STUDIES ON CHALLENGES FACED BY RURAL DAIRY FARMERS IN MILK PROCESSING AND MILK PRODUCTS MANUFACTURING IN SHIRUR TAHSIL OF PUNE DISTRICT

THESIS

Submitted to
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola
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IN
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By

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Enrolment Number - SS/3036 **2022**

DECLARATION OF STUDENT

I hereby declare that, the experimental work and its interpretation of the Thesis entitled **"STUDIES ON CHALLENGES FACED BY RURAL DAIRY FARMERS IN MILK PROCESSING AND MILK PRODUCTS MANUFACTURING IN SHIRUR TAHSIL OF PUNE DISTRICT"** or part thereof has neither been submitted for any other degree or diploma of any University, nor the data have been derived from any thesis / publication of any University or scientific organization. The source of materials used and all assistance received during the course of investigation have been duly acknowledged.

Place: Nagpur **(AGARKAR AKSHAY VISHWANATH)**

Date: 28/12/2022 Enrolment No. SS/3036

CERTIFICATE

This is to certify that thesis entitled **"STUDIES ON CHALLENGES FACED BY RURAL DAIRY FARMERS IN MILK PROCESSING AND MILK PRODUCTS MANUFACTURING IN SHIRUR TAHSIL OF PUNE DISTRICT"** submitted in partial fulfilment of the requirement for the degree of **"Master of Science in Agriculture (Animal Husbandry and Dairy Science) with specialization in Dairy Science"** of Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola is a record of bonafide research work carried out by **AGARKAR AKSHAY VISHWANATH** under my guidance and supervision.

The subject of the thesis has been approved by the Student's Advisory Committee.

Place: Nagpur
Date: 28/12/2022

(Shri. D. T. Undratwad)
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THESIS APPROVED BY THE STUDENT'S ADVISORY COMMITTEE INCLUDING EXTERNAL EXAMINER (AFTER VIVA -VOCE)

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Place: Nagpur

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%	-	per cent
@	-	At the rate of
ºC	-	Degree Celsius
/	-	Per
Agril.	-	Agricultural
Agri.	-	Agriculture
Cr.Lit.	-	Crore Liter
Etc.	-	et cetera
et al.	-	et alia (and others)
g.	-	Gram
GOM	-	Government of Maharshtra
HHP	-	High Hydrostatic Pressure
HTST	-	High Temperature Short Time
I.e.	-	That is
IRDP	-	Integrated Rural Development Board
Kg	-	Kilogram
KPa	-	Kilo Pascal
Lit.	-	Liter
MT	-	Million Tonnes
mm	-	Millimeter
MF	-	Micro Filtration
MPC	-	Milk Protein Concentrate
NDDB	-	National Dairy Development Board

NF	-	Nano Filtration
No	-	Number
RO	-	Reverse Osmosis
SD	-	Standard deviation
SNF	-	Solid Not Fat
TIDP	-	Traditional Indian dairy products
Unpub.	-	Unpublished
UF	-	Ultra filteration
Viz	-	Namely

(E) THESIS ABSTRACT

a)	**Title of the Thesis**	:	**“STUDIES ON CHALLENGES FACED BY RURAL DAIRY FARMERS IN MILK PROCESSING AND MILK PRODUCTS MANUFACTURING IN SHIRUR TAHSIL OF PUNE DISTRICT’’**
b)	**Full name of student**	:	**AGARKAR AKSHAY VISHWANATH**
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ABSTRACT

The study entitled “Challenges faced by rural dairy farmers in milk processing and milk products manufacturing” was conducted in Shirur tahsil of Pune district of Maharashtra state, 200 dairy farmers were selected from 25 villages by using random sampling method. Data were collected by personally interviewing the dairy farmers with the help of well-structured interview schedule and data were subjected to appropriate statistical analysis.

The results of the study revealed that majority of the dairy farmers (42%) belonged to middle age group, (49%) of the dairy farmers had dairy + agriculture as their main occupation and (61.50%) of dairy farmers residing with medium size of family with (63%) of dairy farmers had nuclear type of family while, (53.50%) dairy farmers had annual income between 2,00,000 to 3,00,000. Nearby half (46%) of dairy farmers had medium size of herd, (49%) of dairy farmers had collected milk from other dairy farmers and (40%) of dairy farmers had high level of daily milk production. Nearly half (48.00%) of dairy farmers had sold low level of milk, (26.53%) dairy farmers were sold high level of dahi milk product while, (43%) of dairy farmers had medium level of risk preference in dairy farming about 20 to 24 years.

The major infrastructural constraint (93%) was weak supply of milk chain and regarding economic constraints maximum number of dairy farmers (100%) expressed the major constraint as low price for milk offered, (85%) dairy farmers perceived major constraints inadequate access to training programme under communicational constraints. Regarding marketing constraints, major constraint expressed by dairy farmers (100%) was advertisement of own product and (89%) of dairy farmers encountered the major constraints lack of co-operation and co-ordination under socio-psychological constraints. However, with regards to technical constraints (100%) of dairy farmers expressed the high cost of modern technologies as major constraint.

In new equipment (81%) of dairy farmers had used cone shaped milk can, (49%) dairy farmers used milk boiler. Regarding new equipment (14%) and (09%) dairy farmers had used centrifuge machine and electric churner. In new techniques (49%) of dairy farmers had used packaging technique, (48%) dairy farmers had used chilling technique and (45%) dairy farmers had used cream separation technique.

Hence, it is concluded that there is need to provide training, guidance, knowledge and credit to rural dairy farmers, so as to increase the milk processing and milk products manufacturing in rural area i.e. in study area.

Chapter I

INTRODUCTION

1.1 Background information

Dairy is the single largest agricultural commodity contributing 5 per cent of the national economy and employing more than 8 crore farmers directly. India is ranked 1st in milk production contributing 23 per cent of global milk production. Milk production in the country has grown at a compound annual growth rate of about 6.2 per cent to reach 209.96 million tonnes in 2020-21 from 146.31 million tons in 2014-15. (National Dairy Development Board, 2020).

Milk handling from household sector 45% uses for drinking, for conversion into milk products such as curd, ghee, makhan/butter. Milk handling from non-organized sector 37% uses for meeting the demand for liquid milk, production of mithais (sweets) and traditional dairy products. Milk handling from organized sector 18% uses for processing of milk into pasteurized liquid milk and manufacture of indigenous and western milk products. The first two user's segments account for 80-82% of milk consumed in India. (Patange, 2018).

In spite of being the world's largest milk producer only 12-15% of the milk delivered to the dairies for processing against the world average of 70% in India. In India about 403 private dairy plants for processing of milk with processing capacity 3.84 Cr. L, about 212 co-operative dairy plants with processing capacity 2.83 Cr. L and 63 government dairy plants with processing capacity 1.21 Cr. L. (Patange, 2018).

An estimated, 54% milk produced in India is converted into products (traditional & western) and rest of milk is utilized as a market milk i.e. for liquid consumption. About 46% of milk uses as a liquid milk, 33% milk uses for Ghee/Butter, 7% milk uses for Curd/dahi (Shrikhand, Lassi etc.), 7% milk uses for Khoa (peda, burfi, gulabjamun etc.), 3%

milk uses for Chhana/Paneer (rasogolla, rasmalai etc.) and 4% milk uses for western products (powder, cheese etc.). (Aneja *et al.* 2002)

Due to expanding population and improve income in the rural urban trading centers within the region in order to improve smallholder dairy production in the region. There is a good market opportunity for different milk products. Milk production must be accompanied by processing to produce variety of products to meets market opportunities. Further milk is highly perishable thus there is need to processes the milk into products that have a longer shelf-life, easier to handle and transport to long distance market outlets. Processed milk products can also be stored and off loaded into the market when demand arises. (Njarui, 2010)

Dairy farming is one of the important activities of the rural population of our country. The importance of the dairy, as a subsidiary industry to agriculture, has stressed by the National Commission on Agriculture. Dairy enterprise, next to agriculture, not only provides continuous income and improves dietary standards of family, but also supplement the income and reduces unemployment to a large number of the rural poor.

The advent of “Operation Flood” has made the farmers in rural areas to realize the importance of dairy units as the potential source of additional income and employment. Dairy farming in India is practice with one or two indigenous buffaloes or cow, milk has now emerged as the second largest agricultural commodity and that is why dairy as a business is becoming more popular among farmers and also among the educated unemployment people. Dairying is recognized as an instrument for social and economic development.

The nation's milk supply comes from billions of small producers dispersed throughout rural areas. But the economic condition of rural dairy farmers is not good because they afraid to jump in milk processing due to various reasons.

In spite of the remarkable growth in milk production during the past few decades, dairy farmers face different challenges in infrastructural, technical, socio- psychological, economic and marketing operations are a major concern hindering further development of the industry. (Kavithaa, 2020)

Hence the presence study was carried out to explore various constraints perceived by dairy farmers in milk processing and milk products manufacturing and its marketing.

1.2 Need and importance of study

The present study was conducted in Shirur tahsil of Pune district. In this area the rural dairy farmers maintained dairy farmer on commercial basis or as a subsidiary business to the agriculture. This study would be helpful to know challenges faced by rural farmers in milk processing and marketing. Milk processing and marketing is very less at village level in rural area. Inadequate knowledge, lack of modern machinery, lack of market knowledge are the reasons for poor economic condition of rural dairy farmers. Now a day's milk is emerged as the second largest agricultural commodity and it provides job opportunity to the farmers and also to the educated unemployed people.

This study would be important to know the effect of challenges on livelihood dimensions of the dairy farmers and would be important to know Personal, Socio-economic, Communication and Psychological characteristics of rural dairy farmers also to assess the livelihood status of the dairy farmers. The study can be useful to put forth some evidence about the improvement of rural dairy farmers through dairy farming. Considering all these aspects of the present study, it was felt necessary to plan and conduct study on "Challenges faced by rural dairy farmers in milk processing milk and milk products manufacturing and its marketing".

Milk production in India is far the domain of small farmers in a mixed farming system (Manoharan, 2003). To maximize deep production and thereby profit, the farmer depends on his limited resources available viz., inputs, genetic potential of animal. Scientific management and skill of the farmer can definitely augment the profit. The present study was designed to find out constraints in milk processing and milk product manufacturing.

In India most of the rural dairy farmers live in villages as farmers which have main occupation farming and side business milch animal rearing, most of rural dairy farmers carrying out traditional practices for milk processing and milk products manufacturing at village level. Keeping this view, this study was made to know the socio-economic status of the rural dairy farmers, to identify the challenges faced by rural dairy farmers in milk processing and milk products manufacturing and to study the opportunities and new technologies available in milk processing and milk product manufacturing for rural dairy farmers at village level in Shirur tahsil of Pune district of Maharashtra state.

