) with their overall technological gap. Thus, the null hypothesis (H_0:1.4)"There is no relationship between annual income of the summer bajra growers and their overall technological gap" was rejected.

This finding is in line with findings of Ram *et al.* (2010) and Patel (2019).

4.4.5 Social participation and overall technological gap

It is clear from the Table 4.15 that social participation of the summer bajra growers had negative and significant correlation (r = -0.1625*) with their overall technological gap. Thus, the null hypothesis (H_0:1.5)"There is no relationship between social

participation of the summer bajra growers and their overall technological gap." was rejected.

The probable reason may be that social participation develops the wider outlook of the farmers leading towards higher contact with the outside world. Due to their conversation with other members in an organization, the farmers might have been convinced about the importance of recommended practices of summer bajra production technology and thereby lowering the technological gap.

This finding is in line with finding of Patel (2007) and Patel (2019).

4.4.6 Yield index and overall technological gap

It is clear from the Table 4.15 that yield index of the summer bajra growers had negative and significant correlation (r = -0.1656*) with their overall technological gap. Thus, the null hypothesis (H_0:1.6)"There is no relationship between yield index of the summer bajra growers and their overall technological gap" was rejected. It shows that as yield index increases, overall technological gap decreases and vice-versa.

Yield index enabled the summer bajra growers to access latest agricultural information through newspaper, television and awareness were created among the summer bajra growers with less cost by mass media. Hence, yield index exhibited favorable influence on extent of adoption. So as the yield index increases the overall technological gap decreases and vice-versa.

This finding is in line with findings of Patel (2019).

4.4.7 Source of information and overall technological gap

It is clear from the Table 4.15 that source of information of the summer bajra growers had negative and significant correlation (r = -0.1601*) with their overall technological gap. Thus, the null hypothesis (H_0:1.7)"There is no relationship between source of information of the summer bajra growers and their overall technological gap" was rejected. It can be inferred that as the source of information increase the technological gap decreases.

This finding is in line with findings of Aski *et al.* (2010).

4.4.8 Extension participation and overall technological gap

It is clear from the Table 4.15 that extension participation of the summer bajra growers had negative and non-significant correlation (r = -0.1003^{NS}) with their overall technological gap. Thus, the null hypothesis (H_0:1.8)"There is no relationship between extension participation of the summer bajra growers and their overall technological

gap." was accepted. Thus, it can be said that extension participation has no role in changing technological gap.

This finding is in line with findings Patel and Padheria (2010).

4.4.9 Cropping intensity and overall technological gap

It is clear from the Table 4.15 that cropping intensity of the summer bajra growers had positive and non-significant correlation ($r = 0.0670^{NS}$) with their overall technological gap. Thus, the null hypothesis (H_0:1.9) "There is no relationship between cropping intensity and overall technological gap." was accepted. It means technological gap of respondents was not related with cropping intensity of the respondents.

This finding is in line with findings of Markana *et al.* (2016).

4.4.10 Method of irrigation and overall technological gap

It is clear from the Table 4.15 that method of irrigation of the summer bajra growers had positive and non-significant correlation ($r = 0.1375^{NS}$) with their overall technological gap. Thus, the null hypothesis (H_0:1.10)"There is no relationship between method of irrigation of the summer bajra growers and their overall technological gap." was accepted. It means technological gap of respondents was not related with method of irrigation of the respondents.

This finding is in line with findings of Sakariya (1991).

4.5 Constraints faced by the summer bajra growers in adoption of summer bajra production technology

The summer bajra growers might be facing certain problems in adoption of recommended summer bajra production technology. Due to such constraints, they cannot be achieved desired goal. The constraints in adoption of new technology never end. Hence, it was felt imperative to identify the constraints faced by the summer bajra growers in adoption of recommended summer bajra production technology.

The respondents were asked to give the possible constraints faced by them in adoption of recommended summer bajra production technology.

As seen from Table 4.16 that the major constraints faced by the summer bajra growers in adoption of recommended summer bajra production technology were; shortage of labour (94.67%), high wages of labour (88.00%), non-remunerative price of production (83.33%), Lack of technical knowledge(80.67%) wind lodging causes yield loss (79.33%), damage by wild animal (73.33%), inadequate finance (65.33%), high cost of fertilizer (63.33%), unavailability of irrigation water (43.33%), high cost of seed

(38.67%) and attack of pests and diseases (26.67%) which were ranked as I, II, III, IV, V, VI, VII ,VIII, IX, X, and XI respectively.