The result of this study would be help to provide a guideline for the policy makers for Shirur tahsil. To improve the socio-economic conditions of rural dairy farmers and to becomes dairy farming more producing and profitable, which ultimately help to improve their livelihood. The present investigation on constraints faced by rural dairy farmers in milk processing and milk products manufacturing was conducted on following objectives.

1.3 Objectives of the study

1. To study the socio-economic condition of dairy farmers in tahsil
2. To identify the constraints faced by dairy farmers in processing and marketing
3. To study the new technologies and opportunities available in milk processing and milk products manufacturing to rural dairy farmers

1.4 Hypothesis or assumptions

Considering the findings of various earlier research studies and based on the objectives of the study as well as assumptions, the following hypothesis is formulated and presented in null form (Ho).

There may not be any constraints for rural dairy farmers for processing of milk and manufacturing of milk products.

1.5 Scope and limitation of study

Scope of study

The present investigation is the maiden efforts of studying challenges faced by rural dairy farmers in milk processing and milk product manufacturing in villages of Shirur tahsil of Pune district in a comprehensive manner. The findings will assure great significance in creating data essential for future planning of dairy development in the locality.

Dairy farming is a regular and reliable source of income after the agricultural commodity. The number of farmers having dairy farming but their profit from dairy farming is very less; it needs to improve the profit from dairy farming by milk processing and milk products manufacturing by rural dairy farmers. The study will provide guidelines to the researcher working in this area and extension workers about dairy farmers to make dairy farming more profitable. It is further expected to provide useful criteria for understanding the constraint faced by rural dairy farmers, while performing various activities in dairy farming.

The findings may provide feedback to the extension agencies so as to arrange the training programs and camps for rural dairy farmers. This will improve the knowledge of the rural dairy farmers, resulting in adaption of scientific technique in milk processing and milk product manufacturing. The present study is intended to bring about the detailed analysis of the rural dairy farmers.

Limitation of study

The present study is intended to bring about the detailed analysis of the challenges faced by rural dairy farmers in milk processing and milk products manufacturing. The present study has its own limitation of time and resources as an individual. In the present study, investigation have restricted to the selection of locale sample size and the variables. Hence the findings have to be viewed in the specific context of the conditions prevailing in the study area and cannot be generated for wider geographical area. However careful and rigorous procedures were adopted in carrying out the research as objectively as possible. In spite of the individual bias made by the beneficiaries in eliciting the necessary responses, it is believed that the findings and conclusions drawn in the present study would focus for more rigorous field observations. It has following limitations.

1. The area of investigation is restricted to one district.
2. The generalizations based on findings are applicable to this area or at the most, other areas having similar conditions.
3. The generalizations drawn are based on the responses collected from the farmers engagement in dairy farming. It is therefore limit it's applicability for a wider area.
4. Being a student research project time, money and other resources do not permit to cover large area than one taken for the purpose of the study.
5. The objectivity of the study is limited to the ability of the rural dairy farmers to recall and their honesty in furnishing required information.

Chapter II

REVIEW OF LITERATURE

A review of part studies related to “Studies on challenges faced by rural dairy farmers in milk processing and milk products manufacturing” collected from various journals, periodicals, research paper, websites and post graduate thesis from various universities. Attempts were made to gather findings having relevance with the topics; other closely related research studies were also collected under study. The reviews so collected are presented in this chapter and presented as below.

2.1 Review related to Socio-economic condition of the rural dairy farmers

2.2 Review related to challenges faced by rural dairy farmers in milk processing and marketing

2.3 Review related to new technologies and opportunities available for rural dairy farmers

2.1 Review related to socio-economic condition of dairy farmers

2.1.1 Age

Mane (2001) observed that maximum numbers of the dairy farmer respondents of IRDP 42.00 per cent were found from middle age group followed by young age group i.e., 32.00 per cent and only 26.00 per cent from old age.

Pawar (2001) observed in the study on ‘Dairy farming in relation to socio economic status of tribal’s in Amravati district’ observed that maximum number with 39.00 per cent observed in age group of 45-55 year followed by 35-45-year, 25-35 year and 55 and above year respectively.

Rakshe (2002) studied the technological gap in dairy animal management practices in Parbhani district and revealed that, majority of the dairy farmers 60.83 per cent were from middle age group followed by young age 21.66 per cent and remaining 17.51 per cent dairy farmers were from old age group.

Gour (2002) reported that majority of the dairy farmers (76.74 %) belonged to middle age group.

Chauhan *et al.* (2004) found in his study on 'Impact of farmer status on milk production in tribal area' that 28.00 per cent of dairy farmers were under the age group of 36-45 years, followed by 46-55 years who were 27.00 per cent, whereas, above 55 years were 25.00 per cent and 26-35 years were 16.00 per cent, while only 4.00 per cent of them were under the age group of below 25 years.

Korde (2004) observed in his study adoption of dairy management practices by dairy entrepreneurs found that majority of respondents (61.54%) were of middle age group followed by young age (23.3%). The percentage of respondents in old age category found to be relatively less (16.15%).

Nitnaware (2004) observed in his research on training needs of dairy farmers that 67.33 per cent dairy owners were in the age category of 31-51 years i.e., of middle age and 14.66 per cent dairy owners from young age category of up to 30 years and 18.00 per cent dairy owners were from old age category of 52 and above year of age group.

Khin Mar Oo (2005) found in the study entitled 'Knowledge and adoption of improved dairying practices in Dharwad district' revealed that majority of women dairy farmers 59.17 per cent belonged to middle age group, whereas, 22.50 per cent of them were younger, followed by old age 18.33 per cent category.

Chaudhari (2006) revealed that majority of dairy farmers (68.00 %) belonged to middle age group, whereas, 32.00 per cent of them were younger category.

Patil (2007) observed in a study of dairy farmers from Nagpur district revealed that majority of dairy farmers were of middle age (60.89%) followed by old age group (21.78%) and remaining 17.33 per cent farmers were from young age group.

Khode *et al.* (2009) recorded in their study on adoption of improved dairy cattle management practices under Vidarbha development programme package revealed that majority of beneficiaries (60.47%) were from the age group of 31 to 50 and the age group followed by 20.93 per cent from the age of up to 30 years.

Saha and Akand (2010) studied livestock farmers knowledge about rearing practices in Ganderbal district of Jammu and Kashmir and reported that, maximum number of the livestock farmers 47.5 per cent were from the middle age group, whereas, 39.50 per cent belonged to old age and 13 per cent to young age group.

Desai (2011) reported that majority of the respondents (75.00%) were in the age group of 35-60 years and the remaining respondents were from the age group of 20-35 years.

Patil (2011) revealed that more than half of the dairy farmer (58.00%) belonged to middle age group, whereas, 42.00 per cent of them were younger, followed by old age (05.00%) category.

Rathod *et al.* (2011) revealed that 55.00 per cent of rural women were middle age followed by young (35.00%) and old age (10.00%) category.

Kale (2012) revealed that majority of dairy farmers (70.00%) belonged to middle age group, whereas, 26.00 per cent of them were younger category followed by old age (04.00%) category.

Meena *et al.* (2012) studied the adoption of scientific dairy husbandry practices by tribal farmers from Udaipur district of Rajasthan revealed that around 47.00 per cent of the dairy farmers were from young age group (31 years) followed by nearly 44.00 per cent from middle age group (31 to 49years). Only one-tenth respondents belonged to old age category with an age of 49 years and above.

Rajput *et al.* (2012) studied perceived training needs of dairy farmers regarding improved dairy farming practices in Bundelkhand region indicated that most of the respondents (52.50%) belonged to medium age group followed by young age group (30.63%) while rest 16.88 per cent were from old age group.

Patel *et al.* (2013) observed the status and constraints of dairying in the tribal households of Narmada valley of Gujarat and revealed that the majority of dairy farmers (53.75%) were in middle age group followed by old age group (36.25%) whereas, remaining 10.00 per cent of farmers belonged to young age group.

Prasad *et al.* (2013) reported that majority of the dairy farmers (49.17%) were middle age individuals followed by 33.75 per cent and 17.00 per cent in young age and old age group respectively.

Sahu *et al.* (2013) reported that nearly 50.00 per cent of the respondents belonged to middle age group, followed by 31.25 per cent and 18.75 per cent from old and young age group respectively.

Sasane *et al.* (2013) conducted study in Ratnagiri on knowledge level of farmers about improved dairy management practices and revealed that about 38.18 per cent respondents were belonged to middle age group followed by old age group (34.55%).

Jadav *et al.* (2014) recorded while studying the animal husbandry practices and outline of rural livestock farmers from Surat district of Gujarat revealed that majority of the livestock farmers

(61.00%) belonged to middle age group followed by old (22.00%) and young (17.00%) age group.

Lohakare *et al.* (2015) observed in their study on extent of knowledge of improved animal husbandry practices and socio-economical, psychological characteristics of dairy farmers of Yavatmal district of Maharashtra revealed that majority of the respondents (63.81 %) were belonging to middle age, followed by old (18.57%) and 17.62 per cent of respondent were from young age group.

Tajpara *et al.* (2016) revealed that majority of the dairy farmers belonged to middle age group (40.89) followed by young age group (39.56%). The respondents belonging to old age group were 19.56 per cent only.

Chandrasekar *et al*. (2017) in their study in rural Karnataka observed that majority (58.00%) of the respondents belonged to the middle age group of 40 to 57 years.

Gopi *et al.* (2017) in their study reported that about two-fifth (41.67%) of the dairy farmers belonged to old age group, while 35.00 per cent of them were in middle age group and only 23.33 per cent were in young age group.

Pathade *et al.* (2017) found that majority of the respondents (58.33%) belonged to the middle age group followed by 25.00 per cent to the young age group, while16.67 per cent were under the old age category in Hingoli, Aundha and Basmat talukas of Hingoli district of Maharashtra.

Sahu *et al.* (2017) reported that higher proportion of the respondents (42.14%) belonged to middle age group, followed by 37.86 per cent of dairy farmers belonged to young age category and only one fifth per cent of the respondents belonged old age categories.

Patel *et al.* (2018) indicated that majority (85.00%) of the commercial dairy farm owners were in middle age group (31 to 55 years) and the average age of respondents was only 42 years.

2.1.2 Education

Pawar (2001) observed that, half 49.00 per cent the respondent had primary education and one forth 23.00 per cent had middle school education and 21.00 per cent respondent were illiterate, however only 07.00 per cent were in receipt of 10 above education.