Table 4.16: Constraints faced by summer bajra growers in adoption of recommended summer bajra production technology

Sr. No.	Constraints	Frequency	Per cent	Rank
1	Shortage of labour	142	94.67	**I**
2	high wages of labour	132	88.00	**III**
3	Non-remunerative price of production	125	83.33	**IV**
4	Lack of technical knowledge	121	80.67	**V**
5	Wind lodging causes yield loss	119	79.33	**VI**
6	Damage the crop by wild animals	110	73.33	**VII**
7	Inadequate finance	98	65.33	**VIII**
8	High cost of fertilizer	95	63.33	**IX**
9	Shortage of irrigation water	65	43.33	**X**
10	High cost of seed	58	38.67	**XI**
11	pests and diseases	40	26.67	**XII**

This finding is in partial agreement with those findings of Gopal *et al.* (2014), Shanmugasundaram *et al.* (2015).

4.6 Suggestions from the summer bajra growers for maximum adoption of recommended summer bajra production technology

An attempt was made in this study to know the suggestions given by the summer bajra growers to overcome the constraints faced by them in maximum adoption of recommended summer bajra production technology. The respondents were asked to suggest possible solution to overcome the constraints faced by them in maximum adoption of recommended summer bajra production technology. Frequency and percentage for each suggestion were calculated. Then, the suggestions were ranked accordingly and presented in Table 4.17.

As seen from Table 4.17 that the most important suggestions expressed by summer bajra growers to overcome the constraints faced by the respondents in adoption of improved summer bajra production technology were; provision of support price to the farmers (70.00%), Proper marketing facility should be established (62.67%), to develop lodging resistance varieties (58.00%), timely technical guidance should be provided (54.00%), price of agricultural inputs should be reasonable (51.33%) and easily availability of certified seed from cooperative society and government agency (45.33%) which were ranked as I, II, III, IV, V and VI, respectively.

Table 4.17: Suggestions from the summer bajra growers for maximum adoption of recommended summer bajra production technology

Sr. No.	Suggestions	Frequency	Per cent	Rank
1	Provision of support price to the farmers	105	70.00	**I**
2	Proper marketing facility should be established	94	62.67	**II**
3	To develop lodging resistance varieties	87	58.00	**III**
4	Timely technical guidance should be provided	81	54.00	**IV**
5	Price of agricultural inputs should be reasonable	77	51.33	**V**
6	Easily availability of certified seed from cooperative society and government agency	68	45.33	**VI**

From the above results, it can be said that important suggestions expressed by the summer bajra growers were; provision of support price to the farmers, training should be conducted before summer season, timely technical guidance should be provided easily availability of certified seed from cooperative society and government agency, price of agricultural inputs should be reasonable, crop loan should be provided to the farmer.

This finding in partial agreement with those findings of Salunkhe (2014) and Chaudhary (2019).

4.7 Empirical model of the study

As depicted in Fig. 4.14, it was conceptualized that technological gap in summer bajra production technology among the farmers is affected by their personal, socio-economic, communicational and situational characteristics. This was tested by computing correlation of co-efficient. Out of selected 10 independent variables, six variables *viz*., education, land holding, annual income, social participation, source of information and yield index, had negative and significant correlation with overall technological gap of summer bajra growers. Whereas, one variable *viz*., age of the summer bajra growers had positive and significant correlation with overall technological gap. Whereas two variables *viz.*, cropping intensity and method of irrigation had positive and non-significant correlation with overall technological gap of summer bajra growers. Whereas, one variable *viz.,* extension participation had negative and non-significant relationship with the overall technological gap in summer bajra production technology.

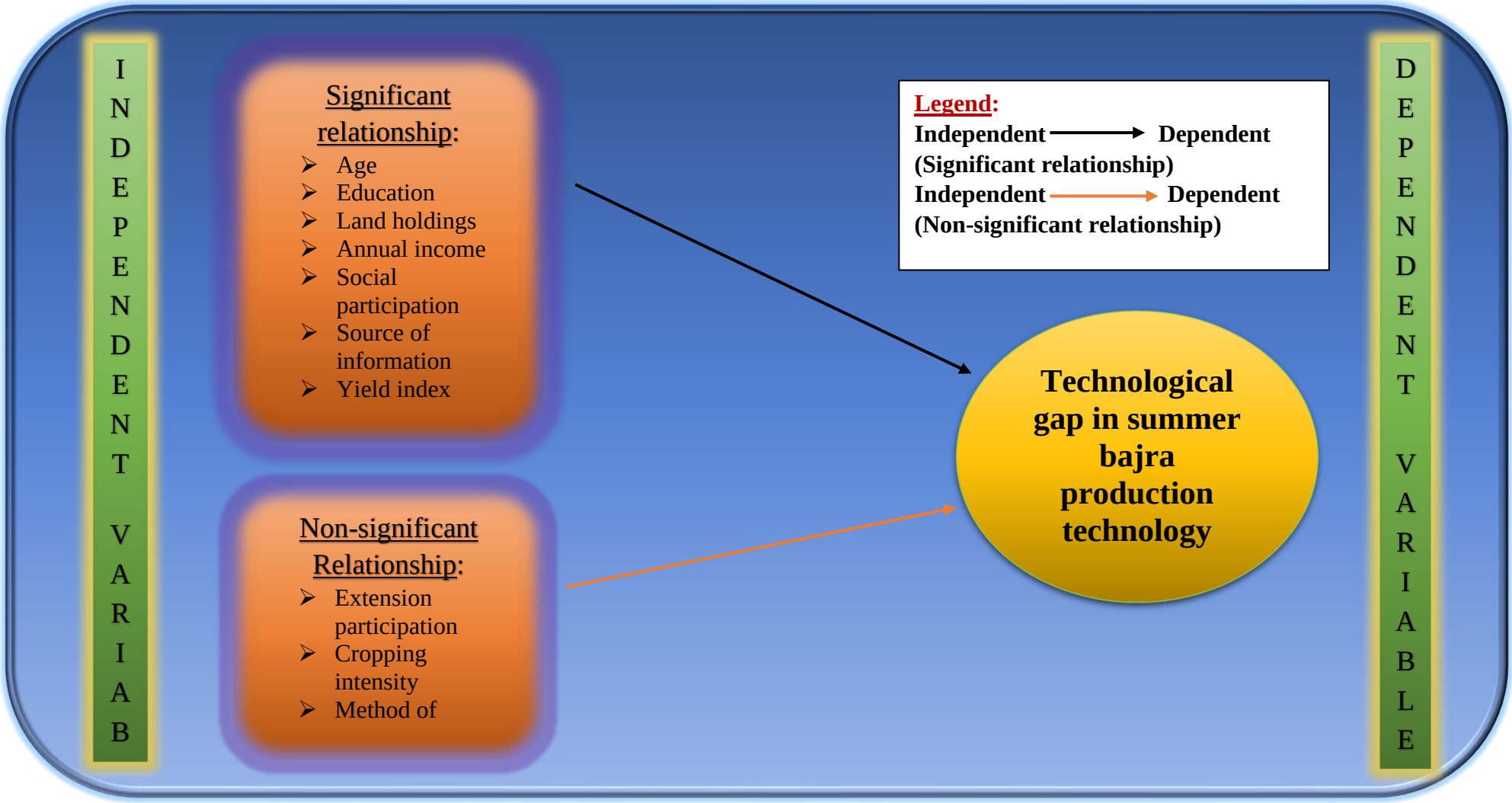

Fig. 4.14: Empirical model of the study showed relationship between dependent and independent

SUMMARY AND CONCLUSIONS

V. SUMMARY AND CONCLUSIONS

The summary and conclusion of the investigation are given as below:

5.1 Introduction

5.2 Methodology

5.3 Findings and conclusions

5.4 Implications of the study

5.5 Suggestions for further research

5.1 Introduction

Pearl millet (*Pennisetum glaucum* L.) is the most popular cereal crop grown in tropical semi-arid regions of the world and belongs to the family of Gramineae. Bajra is a coarse grain crop and considered to be the poor man's staple nourishment and suitable to cultivate in drylands. Area under pearl millet is 7.8 million ha and production (9.25 million tons) of pearl millet, with an average productivity of 12.70 qtl/ha in India. Pearl millet is mostly grown in the states of Rajasthan, Uttar Pradesh, Haryana, Gujarat and Maharashtra.

In Gujrat state area under summer bajra is 2,28,035 ha with production is 6,64,155 MT and yield is 2912.51 kg/ha during 2018-19. Banaskantha is one of the most important summer bajra growing district of Gujarat State. The area under summer bajra in this district was 1,40,474 ha with a production about 3,90,027 mt and productivity of 2776.51kg/ha during 2018-19.