Rakshe (2002) revealed that, 21.66 per cent of the respondents were educated up to high school level followed by, middle school level i.e. (19.16%) and graduate level i.e. (17.54%) whereas, 16.66 per cent of the respondents were having education up to primary level followed by illiterate category, (14.16%), while very negligible percentage (06.66 % and 04.16%) were found in the category of can read only and can read and write category respectively.

Badlurkar *et al.* (2003) studied on decision making pattern and participation of rural women in animal husbandry and dairying enterprises and reported that 65.35 per cent of dairy farm women had education up to illiterate level, whereas, 27.56 per cent were found to be educated up to primary school level and 03.85 per cent had education up to secondary school level and only 02.40 and 0.75 per cent of them had higher secondary and college level, respectively.

Chauhan *et al.* (2004) found in his study on 'Impact of farmer status on milk production in tribal area' that 30.00 per cent of dairy farmers were educated up to high school level followed by primary level 27.50 per cent, middle school level 19.00 per cent and college level 13.50 per cent, whereas, 10.00 per cent of dairy farmers were illiterate.

Korde (2004) conducted study on adoption of dairy management practices by dairy entrepreneurs and found that nearly 36.16 per cent

respondents were educated up to high school level followed by 28.46 per cent respondents who were educated up to middle school level, whereas, 19.23 per cent of respondents received education up to college level. Further, it was noted that only 09.23 per cent of the respondents were found to be illiterate. It could therefore, be inferred that majority of respondents i.e. 64.62 per cent has middle school and high school level of education. It may be because of fact that education up to high school level is available in most of the villages.

Nitnaware (2004) analyzed training needs of dairy farmers that 42.66 per cent and 34.00 per cent respondents were educated up to college level and higher secondary level, while only 13.33 per cent and 05.33 per cent respondents were educated up to primary school and secondary school respectively, whereas, very less percentage i.e. 04.66 per cent respondents were comes under illiterate category.

Bordoloi *et al.* (2005) studied the socio-economic and personal characteristics of dairy farmers of West Bengal and reported that landless labours remained educationally backward i.e. 50.67 per cent of them were illiterate, 40.00 per cent educated up to 10^{th} standard and only 09.33 per cent people were educated above 10^{th} standard. Whereas, 41.43 per cent of marginal and 41.67 per cent of small farmers were educated up to 10^{th} standard and 13.33 per cent of marginal and 16.67 per cent of small farmers were educated above 10^{th} standard.

Deshmukh and Dakhore (2005) reported that 36.00, 23.50 and 12.00 per cent of the buffalo dairy farmer respondents in Parbhani district were educated up to primary, secondary and higher secondary level, while 09.00 per cent of the respondents belonged to college level education. On the other hands, 19.50 per cent were illiterate.

Khin Mar Oo (2005) observed that majority of the dairy women 60.83 per cent were illiterate, while 22.50 per cent of them were educated up to primary level, followed by middle school 10.33 per cent.

Thus, 04.17 per cent of dairy women were educated up to high school level and only 01.67 per cent of them were studied up to college level.

Chaudhari (2006) found that 39.00 per cent of dairy farmers were educated up to high school level followed by middle level (36.00%), primary school level (11.00%) and college level (14.00%), whereas, 00.00 per cent of dairy farmers were illiterate.

Bhamare (2006) studied socio-economic status of dairy women in SHG of Parbhani district and reported that the 35.83 per cent SHG members were educated up to secondary school level, 28.33 per cent respondents were illiterate, 25.00 per cent respondents were educated up to primary school level and 08.00 per cent of the respondents were able to read and write only.

Senthilkumar *et al.* (2013) observed that the education of the dairy farmers in urban area of Tamil Nadu state which were the beneficiaries of mobile artificial insemination services that one third (38.00%) of the respondents had collegiate level of education, about 37.00 per cent had higher secondary level of education and remaining 25.00 per cent had education up to primary level. There were no illiterates among the beneficiaries.

Khode *et al.* (2009) recorded in a study on adoption of improved dairy cattle management practices under Vidarbha development programme package reported that 51.16 per cent beneficiaries were educated between 5^{th} to 10^{th} standard.

Nishi *et al.* (2011) reported that, highest percentage 42.50 per cent of the respondents were having formal education up to matriculation, followed by 25.00, 12.50, 10.00, 06.25 and 03.75 per cent having middle, primary, no formal schooling, graduate or above and intermediate level education, respectively.

Patil (2011) found that 48.00 per cent of dairy farmers were educated up to higher secondary level followed by high school (25.00

%), middle school level and primary school level (07.00%), each and college level (09.00%) whereas, 04.00 per cent of dairy farmers were illiterate.

Rathod *et al.* (2011) revealed that 45.00 per cent dairy farmers were illiterates while other 55.00 per cent dairy farmers had education from primary school to the intermediate level schooling.

Shinde (2011) reported that the socio-economic profile of dairy farmers in Solapur district of Maharashtra and showed that, the percentage of farmers who can read and write was 54 in irrigated and 69 in non-irrigated talukas. The large and commercial dairy farmers were more educated than all other categories of dairy farmer in both the irrigated and non-irrigated talukas.

Meena *et al.* (2012) revealed that most of the tribal dairy farmers (50.34%) from Udaipur district of Rajasthan were educated up to 5th standard followed by one-fourth illiterate (26.00%), nearly one-tenth (13.00%) were educated up to 8^{th} standard while only a few farmers had secondary and higher educational qualifications i.e. 06.33 per cent and 04.33 per cent, respectively.

Kale (2012) recorded that 43.00 per cent of dairy women farmers were educated up to high school level followed by college level (20.00%) and middle school level (19.00%) and primary level (14.00%), whereas, only 04.00 per cent of dairy farmers were illiterate.

Jaisridhar *et al.* (2013) in their study on factors determining adoption of scientific dairy farming practices in five districts of Tamil nadu revealed that majority of the dairy farmers (38.67%) were educated up to high school level followed by middle school (23.33%), degree and above (16.00%), primary (13.33%) and remaining 08.67 per cent of respondents were illiterate.

Patel *et al.* (2013) showed that majority of the farmers (41.00%) had primary level of education, followed by secondary level of education (35.00%) while remaining (20.00%) of farmers were illiterate.

Sahu *et al.* (2013) indicated that majority of the respondents had their education up to junior high school level, whereas, 32.50, 17.50, 10.00 and 03.75 per cent respondents were from the categories like illiterate, up to high school, up to intermediate, up to graduation and above level respectively.

Sasane *et al.* (2013) conducted study in Ratnagiri on knowledge level of farmers about improved dairy management practices and revealed that regarding education 61.82 per cent of respondents were educated up to higher secondary.

Jadav *et al.* (2014) recorded that while studying on topic animal husbandry practices and outline of rural livestock farmers revealed that Livestock farmers (27.00%) were educated up to primary level followed by those who could read and write (23.00%), illiterate and up to secondary educated (17.00% each), up to higher secondary educated (07.00%) and above higher secondary educated (09.00%).

Lohakare *et al*. (2015) observed in their study revealed that majority of respondents (55.77%) were educated up to secondary school while 12.86 per cent respondents had primary and higher secondary school education. However, only 06.98 per cent of the respondents were educated up to graduation.

Tajpara *et al.* (2016) reported that majority (43.11%) of the dairy farmers had obtained primary education; whereas 17.33 per cent and 16.44 per cent of them had secondary and senior secondary level education respectively. Only 05.33 per cent respondents had educated up to graduation level. 16.89 per cent of respondents were illiterate.

Chandrasekar *et al.* (2017) reported that 87.50 percent of the respondents were literates having education of different levels in rural district of Karnataka.

Gopi *et al.* (2017) recorded in their study reported that nearly half (45.00 %) of the respondents were illiterate followed by high school education (19.17%), primary school and middle school education (each 13.33%), can read and write (05.00%) and can read only (02.50%). A negligible 01.67 per cent of the respondents had collegiate education.

Sahu *et al.* (2017) reported that maximum number of the respondents (38.57%) were educated up to high school level, followed by little less than one fourth of respondents (23.58%) were educated up to higher secondary level whereas, 12.14 per cent of respondents were educated up to middle school level, also it was observed that 10.71 per cent of respondents were educated up to primary school, further 09.29 per cent where graduated and Only 05.71 per cent respondents were illiterate.

Patel *et al.* (2018) revealed that 100.00 percent commercial dairy farm owners were literate and no respondent was illiterate.

2.1.3 Family size

Shingade *et al.* (2001) observed that 51.67 per cent of members were found in a big family size (6 and above), whereas, 48.33 per cent member were found in small family size (up to 5 members).

Pawar, (2001) noted that, 21.00 per cent families of respondent were of small size i.e. (up to 3 member) 39.00 per cent were medium size i.e. (46 members) and the rest 40.00 per cent were large size (7 & above members). This indicates 60.00 per cent families in the sample belonged to medium size.

Korde, (2004) observed in his study adoption of dairy management practices by dairy entrepreneurs that 83.08 per cent

families of respondent were of medium size i.e. (4 to 7 members) per cent were of big size i.e. (above 7 members) and rest of 04.62 per cent of respondent had small size families i.e. (up to 3 members).

Khin Mar Oo (2005) revealed that, 76.30 per cent of the dairy women had medium size of family whereas, 20.00 per cent of them had big size family, followed by small size family 12.50 per cent.

Deshmukh and Dakhore (2005) revealed that, nearly half of the respondents belonged to the category of medium size of family and 31.50 per cent belonged to the category of small size of family. Remaining 22.50 per cent belonged to the category of big family size.

Chaudhari, (2006) in his study on 'Entrepreneurial behavior of dairy farmer' revealed that more than half of the trained 62.00 per cent and untrained 59.00 per cent dairy farmers belonged to medium (5-8 members) family size, whereas, less than one fourth of the trained 22.00 per cent and untrained 18.00 per cent dairy farmers belonged to small (up to 4 members) family size and 16.00 per cent of trained and 23.00 per cent of untrained farmers had large (above 8 members) family size.

Kumar *et al.* (2006) revealed that, equal to one half (50.00%) of the families of dairy farmers of Punjab were under group of large family followed by medium and small families 38.57 and 11.43 per cent respectively.

Gautam *et al*. (2007) reported that majority of the dairy farmers (69.20%) had small family size followed by medium family size (29.50 %) while only 01.30 per cent farmers had large family size.

Patil (2007) in a study on training needs of dairy farmers revealed that majority of the dairy farmers (47.11%) from Nagpur districts were having small family size, followed by medium (38.67%) and big sized families (14.22%).

Kharwadkar and Siddiqui (2008) studied impact of Chitale dairy farming pattern on socio-economic status and constraints of buffalo dairy farmers in Bhilwadi district Sangli and reported that, nearly half of the buffalo dairy farmers of chitale co-operative dairy 55.50 per cent belonged to the category of medium size of family followed by 23.00 per cent small size of family and remaining 21.50 per cent belonged to the category of big size of family.