Technological gap is a major problem in increasing summer bajra production in the Banaskantha district. So far, no systematic effort was made to study the technological gap existing in various components of summer bajra cultivation in Banaskantha district. The present study entitled, “Technological gap in summer bajra production technology by the farmers of Banaskantha district” was therefore, planned with following specific objectives.

Objectives of the study

1) To study the selected characteristics of the summer bajra grower
2) To ascertain the knowledge level of the summer bajra growers pertaining to recommended summer bajra production technology
3) To determine the extent of Technological gap in recommended summer bajra production technology

4) To find out the association between selected characteristics of the summer bajra growers and their technological gap in recommended summer bajra production technology
5) To know the constraints faced by the summer bajra growers in adoption of recommended summer bajra production technology
6) To seek the suggestions from the summer bajra growers for maximum adoption of recommended summer bajra production technology

5.2 Methodology

"Ex-post facto" research design was used for the study. Banaskantha district of Gujarat State was selected purposively as it has covered important summer bajra cultivation areas. Using multistage sampling technique, three talukas *viz.,* Deesa, Tharad and Dhanera were selected purposively from the district as these talukas were having higher areas under summer bajra cultivation. Five villages were selected randomly from each taluka. Thus, total 15 villages were selected. From each selected village, 10 farmers were selected randomly making a sample of 150 respondents.

Based on an extensive review of literature, consultation with extension personnel and experts of the subject, some important variables *viz.,* age, education, land holding, annual income, social participation, yield index, source of information, extension participation, cropping intensity, method of irrigation were selected as independent variables. They were measured with the help of the different scales and indices developed by past researchers as well as structured schedules/tests which were framed for the purpose.

Level of knowledge and technological gap was considered as dependent variable in the present study. For the measurement of technological gap, a list of the recommended package of practices of the summer bajra crop was prepared with the help of extension personnel and experts of the subject. The farmers were asked to indicate the practices they adopted in their field. Farmers were grouped into three categories *viz.,* low, medium and high extent of technological gap based on their technological gap score using mean and standard deviation.

Constraints were identified by as per their replays on constraints faced in adoption of recommended summer bajra cultivation technology. The frequency and percentage for all the constraints were calculated and then ranked accordingly.

Suggestions were collected from the summer bajra growers to overcome the constraints they faced in adoption of recommended summer bajra cultivation

technology. The frequency and percentage for all the suggestions were calculated and then ranked accordingly.

The data were collected by personal contact method with the help of structured interview schedule and collected data were coded, classified, tabulated and analyzed in light of objectives and in order to make the findings meaningful for drawing meaningful interpretation. The statistical tools such as frequency, percentage, mean, standard deviation, co-efficient of correlation were used.

5.3 Findings and conclusions

The major findings of the study are summarized as below.

5.3.1 Selected characteristics of the summer growers

5.3.1.1 Personal characteristics

(1) Age

Slightly less than one half (44.67%) of the summer bajra growers belonged to middle age group followed by old age 30.67 per cent and young age group 24.66 per cent, respectively.

(2) Education

In this study 35.33 per cent of the respondents were educated up to primary school. On the other hand, 20.67 per cent respondents had secondary school level education, 18.67 per cent respondents were found in functionally literate and 10.00 per cent respondents were found in illiterate. It is fortune to note that 08.66 per cent respondents were found in higher secondary level education and only 06.67 per cent respondents were found to be graduate.

5.3.1.2 Socio-economic characteristics

(3) Land holding

Slightly less than one third (31.33%) of summer bajra growers had small size of land holding, while 29.33 per cent summer bajra growers had semi-medium size of land holding. The respondents with marginal, medium and large size of land holding were 26.00, 08.67 and 04.67 per cent, respectively.

(4) Annual income

Maximum 34.00 per cent of the summer bajra growers had annual income between ₹50,001 to ₹1,00,000, while 30.00 per cent of the summer bajra growers had annual income between ₹1,00,000 to ₹1,50,000, and 12.67 per cent summer bajra growers belonged to annual income from ₹1,50,001 to ₹2,00,000. Whereas 12.00 per cent of the

summer bajra growers had annual income up to ₹50,000. Only 11.33 per cent summer bajra growers had annual income above ₹2,00,000.

(5) Social participation

Majority (80.66%) of the summer bajra growers had membership in social organization.