Khode, *et al.* (2009) found that majority of dairy farmers (68.61 %) under vidarbha development programme belonged to the family size of 5 and below members and majority of the dairy farmers (61.63%) had participation of 2- 3 family members in dairy farming.

Meena *et al*. (2012) reported that 62.67 per cent of the dairy farmers had 5-8 family members followed by 21.00 per cent with less than 5 family members while 16.33 per cent had more than 8 members.

Gami *et al.* (2013) observed that majority (53.33%) of the respondents had medium size family (5-8) followed by large size 32.67 per cent (more than 8 members) and 14.00 per cent had small size family (up to 4 members).

Patel *et al.* (2013) showed that most of the dairy farmers (62.50 %) had medium family size followed by small family size (21.30%) whereas, 16.30 per cent had large family size.

Sasane *et al.* (2013) conducted study in Ratnagiri on knowledge level of farmers about improved dairy management practices and revealed that majority of respondents (72.73%) had medium family size.

Tudu *et al*. (2013) observed that 87.2 per cent of the respondents had family size of up to 5 members while the remaining 12.8 per cent had more than 5 members in their family.

Jadav *et al.* (2014) while studying the animal husbandry practices and outline of rural livestock farmers revealed that, 57.00 per cent, 30.00 percent and 13.00 per cent of the respondents belonged to small, medium and large families, respectively.

Lohakare *et al.* (2015) showed that majority of dairy farmers (81.43%) were having medium family size i.e., 4 to 9 members, followed by big size (11.42%) and only 07.15 per cent had small size families.

Mane *et al*. (2016) found that more than half of the farmers studied had medium family size (5 to 9 members) followed by small family size, while 17.00% belonged to the category of large family size with more than 10 members.

Chandrasekar *et al.* (2017) revealed that more than half of the respondents lived in medium sized families (51.67%) whereas, 38.33% were reported to be having small families with two to five members per family.

Gopi *et al.* (2017) observed in their study found that nearly three-fourth (73.33%) of the farmers had up to 5 members whereas; the remaining 26.67 per cent had more than 5 members in their family.

Pathade *et al.* (2017) recorded in their study found that majority of the families (58.34%) were having small family size of up to 4 members and about 17.00 per cent in young age and old age group respectively.

Sahu *et al*. (2017) revealed that maximum number (56.43%) of the dairy farmers had medium family size (5 to 8 members) whereas, 29.28 per cent of dairy farmers belonged to small family size (Up to 4 members) and 14.29 per cent of dairy farmers belonged to large family size (Above 8 members).

2.1.4 Family type

Bidwe (2004) reported that majority of the dairy farmers (50.33 %) had medium size family; however, a sizeable number of dairy farmers had very large family which probably might be on account of joint family structure.

Gunjkar (2005) found that more than half of respondents (52.67 %) were from joint family and just below half (47.33%) of them were from nuclear type of family.

Pushpa (2006) conducted a study on livestock production systems of rural and periurban livestock owners in Belgaum district and reported that 72.50 per cent of the respondents belonged to joint family and remaining 27.50 per cent of respondents belonged to nuclear family.

Tayade (2006) concluded that majority of the respondents (56.67%) had nuclear family followed by respondents who had joint family (43.33%).

Halakatti *et al.* (2007) conducted a study on empowerment of women through dairy training in Haveri district of Karnataka and found that majority of the trained (59.85%) dairy farm women had nuclear family.

Punde (2008) revealed that 60.00 per cent of respondents belonged to joint family while 40.00 per cent respondents were belonged to nuclear family.

Mande and Thombre (2009) revealed that majority (63.33%) of the respondents had nuclear families while, 36.67 per cent of cases were of joint type family.

Suresh *et al.* (2009) revealed that majority of the women beneficiaries had nuclear family (90.00%) and 10.00 per cent lived in joint family.

Thombre *et al.* (2010) stated that majority (65.00%) of the respondents had nuclear families while, 35.00 per cent of cases were of joint type family in Latur district of Marathawada region of Maharashtra state.

Kaur *et al.* (2011) studied measurement of empowerment extent of rural women and found that majority of respondents (63.00%) had belonged to joint families.

Rathod *et al.* (2011) observed in their study regarding the type of family, majority of farm women lived in joint family 65.00 per cent while 35.00 per cent lived in nuclear family.

Badodiya *et al*. (2012) studied the impact of Swarnajayanti Gram Swarozgar Yojana on poverty alleviation and observed that majority of the beneficiary respondents (69.33%) had nuclear family.

Kiran *et al.* (2012) studied empowerment of rural women in agriculture a socio-psychological analysis and found that majority of respondents (67.00%) belonged to joint family.

Thombre *et al.* (2012) revealed that majority (67.19%) of the respondents had nuclear families while, 32.81 per cent of cases were of joint type family.

Mitkari (2013) studied Impact of ecotourism on livelihood of rural people in Shahanur of Akola district and fount that maximum numbers of respondents (75.00%) were belonged to nuclear family type.

Sabapara *et al.* (2014) reported that majority (58.33%) belonged to nuclear type family and 41.67 per cent to joint type family.

Bhushan *et al.* (2015) revealed that majority (55.33%) of the respondents had nuclear families while, 44.67 percent of cases were of joint type family.

Chauhan *et al.* (2015) conducted a study and reported that most of the dairy farmers (54.40%) lived in joint family followed by nuclear family (45.60%).

Deepa *et al.* (2015) in their study reported that 63.30 per cent of them belong to nuclear family followed by joint family (36.60%).

Harisha *et al*. (2015) conducted a study related to family type revealed that 70.00 per cent of the respondents lived in a nuclear family followed by joint family which constituted 30.00 per cent.

Kumari *et al.* (2015) in their study on socio-personal and economic profile of respondents revealed that majority of the respondents had medium family size and belonged to joint family.

Mahla *et al.* (2015) observed that 61.87 per cent of the dairy farmers had joint family and 38.13 per cent had nuclear family with less than four members in Jalore district of western Rajasthan state.

Rathod and Damodar (2015) studied impact of MAVIM activities on empowerment of rural women and fount that great majority of women respondents (85.00%) had nuclear type of family.

Thombre *et al*. (2015) in their study observed that 73.75 per cent of respondents having nuclear type followed by 26.25 per cent of joint family.

Bhanotra *et al*. (2016) revealed that in Kathua district of Jammu and Kashmir state 56.67and 43.33 per cent dairy farmers were having joint families with more than seven members and nuclear families with less than five members, respectively.

Sabapara *et al*. (2016) in their study reported that majority (58.33%) of dairy owner's belonged to nuclear type of family and 41.67 per cent to joint type of family.

Singh *et al.* (2016) noticed that 73.33 per cent of dairy farmers belonged to nuclear family while 26.67 per cent hailed from joint family.

Gopi *et al.* (2017) in their study reported that nearly three-fourth (70.83%) of the farmers was from nuclear family, while the rest 29.17 per cent were from joint family.

2.1.5 Occupation

Rathod *et al.* (2011) revealed that agriculture (52.50%) was the major occupation of the family followed by the laboure's (28.33%). The remaining farm women included home makers (15%) and government job holders (04.17%).

Raval and Chandawat (2011) reported that majority of the respondent was involved in agriculture and dairy.

Kale (2012) revealed that great majority of dairy farmers (90.00) having agriculture and dairy occupation, whereas 05.00% of them belonged to agriculture, dairy and labour occupation followed by (04.00) percent of respondents had agriculture, dairy and other business and negligible percent of respondent (1.00%) had agriculture, dairy and service as their occupation.

Chaudhari (2006) revealed that great majority of dairy farmers (83.00) having agriculture and dairy occupation, whereas (11.00) per cent of them were performs agriculture, dairy and service and remaining 06.00 per cent engaged in agriculture, dairy and other.

Patel (2005) reported that a great majority (85.50%) of the dairy farmers were found to be dependent on farming and animal husbandry, whereas 10.00 per cent of them were engaged in farming and animal husbandry along with services, while only 4.50 per cent had farming and animal husbandry along with business as sources of income.

Mahindra and Kalra (2001) found that majority of dairy farmers were engaged in agriculture, whereas 14.67 per cent of them were engaged in business, followed by service (13.33%).

Rathod and Damodhar (2015) revealed that half of the dairy farmers 56.66 percent were engaged in farming as a family occupation and 21.66 per cent of them had allied business in addition to agriculture.

2.1.6 Annual income

Patil (2011) observed that most (41.00%) of the dairy farmers under high category had high level of dairy income Pawar (2001) in her study on dairy farming in relation to socioeconomic status of tribal's in Amravati district revealed that respondents having income up to Rs. 25,000 were 32.00 per cent those having income Rs. 25000 to 50000 were 24.00 per cent and from Rs. 50000 to 75000 were 9.00 per cent and those having income more than Rs. 75000 were 35.00 per cent.

Khalache *et al.* (2003) reported that one half (50.67%) of dairy farmers respondents were having low annual income category whereas, 37.55 and 12.00 per cent of dairy farmer respondents had medium and high annual income category respectively.

Sawant and Siddiqui (2003) observed that, 54.00, 28.00 and 18.00 per cent of beneficiaries of IDDP in Jalna district were having medium, low and high annual income, respectively.

Nitnaware (2004) observed in his study training needs of dairy farmer that 74.00 per cent of dairy owners were grouped in medium annual income category, whereas, 14.66 per cent and 11.33 per cent dairy owner grouped in high and low annual income categories, respectively.

Khin Mar Oo (2005) observed that, 45.00 per cent of dairy women had medium annual income i.e., Rs. 30,001 to 50,000, followed

by low i.e., up to Rs. 30,000, 29.16 per cent and high annual income i.e., above Rs. 50,000, 23.33 per cent.

Chaudhari (2006) reported that majority of milk producers were in medium income group (47.00%), followed by high- and low-income groups i.e., 39.00 per cent and 14.00 per cent, respectively.

Khode *et al.* (2009) reported that, revealed that, maximum numbers of beneficiaries (38.37%) had annual income of Rs. 50,000 to 1, 00000.

Saha *et al.* (2010) reported that, average family income of the livestock farmers was Rs.1,14,154 per annum. 38.75 per cent earned between Rs. 10000 to 30000 followed by 33.75 per cent farmers who could earned between Rs. 5500 to less than Rs. 10000 and 27.5 per cent used to earned more than Rs. 30000 per annum.

Pawar (2010) indicated that 85.00 whereas, medium dairy farmers (28.00%) from medium category and 26.00 per cent of dairy women from medium high category while low category have low income 05.00 per cent.