(6) Yield index

Majority of the summer bajra growers 58.67 per cent had medium yield index, followed by 21.33 and 20.00 per cent of the summer bajra growers had high and low yield index, respectively. Hence, it can be referred that majority of summer bajra growers had medium yield index.

5.3.1.3 Communicational characteristics

(7) Sources of information

About two third (64.00%) of the summer bajra growers had medium level of information source, while 18.67 and 17.33 per cent of them had high and low level of information sources, respectively.

(8) Extension participation

More than two third (68.67%) of the summer bajra growers had medium level of extension participation, followed by 19.33 and 12.00 per cent had high and low level of extension participation, respectively.

5.3.1.4 Situational characteristics

(9) Cropping intensity

Majority (92.67%) of summer bajra growers had high cropping intensity, followed by 07.33 per cent summer bajra growers were medium cropping intensity, respectively.

(10) Method of irrigation

Majority (70.67%) of the summer bajra growers were using flood irrigation method followed by 29.33 per cent of the summer bajra growers were using sprinkler irrigation method and only, 00.00 per cent of the summer bajra growers were using drip irrigation method.

5.3.2 Knowledge level of the summer bajra growers pertaining to recommended summer bajra production technology

Data showed that clear 66.00 per cent the summer bajra growers were medium level of knowledge. On the other hand, 20.00 and 14.00 per cent of summer bajra growers were found having low and high level of knowledge of summer bajra cultivation technology.

Data indicate that the high knowledge level was observed in case of recommended varieties (76.00%), symptoms of maturity in summer bajra (75.33%), seed rate (74.66%), days after sowing summer bajra crop should be harvested (73.33%), crop rotation in a year (72.66%), method use of irrigation is recommended for your area (69.33%), spacing for sowing summer bajra (61.33%) and method of sowing of seed for summer bajra (66.00%).

The medium knowledge level was observed regarding number of irrigations for summer bajra crop (54.66%), dose of farm yard manure for summer bajra (54.67%), number of irrigations for summer bajra crop (54.66%), herbicides used for weed control in cultivation of summer bajra (54.00%), the critical stages of summer bajra crop for irrigation (52.66%), recommended interval between two weeding for summer bajra crop (52.00%), diseases appear in summer bajra crop and measures are recommended for their control (51.33%), time for sowing of summer bajra (50.66%), yield of summer bajra (49.33%), insect-pests appear in summer bajra crop and measures are recommended for their control (47.33%) and interculturing in cultivation of summer bajra (45.33%).

The low knowledge level was found about hand weeding in cultivation of summer bajra (40.00%), seed treatment of summer bajra (24.00%), chemical fertilizer (38.66%), chemical fertilizer did you applied as top-dressing dose (09.33%), interval between two irrigations for summer bajra crop (39.33%) and gap filling should be done in summer bajra (05.33%).

5.3.3 Technological gap in the recommended summer bajra production technology

Data indicate that 60.66 per cent of the summer bajra growers were having medium technological gap followed by 16.67 and 22.67 per cent summer bajra growers were having low and high technological gap, respectively

Data showed that the practice-wise technological gap varied from practice to practice. The practice-wise technological gap among the summer bajra growers was ranging from 00.00 to 100 percent.

The data revealed that the high technological gap was observed in recommend variety and gap filling or thinning has 100 per cent, also line sowing has 100 per cent technological gap, plant protection 91.30 per cent, seed treatment 84.75 per cent, FYM/ chemical fertilizer 78.63 per cent and interculturing 54.00 per cent.

Seed rate 38.00 per cent, harvesting 28.00 per cent, weed control 21.57 per cent, sowing time 18.34 per cent, crop rotation 10.44 per cent, irrigation schedule 08.75 per

cent and method of sowing (broadcasting) zero per cent which were ranked as first to thirteen, respectively.

5.3.4 Association between profile of summer bajra growers and their overall technological gap

Data showed that independent variables, six variables *viz.*, education, land holding, annual income, social participation, source of information and yield index had negative and significant correlation with overall technological gap of summer bajra growers. Whereas, one variable *viz.*, age of the summer bajra growers had positive and significant correlation with overall technological gap. Whereas two variables *viz.*, cropping intensity and method of irrigation had positive and non-significant correlation with overall technological gap of summer bajra growers, whereas, one variable *viz.*, extension participation had negative and non-significant relationship with the overall technological gap in summer bajra production technology.

5.3.5 Constraints faced by the summer bajra growers in adoption of summer bajra production technology

Major constraints faced by the summer bajra growers in adoption of recommended summer bajra production technology were; shortage of labour (94.67%), high wages of labour (88.00%), non-remunerative price of production (83.33%), Lack of technical knowledge (80.67%)wind lodging causes yield loss (79.33%), damage by wild animal (73.33%), inadequate finance (65.33%), high cost of fertilizer (63.33%), shortage of irrigation water (43.33%), high cost of seed (38.67%) and pests and diseases (26.67%), which were ranked as I, II, III, IV, V, VI, VII ,VIII, IX, X, and XI, respectively.

5.3.6 Suggestions from the summer bajra growers for maximum adoption of recommended summer bajra production technology

The most important suggestions expressed by summer bajra growers to overcome the constraints faced by the respondents in adoption of improved summer bajra production technology were; provision of support price to the farmers (70.00%), proper marketing facility should be established (62.67%), to develop lodging resistance varieties (58.00%), timely technical guidance should be provided (54.00%), price of agricultural inputs should be reasonable (51.33%) and easily availability of certified seed from cooperative society and government agency (45.33%) which were ranked as I, II, III, IV, V, and VI, respectively.

5.4 Implications of the study

Some important implications drawn from this study are presented below:

1) The study to design strategy for capacity building of farmers about the knowledge technological gap in bajra crop, serve as guideline for policy makers, planners and extension workers.
2) Results of this study indicated that majority of the summer bajra growers had medium level of knowledge and medium level of technological gap in recommended summer bajra production technology, Hence, extension personnel and experts can organize training to supply technical know-how to them accordingly.
3) The study revealed that education and had negative and significant correlation with overall technological gap of summer bajra growers. In selecting the target group, the extension agencies should give priority to those farmers possessing high qualities in above attributes. Such farmers can help the extension agencies in convincing the other farmers to know and adopt scientific technology at a fastest rate.
4) More efforts should be made by the extension agencies to establish in depth extension contact with the farmers. Field demonstration, farmer's day, campaign, etc. should be organized at village level for this purpose.
5) In order to overcome the constraints *viz.,* Shortage of labour, Lack of market facilities, high wages of labour, non-remunerative price of production were the major constraints faced by summer bajra growers, so this point should be kept in mind for extension worker & strategies maker for increasing summer bajra production technology.
6) The important suggestions reported by the summer bajra growers were provision of reasonable price to the produce, good quality seed should be supplied at low cost to farmers in time, Proper marketing facility should be established timely technical guidance should be provided, Price of agricultural inputs should be reasonable, easily availability of certified seed from cooperative society and government agency, and crop loan should be provided at proper time.
7) Agricultural Department and State Agricultural Universities should give more emphasis on training, and demonstration on summer bajra production technology, so that farmers can increase summer bajra production by adoption of recommended practices.

5.5 Suggestions for further research

In light of the findings of the present study and the experience gained during the course of investigation, some new areas have emerged for future research. These are as under.

1) Similar investigation may be conducted in other summer bajra growing areas of district and state, so that results of this study can be strengthened.
2) Different variables other than those included in this study may also be identified and included in future study.
3) The size of sample may be enlarged to draw more valid conclusion.
4) Similar investigations may be conducted on other crops to find out extent of technological gap and the constraints in transfer of improved technology.
5) To remove existing constraints faced by summer bajra growers, the solution of these constraints needs to be investigated.

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APPENDICES

APPENDICES

"TECHNOLOGICAL GAP IN SUMMER BAJRA PRODUCTION TECHNOLOGY BY THE FARMERS OF BANASKANTHA DISTRICT"

INTERVIEW SCHEDULE

Interview Date:		**Respondent No.:**
Name of the farmer:		
Village:	Taluka:	District:
Contact No.:		

PART – I

[A] Personal characteristics

1. Age: _____ years (completed years)

2. Education

Sr. No.	Education	Tick mark (✓)
1	Illiterate	
2	Functionally literate	
3	Primary school (up to 7th standard)	
4	Middle school (8th to 10th standard)	
5	High school (11th to 12th standard)	
6	Under& Post graduate (UG&PG)	

[B] Socio-economic characteristics

3. Land holding

i. Total land: _____ha

ii. Area under summer bajra cultivation: _____ ha

4. Annual income

Sr. No.	Sources	Income (Rs. per annum)
1	Agriculture	
2	Horticulture	
3	Animal husbandry	
4	Service	
5	Business	
6	Any other (Specify)	
Total		

5. Social participation

Did you ever participate in any Social Organization? Yes/No

If yes, please give the following details.