Rathod *et al.* (2011) in the study 'Participation of rural women in dairy farming Karnataka' found in study exhibit that 60.38 per cent of families had low income followed by medium income category 35.83 per cent and high-income group 3.34 per cent.

Mali *et al.* (2014) revealed that half of the dairy farmers (50.00 %) and non-dairy farmers (43.06%) had medium level of annual income. Whereas, only 30.56 per cent of dairy farmers and 34.72 per cent of non-dairy farmers were had high annual income and 19.44 per cent of dairy and 22.22 per cent of non-dairy farmers had low annual income.

Sangeeta *et al.* (2013) in their study revealed that majority of the respondents (78.34%) reported that they had low to medium level of annual income.

Sasane *et al.* (2013) carried out study in Ratnagiri on knowledge level of farmers about improved dairy management practices and revealed that majority of respondents (84.54%) obtained annual income more than Rs. 10,000 from dairying.

Chandankar (2014) in his study revealed that 38.00 per cent dairy farmers had high level of annual income followed by 31.00 per cent, 19.00 per cent, 11.00 per cent and 01.00 per cent medium, medium high, low medium and low level of annual income respectively.

Gulkari *et al.* (2014) in their study observed that nearly 84.37 per cent of respondents earning medium level (Rs. 50,001 to 1, 00,000) followed by 08.75 per cent of high level and 06.88 per cent of low-level income of dairy farm women.

Bhushan *et al.* (2015) revealed most (54.66%) of the dairy farmers had medium level of annual income followed by 36.00 per cent and 09.33 per cent low and high annual income respectively.

Deepa *et al.* (2015) in their study reported that 75.00 per cent of them belong to middle income group, while 15.00 per cent of them were from low and 10.00 per cent from high income group.

Kumari *et al.* (2015) observed that most (45.00%) of the farmers had medium level of annual income followed by 37.00 per cent and 18.00 per cent high and low annual income respectively.

Lohakare *et al*. (2015) reported that, majority (69.52%) of the respondents were having medium income, followed by high income 18.58 per cent and low income 11.90 per cent.

Mooventhan *et al*. (2015) in their study reported that most (49.00 %) of the dairy farmers had medium level of annual income followed by

32.00 per cent and 19.00 per cent high and low annual income respectively.

Patel *et al.* (2015) revealed that nearly less than two fifth (36.67 %) of the livestock owners had medium annual income ranging from 1,00,001 to 1,50,0300, followed by 23.34 per cent, 16.66 per cent, 13.33 per cent and 10.00 per cent had very low, low, high and very high annual income, respectively.

Thombre *et al.* (2015) in their study revealed that 48.75 per cent of the respondents had annual income ranging from Rs. 60,001 to 90,000/- and 33.75 per cent of respondents have high income (above Rs. 90,000).

Mane *et al*. (2016) carried out an investigation with 200 dairy farmers of Jalgaon district of Maharashtra and reported that 41.50 per cent of farmers had medium level of income of 51,000 to 1.00 lakh, followed by low level of income (36.00%) and high level of income (22.50%).

Chandrasekar *et al.* (2017) in their study found that the majority (50.00%) of the respondents had income below 1, 50,000 rupees per year.

2.1.7 Herd size

Banger (1982) finds in the study 'Impact of dairy co-operative societies on lives of small farmers in Ambegaon taluka of Pune district that, the member and non-member farmers were having average dairy animals nearly equal in number i.e., 02.84 per cent and 02.57 per cent respectively.

Rakshe (2002) observed that, most of the dairy farmers 56.67 per cent possessed dairy animal up to 6 numbers, 30.00 per cent dairy farmers were having 7 to 11 numbers of dairy animals and only 13.33

per cent dairy farmers were having 12 and above numbers of dairy animals.

Gour (2002) revealed that two fifth (40.76%) of the dairy farmers had low herd size, followed by 32.50 per cent with high and 26.74 per cent with medium herd size.

Banwari (2004) found that majority of the respondents were having herd size more than 4 animals.

Deshmukh and Dakhore (2005) revealed that, vast majority 87.00 per cent of the respondents belonged to medium level category of herd size i.e., possessing 3 to 8 animals, whereas, 11.00 per cent respondents belonged to high category of herd size i.e., 9 and above.

Mohammad (2006) observed that majority (73.44%) of the respondents had medium herd size.

Lokhande (2009) in the study reported that most of the respondents (40.83%) were having medium herd-size of 7-9 animals, 36.67 per cent were in small herd-size category of 4-6 animals, 15.83 per cent were having herd-size of more than 10 animals and only 6.67 per cent of respondents were having marginal herd-size of less than 3 animals.

Thombre *et al.* (2010) observed that majority (61.67%) of the respondents had small herd size followed by medium (25.00%) and large (13.33%) herd size in a study area of Latur district of Marathawada region of Maharashtra state.

Nishi *et al.* (2011) revealed that, the majority of the respondents 72.50 per cent had medium herd sizes of 6-9 animals followed by 16.25 and 11.25 per cent of the respondents having large (more than 9) and small herd size (up to 5) respectively.

Thombre *et al.* (2012) observed that majority (53.13%) of the respondents had small herd size followed by medium (31.25%) and

large (14.06%) herd size in a study area of Nanded district of Marathawada region of Maharashtra state.

Gulkari *et al.* (2014) in their study reported that nearly 63.75 per cent of medium herd size (3-4 milch animals) followed by 18.75 per cent of small herd size and 17.50 per cent of large herd size of dairy farm women.

Patel *et al.* (2014) in their study indicated the majority of the tribal farmers (60.00%) had medium size herds.

Sabapara *et al.* (2014) indicated that majority of the respondents (57.34%) had small herd size followed by medium size (26.33%) and large size herd (16.33%).

Bhushan *et al.* (2015) revealed that majority (50.66%) respondents maintained medium herd size followed by 30.66 per cent and 18.66 per cent small and large herd size respectively.

Harisha *et al*. (2015) in their study observed that 75.00 per cent of the respondents had low livestock possession followed by medium (21.67%) and high (03.33%) livestock possession.

Lohakare *et al.* (2015) reported that majority of dairy farmers from the Vidarbha region of Maharashtra were having a medium herd size of 3 to 9 animals followed by high (16.20%) and low herd size (13.80%).

Bhanotra *et al.* (2016) reported that majority of farmers (68.33%) had medium herd size whereas, 25.83 per cent were having small herd size and very few (05.83%) farmers had large herd size.

Mane *et al.* (2016) observed that the majority of farmers possessed medium animal herd size and just 15.00 per cent dairy farmers belonged to large herd sized group.

Sabapara *et al*. (2016) in their study indicated that majority of respondents (57.34%) had small herd size followed by medium size (26.33%) and large size herd (16.33%).

Singh *et al.* (2016) observed that the majority (81.66%) of dairy farmers were having either small or medium herd size. Only 18.34 per cent dairy farmers were having large herd size.

Chandrasekar *et al.* (2017) in their study observed that majority (87.50%) of the respondents possessed small (1 to 5) and medium herds (5 to 9 numbers) of crossbred cattle.

Gopi *et al.* (2017) in their study reported that nearly three-fourth (73.33%) of the farmers had medium livestock possession followed by low (20.83%) and high (05.84%) livestock possession.

Patel *et al.* (2018) reported that 47.50 per cent commercial dairy farm owners had medium sized herd followed by 37.50 per cent commercial dairy farm owners who had small sized herd and only 15.00 per cent commercial dairy farm owners had large sized herd.

2.1.8 Daily sale of milk

Singh (1993) in his study revealed that on an average 42 per cent of total milk was kept, while remaining 58 per cent was sold. The milk consumption varied from region to region and was found to be minimum in central region (36%) and maximum in North Western region (48%).

Sah *et al.* (2001) found that 46.67 per cent of the selected respondents had medium level of milk sale followed by 33.33 per cent and 20.00 per cent of them were having low and high milk sale respectively.

Kadian and Sankhala (2007) observed in a study conducted in Haryana that 20.00 per cent family members sold more than 5 liters of milk every day.

Lohakare *et al.* (2015) revealed that, majority (74.76%) of respondents had medium level of milk sale followed by high milk sale (14.29%) and (10.95%) low milk sale.

Singh *et al.* (2016) in their study revealed that majority of the respondents (60.00%) were not selling any milk. Only 14.44 per cent of the respondents in the medium category sold 4-8 liters of milk per day, rest of the respondents had a milk sale of less than 4 liters/ day (18.89 %) and more than 8 liters/day (06.67%) under low and high sale category groups, respectively.

Rai *et al*. (2017) in their study revealed that majority (45.63%) of the respondents had low level of milk sale, whereas, 39.37 per cent and 15.00 per cent had medium and high level of milk sale respectively.

2.1.9 Milk Production

Subramanian (1982), Singh (1983) and Singh (1986) reported high level of milk production among large percentage of respondents.

Pawar (1983), Kokate (1984) and Kaushik (1988) in their studies reported low level of milk production among large percentage of the respondents.

Kumar (1995) found medium level of milk production (2.28 to 8.5 lit./day) with majority of the respondents.

Khode *et al.* (2009) revealed that 62.79 per cent dairy farmers from the Vidarbha development programme had more than 10 liters of daily milk production while, 37.21 per cent of the dairy farmer had 6 to 10 liters of daily milk production.

Vidya *et al.* (2009) studied the situational and psychological profile of dairy farmers of Kanpur district and indicated that daily milk production by majority of the dairy farmers (71.67%) ranged between

3.66 to 11.2 liters followed by 18.88 percent with over 11.2 liters per day while, one tenth of the dairy farmers had low milk production.

Ashwar *et al.* (2011) reported that 45.42 per cent dairy farmers were producing 20 liters and above milk per day while 31.25 per cent and 23.33 per cent farmers were having a daily milk production in the range of 11-20 liters and up to 10 liters per day respectively.

Nishi *et al*. (2011) showed that majority of the dairy farmers (70.00%) had medium level of milk production and the rest 30.00 per cent were from high and low milk production category.

Meena *et al*. (2012) observed that around three forth dairy farmers had a daily milk production of 13-51 liters/day followed by 13.67 per cent farmers producing less than 13 liters/day while the remaining nearly one-tenth farmers had more than 51 liters/day milk productions.

Jaisridhar *et al.* (2013) in their study in the five districts of Tamil Nadu reported that majority of the milk producers (69.33%) had daily milk production ranging between 10.19-27.20 liters per day followed by 20.00 per cent respondent with more than 27.20 liters per day while remaining 10.67 per cent dairy farmers had low milk production.

2.1.10 Risk preference

Shinde (1993) reported that 48.00 per cent selected dairy farmers were seen in medium risk orientation category, whereas, 35.00 per cent were in high-risk orientation category while 17.00 per cent were located in the low-risk orientation category.

Durgga (2004) reported that majority (71.67%) of the farm women engaged in dairy farming had medium risk orientation, whereas almost an equal percentage of farm women had high (12.50%) and low (15.83%) levels of risk orientation respectively.

Bhatt (2006) in his study on effect of mass media exposure on dairy farmers regarding animal husbandry practices found that more than half (51.00%) of the dairy farmers had medium level of risk orientation, whereas, 30.00 per cent and 19.00 per cent of the respondents had high and low level of risk orientation respectively.

Chaudhari (2006) observed in his study on entrepreneurial behaviour of dairy farmer that more than half of the both trained (58.00%) and untrained (53.00%) dairy farmers had medium risk orientation, however 33.00 per cent of the trained and only 10.00 per cent of untrained dairy farmers had high risk orientation, whereas major per cent of trained (09.00%) and more than one third of untrained (37.00%) dairy farmers had low risk orientation.

Tala (2013) reported that majority of the farmers of (64.00%) had moderate level of risk orientation, followed by 18.66 per cent had higher level of risk orientation and 17.33 per cent of them had lower level of risk orientation.

Tekale *et al.* (2013) observed that majority of the respondents (52.00%) had high risk orientation followed by 38.00 per cent of the respondents had medium level of risk orientation and only 10.00 per cent of the respondents had low level of risk orientation.

Tochhawng and Rewani (2013) revealed that nearly half of the pig farmers (47.00%) had low level of risk orientation, while 32.22 and 21.11 per cent farmers had medium and high level of risk orientation, respectively.

Patel *et al.* (2014) found that more than half of the farmers (53.75%) were found to have medium level of risk orientation, followed by low (25.00%) and high (15.00%) level of risk orientation.

Bhushan *et al.* (2015) reported that majority of the respondents (44.66%) had medium risk orientation followed by high (25.33%) and 30.00 per cent of low-risk orientation.

Gamit *et al.* (2015) revealed that majority of the dairy farmers (87.00%) showed medium to low level of risk orientation related to dairy farming in Surat district of South Gujrat.

Kumari *et al.* (2015) Revealed that majority of the respondents (47.00%) had medium risk orientation followed by high (28.00%) and low (25.00%) level of risk orientation.

Patel *et al*. (2015) revealed that more than half (55.00%) of the livestock owners had medium risk orientation followed by 20.00 per cent, 13.33 per cent of them with very low and high-risk orientation. Only 06.67 per cent and 05.00 of them were observed to have low and very high degree of risk orientation.

Divekar (2016) reported that more than half (53.50%) of the dairy farmers had medium level of risk orientation, followed by 26.50 per cent and 20.00 per cent with high and low level of risk orientation.

2.2 Review related to challenges faced by rural dairy farmers in milk processing and marketing

Naru *et al*. (1978) conducted a study in Haryana and observed constraints was low price for fresh milk which creates a disincentive to producers as additional limiting factors. Other important factors which contain domestic milk production include the competition from imported dairy products, insufficient technical and extension services, inadequate labour supply as well as ecological factors.

Choudary (1989) conducted a study in West Bengal found that the lack of retail outlet for sale of products was the biggest problem of marketing. Irregularity and lack of advance payments were most serious constraints during milk procurement.

Shrotic (1989) conducted a study in UP and observed the very serious constraints affecting milk procurement as middleman providing various incentives to milk producers in the form of advance payment,

lack of fund for circulation, lack of training programmes for milk enhancement etc.

Sharma (1994) observed constraints perceived by dairy farmers in the adoption of marketing practices included purchase of milk by co-operative societies on fat percentage basis with no consideration on SNF, non-existence of milk co-operatives societies in villages and problem of transport of milk to societies located at a distance.

Kemchand *et al.* (1994) studied the production and marketing of channa based milk products in Rajasthan during 1991 and revealed that the business of production of various indigenous sweets is quite profitable and caries a margin of about 70%.To make the industry more practical, more research has to be done.

Jaun (1997) stated that on small farmers (1-3 cows) the milk collection cost has become exorbitant and milk quality also affected. The availability of capital also becomes constraints among small farmers.

Pawar (2001) found that, the constraints faced by majority of dairy farmers 72.60 per cent are non-availability of loan facility to purchase new modern equipment and machinery for processing.

Gour (2002) revealed out problems faced by dairy farmers were lack of knowledge of recommendation management practices and difficulty to store milk in summer season.

Sawant and Siddiqui (2003) reported that majority of the beneficiaries of IRDP Jalna (85.33) reported irregular/delayed payment of bills, lower rate of milk.

Shrivastava (2003) conducted a study in M.P and the, major problem were non availability of good quality milch animals, lack of proper organized market system (farmers do not receive remunerative prices every time), lack of storage facilities, technical and infrastructure

support system and packaging facilities. To overcome their problems the study suggests that since the processing units are looked after by household workers, good training programme for managing these units developed for manufacturing low-cost packaging material and dairy feed formulations at the village level. The collection centers must be established on co-operative basis, sufficient financial assistance by the government agencies at cheaper rates of interest must be provided to encourage the small producers and infrastructure facilities and extension activities must be developed.

Rajendran and Mohanty (2004) studied the Dairy co-operatives and milk marketing in India. They reported that lack of bargaining power by the producers, Lack of infrastructure facilities for collection, Storage, transportation and processing were the major constraints. He also told that milk quality, product development, infrastructure support development, and global marketing are found to be future challenges of India milk marketing.

Singh *et al*. (2004) reported that the major constraints of rural dairy farmers was poor credit and marketing facilities.

Kumar (2006) revealed that majority of the farmers had opined lack of credit facilities in Punjab.

Sankhala *et al.* (2006) concluded in their study that lack of credit facilities was the most important constraints faced by dairy farmers, low price of milk and non-availability of subsidy.

Rangasamy and Dhaka (2007) conducted study in T.N. and observed the constraints common problems were underutilization of chilling centres and higher sales commission to the commission agents, whosalers and retailers.

Chahan *et al.* (2007) carried out a study observed that the major constraint was shortage of poor followed by inadequate supply of good quality milk in lean season. The other constraints were stiff competition

from the giant branded product competitors, higher interest rates of bank loans for setting up milk processing units etc.

Njarui *et al. (*2010) conducted survey in semi-arid region of Estern Kenya. They observed that lack of equipment and skills were greatest impediment in processing of milk while competition for market. They also stated that to remain competitive in the market, they need to diversify their products through value addition using simple and cost-effective methods.

Ray (2008) conducted a study in west Tripura district and observed that the major constraint was lack of skilled labour, low price of milk, high price of raw materials and non-availability of adequate and good quality of milk.

Patil, (2009) studied the constraints faced by dairy farmers in Nagpur district. Study was conducted in villages by personal interview of 225 dairy farmers. They observed that 78.22% respondents had constraints of delay in milk payment and 63.11% respondents had constraint of inadequate money and lack of loan facility for purchasing new equipment and machinery.

Siddiqui *et al*. (2009) on their opinion that the constraints expressed by dairy cattle owners in Islampur as regards the nutrition, management, economic and milk distribution were studied. Some remedial measure like trainings, exhibitions, brains storming sessions, poster presentations, radio talks and programme on Door-darshan can be taken up to create awareness in dairy farmers and to impart knowledge to them to undertake new animal management practices to increase milk yield.

Pisure *et al*. (2015) in their study revealed that lack of storage facility was major constraints to dairy farmers in Latur district of Maharashtra.

Darling (2017) conducted study in Kanyakumari district of Tamil Nadu and she reported that major constraints in distribution and marketing of milk and milk products were price constraints, constraints of quality and infrastructure of dairy units, poor road system, transport cost, delivery and packaging cost etc. She also concluded that if the constraints are being taken care of and are solved, these is a brighter future for the dairy farming in the district.

Mossie, (2019) conducted a study in Ethiopia and they reported that the major constraints pertaining and processing of milk and milk products was lack of clean water for cleaning purpose i.e. (washing udder, milker hands, and milk containers). They said that the other constraints were unimproved of milk and milk processing utensils and lack of access and high price of cooling facilities.

Kavitha, (2020) observed that majority (53.34%) of the respondents have medium level of constraints followed by high (33.33%) and low (13.33%) level constraints.

Lokhande *et al.* (2009) conducted study in Karnal district of Haryana. He stated that the major constraints that disinterest in maintaining simple record, least important constraint were shortage of labours, lack of credit facility and lack of cold storage facility.

2.3 Review related to new technologies and opportunities available for dairy farmers

Lewis (1994) observed that milk will refer to bovine milk, either as full cream milk, skim-milk obtained by centrifugal separation, or standardized milk made by combining skim-milk with cream. Currently UK milk is not standardized, although both skim-milk and particularly semi-skim milk containing between 1 and 1.5 per cent fat have become more popular. Sales of semi-skim milk have increased from 4.74 million tons in 1985 to almost 17.7 million tons in 1990 (373 per cent increase). However, this increase has not occurred in other EC countries: France, 10 per cent; Germany, 5.4 per cent; and Netherlands 17.4 per cent. Other types of milk that require heat treatment are flavored milk, reconstituted milk, filled milk, evaporated milk, milk modified in composition by demineralization or lactose hydrolysis and protein-enriched milk produced by ultrafiltration. Milk from other species, such as goats, sheep and buffalo, may also be very important in some countries.

Zydney (1998**)** told that there is considerable commercial interest in the preparation of individual whey proteins for food, nutraceutical, and therapeutic applications. Recent developments in membrane filtration have provided exciting new opportunities for large-scale protein fractionation

Huffman and Harper (1999) told that isolated milk proteins are natural, trusted food ingredients with excellent functionality. Separation technologies provide the basis for adding value to milk through the production of proteins that provide the food industry with ingredients to meet specific needs. The major milk proteins, casein and whey protein, can be isolated by manipulating their compositional and physical properties and then by using various separation technologies. Milk can be converted into a wide range of ingredients that have diverse functional characteristics. Ingredients include milk protein concentrate, milk protein isolate, casein, caseinate, whey protein concentrate and

hydrolysates. Within each of these ingredient categories, there is further differentiation according to the functional and nutritional requirements of the finished food. As clinical evidence develops, the opportunity for adding value to dairy products as functional foods with health benefits may be achieved.

Goff and Griffiths (2006) reported that technological advances in the fluid milk processing industry in the last 25 years include significant improvements in all the unit operations of separation, standardization, pasteurization, homogenization, and packaging. Many advancements have been directed toward production capacity, automation, and hygienic operation. Per capita consumption of fluid milk has declined but consumption of frozen dairy desserts has remained steady.