Sr. No.	Organization		Member	Office bearer
(A)	**In village**			
	1	Gram Panchayat		
	2	Milk Cooperative Society		
	3	Service Cooperative Society		
	4	Youth Club		
	5	SHG		
	6	Any others (Specify)		
(B)	**Outside village**			
	1	Taluka Panchayat		
	2	District Panchayat		
	3	Farmers Union / Club		
	4	Any other (Specify)		

[C] Communicational characteristics

6. Sources of information

Please indicate by making tick mark (✓) from where you get the information about agriculture technology.

Sr. No.	Name of Source		Regularly (3)	Occasionally (2)	Never (1)
[i]	**Formal source:**				
	1.	Village Level Worker			
	2.	Agril. Extension Officer			
	3.	Subject Matter Specialist			
	4.	Agriculture Scientists			
	5.	Krishi Vigyan Kendra (KVK)			
	6.	Kisan Call Centre (KCC)			
	7.	Farmers Training Center			
	8.	Service Co-operative Society			
	9.	Fertilizer Information Depot			
	10.	NGO			
	11.	ATMA personnel			
	12.	Any others (please specify)			
[ii]	**Informal source:**				
	1.	Neighbours			
	2.	Relatives and Friends			
	3.	Progressive farmers			
	4.	Local leaders			
	5.	Any others (please specify)			

[iii]	Mass Media:				
	1.	Mobile app			
	2.	Television			
	3.	Radio			
	4.	Internet			
	5.	i-Kisan portal			
	6.	News papers			
	7.	Agricultural literature			
	8.	Agricultural Exhibition			
	9.	Agricultural fair/ Krishi mela			
	10.	Any others (please specify)			

7. Extension participation

Kindly indicate whether you participate any of the following extension activity by putting tick mark (✓).

Sr. No.	Participation in extension activities	Yes	No
1.	If there any demonstration conducted on your field?		
2.	Could you have discussion with extension workers?		
3.	Do you ever participate in field days or demonstration meet on the farmers' fields?		
4.	Have you ever participated in agriculture extension meetings?		
5.	Have you ever visited demonstration plot of your neighbour and discussed with him?		
6.	Have you ever participated in krushimela?		
7.	Have you ever visited any agricultural exhibition?		
8.	Do you read agriculture extension publications?		
9.	Do you listen radio programmes on agriculture?		
10.	Do you watch T.V. programmes on agriculture?		
11.	Have you ever participated in exposure visit organized by various agencies?		

[D] Situational characteristics

8. Cropping intensity

What was the area under different crop?

Sr. No.	Season	Crop	Area(ha)
1	Kharif		
2	Rabi		
3	Summer		

9. Yield

What was the yield of summer Bajra on your farm? _____q/ha

10. Method of irrigation

Sr. No.	Name of method	Area(ha)
1	Flood	
2	Sprinkler	
3	Drip	

Part II

Knowledge of summer bajra growers regarding recommended summer bajra production technology

Sr. No.	Statements	Correct/ Incorrect
[1]	**Improved varieties:**	
	which varieties of bajra are recommended for summer cultivation?	
[2]	**Seed rate:**	
	What is the recommended seed rate for cultivating summer bajra? _____kg/ha	
[3]	**Spacing:**	
	What is the recommended spacing for sowing summer bajra?	
[4]	**Seed treatment:**	
	Which fungicide is recommended for seed treatment of summer bajra?	
[5]	**Sowing time & method:**	
	A. Which is the recommended time for sowing of summer bajra? _____	
	B. Which method of sowing of seed is recommended for summer bajra cultivation? _____	
[6]	**Fertilizers:**	
	A. What is the recommended dose of farm yard manure for summer bajra cultivation? _____t/ha.	
	B. How much quantity of chemical fertilizer is recommended basal dose for summer bajra crop?	
	C. How much chemical fertilizer is to be applied as top-dressing dose?	
[7]	**Irrigation:**	
	A. State the critical stages of summer bajra crop for irrigation? _____	
	B. Which method use of irrigation is recommended for your area? _____	
	C. State the recommended number of irrigations for summer bajra crop? _____	
	D. State the recommended interval between two irrigations for summer bajra crop? _____	