Sarkar (2008) reported that dahi is considered the oldest Indian fermented milk product and is equivalent to Western yogurt. Acceptable quality dahi could be obtained with the application of acid producing as well as flavor-producing organisms and adopting a two-stage fermentation. Application of bio-preservatives and thermization (mild heat-treatment) may be recommended for shelf-life extension of dahi which has so many beneficial roles in human body.

Kumar *et al*. (2010) reported that traditional method of khoa making has a number of drawbacks. It has a limited capacity due to batch operation which results in non-uniform product quality. Sometimes burning of the product occurs which lowers its quality. Applications of thin film microscopy and surface heat technology could have great potential for industrial use.

Quddus (2012) conducted research work in Bangladesh and for that 180 dairy cattle farmers were interviewed. The study was carried in 3 different agro economic zones. He stated that small scale farmers not adopted to use all kinds of improved technologies in dairy farming and they also stated that high level of technology adoption had direct Impact on milk yield and household income generation as well as dairy

development. They reported that higher educated farmers 9.7 times more likely to be adopting improved technologies compared to illiterate farmers. At last, they told that need more knowledge on improved technologies through training, availability of reliable and continuous technical assistance.

Kumar *et al*. (2013) told that membrane technology has revolutionized the dairy sector. Different types of membranes are used in the industry for various purposes like extending the shelf life of milk without exposure to heat treatment and increasing yield and quality of the dairy products. With the introduction of superior quality membranes as well as newer technology, the major limitation of membranes, fouling or blockage has been overcome to a greater extent.

Patel *et al*. (2014) reported that the processing of dairy product is no longer as simple or straightforward as in the past. It is now moving from an art to a highly interdisciplinary science. New and alternative dairy processing methods and novel combinations of existing methods are continually being sought by industry in pursuit of producing better quality dairy products more economically. Hence, new innovations, technologies, and concepts continue to emerge. In general, several years are necessary for new technologies to become successful in the commercial performance. Over the years, many traditional technologies have been optimized for producing better quality dairy products with the use of aseptic processing, membrane processing, microwave, radio frequency and ohmic heating, high-pressure processing and electrical pulse processing. These new technologies, although emerging as strong alternatives to conventional processing, still need to be rigorously tested and proved to be safe and commercially viable.

Chandan (2015) reported that this process reduces size of fat globules of milk by pumping milk at high pressure through a small orifice, called valve. It works well with low fat products or in products where high viscosity is desired as in creams and sour cream

manufacture. Homogenized milk does not form a cream layer on storage. It leads better viscosity and stability in cultured products by fully dispersing stabilizers and other ingredients in ice cream, yoghurt and other formulated dairy products.

Kinjal *et al*. (2015) reported that paneer is a South Asian variety of soft cheese obtained by acid and heat coagulation of milk, entrapping almost all the fat, casein complexed with denatured whey proteins and a portion of salts and lactose. India has emerged as the largest milk producer in the world with 132.4 million metric tonne milk production in 2012-13 (15% of the world's total milk). An estimated 7% of milk produced in India is converted to paneer. Paneer has a short shelf life and is rich in milk fat, but is also very costly to produce. Developing new types and varieties of paneer is necessary to meet the growing demand of health-conscious consumers. Therefore, advancements in manufacture of paneer are necessary in order to increase the yield of paneer so to lower the production cost, increase the shelf life of paneer.

Minz and Singh *et al*. (2016) reported that traditional Indian dairy products hold a very important place in social, cultural and economic life in India. Since ages, these products have been prepared at home or by small-scale entrepreneurs. But because of huge demands, systematic efforts have been made by the industry and research institutions for large-scale mechanized production of traditional dairy products.

Watts S. (2016) told that pasteurization is the process of heating every particle of milk or milk product. Pasteurization involves heating food to a temperature that kills disease-causing microorganisms and substantially reduces the levels of spoilage organisms. Pasteurization kills microbes (mainly bacteria) in food and drink, such as milk, juice, canned food, and others. Unlike sterilization, pasteurization is not intended to kill all microorganisms in the food. Instead, it aims to reduce the number viable pathogens so they are unlikely to cause

disease. Milk bacteria like acid producers, Gas producers, ropy or stingy fermentation, proteolytic and lipolytic bacteria which are killed by process of pasteurization.

Chavhan *et al*. (2017) reported that milk contains very little bacteria coming from the animal's udder, milk vessels and operators. Cooling is the predominant method of maintaining milk quality during collection. The bacterial load is a reflection of the hygienic quality of milk. This aspect has been ignored due to lack of facility for proper on-farm cooling of milk immediately after milking.

Chopde *et al*. (2017) told that consumer's demand for minimally processed, fresh, additive-free and shelf-stable products have prompted food scientists to explore other processing technologies as alternative to traditional treatments that rely on heating or cooling operations. Traditional treatments ensure high level of food safety but they lead to degradation of various food quality and nutritious attributes. A typical HPP unit consists of a pressure vessel and pressure-generating device. Food packages are loaded into the vessel and top is closed. HPP induces fat crystallization, shortens the time required to achieve a desirable solid fat content and thereby reduces the aging time of ice-cream mix and also enhances the physical ripening of cream for butter making.

Dhotre *et al*. (2017) reported that SSHE has been employed for many processing milk into many dairy products majorities of which are the indigenous milk products of India. SSHEs have replaced many kettle-based units that were used in the manufacture of dairy products. The inherent features of SSHE make it suitable to handle the products with high viscosity and particulate structure, which occurs in most of the dairy product especially in traditional Indian dairy products (TIDP).

Kalla *et al*. (2017) reported that high hydrostatic pressure processing (HHP) retains food quality, maintains natural freshness, and

extends microbiological shelf life. Pressure inactivates most vegetative bacteria at pressures above 600 MPa. HPP treatment of food is carried out using batch or semi continuous process. The milk pasteurization destroys pathogenic but completely the spoilage microorganisms. It is the most important heat treatment applied to cheese milk to provide acceptable safety and quality.

Talwar and Brar *et al*. (2017) reported that India is the largest milk producing nation in the world and more than half of its milk is converted into value added products. Milk is perishable in nature; thus, it cannot be stored for a very long period. There has been significant development and mechanization in dairy sector in past few years. It has transformed various processes for dairy products from traditional energy and labour-intensive processes to mechanized processes where human interference is minimized.

Aggarwal *et al.* (2018) told that heat desiccated milk products have been traditionally produced in Indian sub-continent since ancient times. This sector is poised to have rapid expansion hopefully with the innovations in technology, equipment's for mechanized production, packaging and storage. With globalization of dairy trade focusing on quality and consumer satisfaction, process optimization and mechanization of the manufacturing process of these products is very challenging. Efforts have been made to review on the development and improvements made for process upgradation of heat desiccated traditional milk products manufactured in Indian sub-continent, newer packaging options and their market potential.

Kumar *et al*. (2018) reported that technology-assisted ghee plants have the capacity of 400-500 kg/h of ghee, using creamy butter or high fat cream as raw material. This system offers a number of advantages, namely, compactness in design, hygienic operation, clean-in-place (CIP cleaning, reduced strain over the operator and absence of fouling and foaming. An average saving of 0.17 kg steam/kg ghee is achieved. Apart from these benefits, the continuous

ghee making system incorporates an excellent feature of energy used for preheating butter/cream.

Patange (2018) reported that the milk of cow, buffalo, sheep and goat shows always variation in composition. As a results milk available to the processor may not necessarily be of same composition which is desired in the milk to be marketed. Therefore, it is very common practice to adjust the composition of milk as per legal requirement. Standardization of whole milk may be necessary for production of standardized, toned and double toned milk of standard composition or for manufacture of various milk products to meet the legal standards.

Patange (2018) reported that packaging is an integral part of processing in dairy and food industry, and is media for safe delivery of the product from the center of production to the point of consumption. Packaging industry is growing at much higher rate in developing countries, resulting in an overall 12% annual growth. Millions of rupees are spent on packaging the food and other items each year. 60 per cent of all packaging is done for food products only. Today packaging is the way the packaging looks that influences shopper to buy the product inside it.

Patange (2018) reported that preservation technique used in milk and milk products during storage and distribution as they exposed to a wide range of environmental conditions. Environmental factors such as temperature, humidity, oxygen and light can trigger several reaction mechanisms that may lead to deterioration of milk and milk products. As milk and milk products are ideal source for growth/ development of microbes and place for physico-chemical changes (due to its contents) it is, therefore essential to preserve it by suitable process of preservation.

Joshi *et al*. (2019) told that milk and Milk products are consumed by people across all ages and countries. Being highly nutritious, dairy products are known to be susceptible to microbial and enzymatic

spoilage and thus mandate improved processing methods. In recent years, the development of various non-thermal technologies like high pressure processing (HPP), pulsed electric field, ultra-sonication, membrane filtration and cold plasma, have demonstrated the potential to produce shelf stable dairy products with retained nutritional parameters.

Akbar *et al.* (2020) reported that the demand for milk and milk products is continuously increasing due to raising population of the world. The consumption of the dairy products is more in developed contries. So, there is a great opportunity for rural dairy farmers due to raising demand of healthy and nutritious fresh milk and other milk products.

Sahu (2020) reported that there is a very heavy burden of vitamins deficiency in all age groups of population particularly in urban areas because of their lifestyle as they spent more time indoors so they get less exposed to sunlight and therefore become more prone to vitamin D deficiency. Milk is the best way to supplement with additional vitamins to overcome the effect of deficiencies. Not only vitamins milk can also be supplemented with micronutrients like Fe, Zn and folic acid. Government is focusing on fortification as this is cost effective and do not require complex technologies for the addition of vitamins.

Meena *et al*. (2021) reported that ultrafiltration and diafiltration processes are used to concentrate proteins present in defatted milk in order to manufacture milk protein concentrate (MPC) powders. Increase in calcium and casein contents decreases the stability of milk proteins, and affects properties of MPC powders produced by these processes. Applied treatments significantly improved foaming and emulsification, solubility, viscosity, heat stability, dispersibility, specific surface area and buffer index of resultant MPC powders over control. Fresh, treated low-protein MPC samples showed significantly higher solubility values over control samples, which remains higher after 60 days of storage at 25 ± 1 °C.

Deshmukh *et al.* (2022) reported that good volume of fluid milk is converted to value-added traditional Indian dairy products, which help the dairy industry in product diversification and profit augmentation. Organized manufacture of these products entails mechanization and controlled production for uniform quality and safety of a product. Several efforts have been reported for the mechanical production and process upgrading of different classes of traditional dairy products.