[8]	**Gap filling or thinning:**	
	when gap filling should be done in summer bajra? after _____ days of sowing	
[9]	**Interculturing:**	
	How many Interculturing recommended in cultivation of summer bajra? _____	
[10]	**Weed management**:	
	A. State the recommended interval between two weeding for summer bajra crop?	
	B. How many times hand weeding recommended in cultivation of summer bajra? _____	
	C. Which herbicides recommended used for weed control in cultivation of summer bajra?	
[11]	**Crop rotation:**	
	Which are the crops recommended in crop rotation in cultivation of summer bajra in a year?	
[12]	**Plant protection:**	
(A)	**Insect-pest management:**	
	Which insect-pests appear in summer bajra crop and what measures are recommended for their control?	
[B]	**Disease management:**	
	Which diseases appear in summer bajra crop and what measures are recommended for their control?	
[13]	**Harvesting:**	
	A. How many days after sowing summer bajra crop should be harvested? _____	
	B. What are the symptoms of maturity in summer bajra? _____	
	C. Yield of summer bajra _____ q/ha	

PART III

Technological gap in Recommended summer bajra production technology

Please answer the following questions on recommended summer bajra cultivation technology which you actually follow in your field.

Sr. No.	Statement	Adopted	Not adopted
[1]	**Improved varieties:**		
	Which varieties of summer bajra did you sow in your field?		
[2]	**Seed rate:**		
	How much seed rate did you use for cultivation of summer bajra in your field? _____Kg/ha		
[3]	**Spacing:**		
	At what distance did you sow summer bajra crop in your field?		
[4]	**Seed treatment:**		
	Have you treated the seed of summer bajra before sowing? Yes / No If yes, give details.		
[5]	**Sowing time:**		
	A. when you sowed the summer bajra crop on your field? _____		
	B. Which method did you used for sowing seeds of summer bajra crop? _____		
[6]	**Fertilizers:**		
	A. How much farm yard manure did you applied before sowing summer bajra crop? _____ t/ha		
	B. How much chemical fertilizer did you applied as basal dose?		
	C. How much chemical fertilizer did you applied as top-dressing dose?		
[7]	**Irrigation:**		
	A. State the critical stages of summer bajra crop for irrigation? _____		
	B. which method use of irrigation is recommended for your area? _____		
	C. State the recommended number of irrigations for summer bajra crop? _____		

	D. State the recommended interval between two irrigations for summer bajra crop? _____		
[8]	**Gap filling or thinning:**		
	When gap filling should be done in summer bajra? after _____ days of sowing		
[9]	**Interculturing:**		
	How many interculture did you followed in summer bajra crop? _____		
[10]	**Weed management:**		
	A. How many days after sowing first weeding will be done?		
	B. How many times did you followed hand weeding in cultivation of summer bajra crop? _____		
	C. Did you use herbicide for weed control in cultivation of summer bajra crop? Yes/No: _____ if yes, give detail.		
[11]	**Crop rotation:**		
	Which crops did you grow in rotation with summer bajra crop?		
[12]	**Plant protection:**		
(A)	**Insect-Pest management:**		
	Did you apply the control measures in case of insect's attack in summer bajra crop? Yes / No _____ If yes,		
(**B**)	**Disease management:**		
	Did you apply the control measures in case of diseases attack in summer bajra crop? Yes / No _____ If yes, give the details		
[13]	**Harvesting:**		
	A. How many days after sowing summer bajra crop should be harvested? _____		
	B. What are the symptoms of maturity in summer bajra? _____		

PART-IV

Constraints faced by the summer bajra growers in adoption of recommended summer bajra production technology

Please give you constrains which you faced in adoption of recommended summer bajra cultivation technology

Sr. No.	Constraints	Very Important	Important	Not important
1	Shortage of labour			
2	high wages of labour			
3	Non-remunerative price of production			
4	Lack of technical knowledge			
5	Wind Lodging causes yield loss			
6	Damage the crop by wild animal			
7	Inadequate finance			
8	High cost of fertilizer			
9	Shortage of irrigation water			
10	High cost of seed			
11	pests and diseases			

PART - 5

Suggestion given by the farmers

Please mention the suggestions, if any to overcome the constrains faced in adoptions of recommended summer bajra cultivation technology

Sr. No.	Suggestions	Very Important	Important	Not important
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

CERTIFICATE

This is to certify that, I have no objection for supplying to any scientist only one copy or any part of this thesis at a time through reprographic process, if necessary for rendering reference service in a library or documentation centre.

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Date : 13 SEPTEMBER, 2021

(BHANDERI SAGAR D.)