Singh *et al*. (2022) reported that khoa and khoa based products (burfi, peda, kalakand, milk cake, etc.) are a category of traditional dairy products of Indian subcontinent. The peculiar sensory attributes developed during their course of preparation makes them unique, but their short shelf-life is a major challenge faced by the dairy industries. Various preservation techniques explored in the last two decades such as packaging interventions, chemical preservation, natural preservation, thermal treatments, bio-preservation, etc. which can be used to enhance the shelf life of these milk products.

Bhakti *et al*. (2022) revealed that the application of membrane technology has revolutionized the dairy industry since 1970. The major pressure-driven membrane technology includes microfiltration (MF), ultrafiltration (UF), nanofiltration (NF) and Reverse Osmosis (RO). The key applications of Membrane technology in milk processing includes pre-concentration of milk prior to manufacturing of cheese, demineralization, alternative technology for extension of shelf life of milk, standardization of milk constituents for formulation of novel products and enhancement of yield and quality of the dairy products. Apart from that membrane technology has also been utilized in concentration, fractionation and purification of milk constituents in valuable milk proteins, besides resolving the separation challenges. Moreover, the production of valuable products from milk constituents signifies the most potential applications of membrane technology in dairy sector.

Badola *et al*. (2022) revealed that khoa and khoa based products (burfi, peda, kalakand, milk cake, etc.) are a category of traditional dairy products of Indian subcontinent. The peculiar sensory attributes developed during their course of preparation makes them unique, but their short shelf-life is a major challenge faced by the dairy industries. The preservation techniques explored in the last two decades such as packaging interventions, natural preservation, thermal treatments, bio-preservation, etc. which can be used to enhance the shelf-life of milk and milk products.

Chapter III

MATERIAL AND METHODS

The main purpose of this chapter was to describe the research methods and techniques used in present study “Studies on challenges faced by rural dairy farmers in milk processing and milk products manufacturing in Shirur tahsil of Pune district”. The various aspects included in this chapter have been described with relevant details under following heads.

3.1 Locale of the study

3.2 Research Design

3.3 Sample and sampling procedure

3.3.1 Selection of villages

3.3.2 Selection of rural dairy farmers

3.4 Tools for data collection.

3.4.1 Development of interview schedule

3.4.2 Pre-testing and collection of data

3.4.3 Tabulation and analysis of data

3.5 Variables and their empirical measurement

3.6 Operationalisation, measurement and categorization of variables

3.6.1 Independent variables

3.6.2 Dependent variables

3.7 Constraints faced by rural dairy farmers

3.8 Statistical procedure used for analysis of data

The study was conducted during the year 2021-22 in Shirur tahsil of Pune district of Maharashtra state. The main focus of the investigation was to study the challenges faced by rural dairy farmers in milk processing and milk products manufacturing. The methodology used in this study was presented under following headings.

3.1 Local of study

The present research investigation entitled ‘Challenges faced by rural dairy farmers in milk processing and milk products manufacturing’ was carried in Shirur tahsil of Pune district in western region of Maharashtra state.

3.2 Research Design

Selection of the research design was an important part and hence due consideration was needed for selection of research design. The research design refers to the overall strategy that you choose to integrate the different components of the study in a coherent and logical way. It constitutes the blueprint for the collection, measurement, and analysis of data. The present study was based on Ex-post-facto-Research Design of social research. Out of curiosity, the research was conducted to find out the relevant causes, which are likely to influence the dairy farmers.

3.3 Sample and sampling procedure

The data for the study was collected by random sampling method. The Shirur tahsil comprises 115 villages out of which 25 villages in which dairy farmers follows milk processing and milk products manufacturing were randomly selected. From each village 8 dairy farmers follows milk products manufacturing were selected. Total 200 dairy farmers were personally interviewed with help of well-designed questionnaire.

3.3.1 Selection of villages

The 25 villages from Shirur tahsil of Pune district were purposively selected which were having maximum number of rural dairy farmers following milk processing and milk products manufacturing also on the basis of maximum milk production.

List of villages selected for the present study

Sr. No.	Name of Villages	Respondent number
1	Pabal	8
2	Kendur	8
3	Dhamari	8
4	Hivare	8
5	Jategaon khurd	8
6	Kanhur	8
7	Mukhai	8
8	Karandi	8
9	Pimple Dumala	8
10	Ranjangaon	8
11	Ganegaon	8
12	Vadgaon Rasai	8
13	Varude	8
14	Malthan	8
15	Ganegaon khalsa	8
16	Shikrapur	8
17	Ramling	8
18	Sanaswadi	8
19	Pimple Jagtap	8
20	Jategaon Budruk	8
21	Khandala	8
22	Koregaon	8
23	Khairenagar	8
24	Vadhu Budruk	8
25	Kondhapuri	8
Total	**Villages =25**	**Total dairy farmers=200**

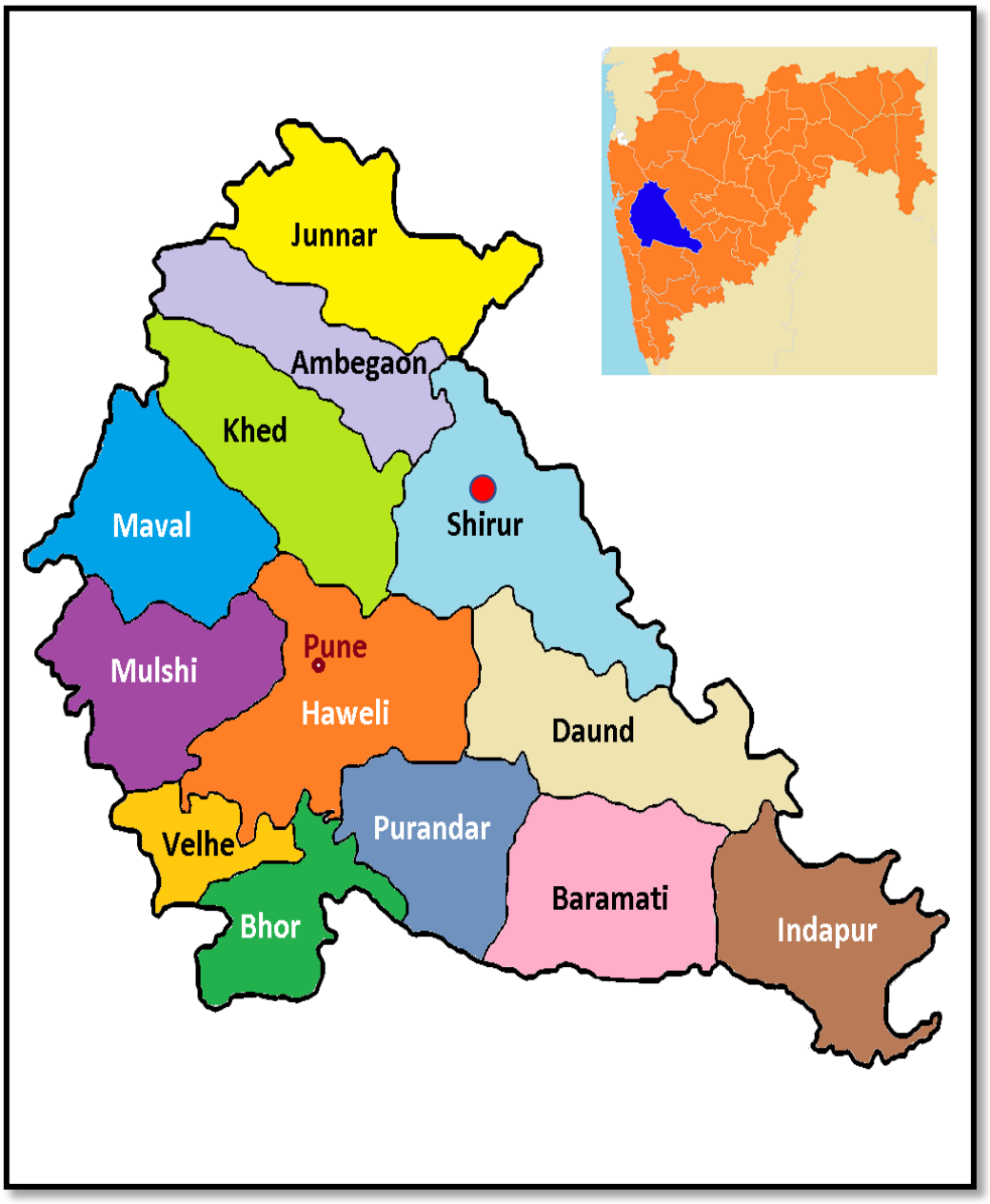

Fig. 1. Map Showing the location of Tahsil in Pune District

3.3.2 Selection of rural dairy farmers

A list of rural dairy farmers from these 25 villages was prepared. From this list 8 dairy farmers from each village were selected randomly for the study comprising the total sample of 200 rural dairy farmers.

3.4 Tools for data collection

Construction of interview schedule and data were collected with the important aspects and the basis for the social research. Data were collected by personal interview with the help of structured schedule especially designed for the purpose of present study. The procedure followed for development of interview schedule and collection of data has been presented here under the separate heads.

3.4.1 Preparation of interview schedule

The interview schedule was prepared for collecting data from the rural dairy farmers. The schedule consisted of the background information of the individual rural dairy farmers along with the components of the constraints faced by them in milk processing and milk product manufacturing. Taking into consideration the objectives of the study a detailed interview schedule was prepared. The interview schedule was developed in both Marathi and English language. The questions related to the personal, socio-economic, situational characteristics of the dairy farmers were prepared. While preparing the schedule, attention was given to make them familiar questions simple, self-explanatory with clarity, so that the rural dairy farmers could understand the same and give the responses more accurately. Effort was made to formulate clear and simple questions.

3.4.2 Pre-testing and collection of data

The interview schedule was pretested in order to correct the mistakes and shortfalls to ensure the clarity, validity and practicability

of the schedule. Necessary modification was incorporated in the final schedule wherever necessary after pre-testing.

The data were collected personally from the sampled rural dairy farmers with the help of structured interview schedule developed for this purpose. The rural dairy farmers were contacted at their home or their work place. Total 200 rural dairy farmers were interview and their responses were recorded in the schedule.

3.4.3 Tabulation and analysis of data

Tabulation was done after completion of the interview work with the dairy farmers and editing the schedule. The raw data from edited schedule were first recorded in suitable primary table serially and incorporated in secondary table according to the classification.

After scoring for each case for relevant responses, frequency distribution of dairy farmers were made for independent and dependent variables into their categories. In other words, distribution of dairy farmers according to their personal, socio-economic characteristics was worked out. The frequencies with percentages on the basis of the total categories and in different form have been presented in results and discussion chapter in the worktables as part of analysis.

3.5 Variables and their measurement

In present study based on the review of literature and considering the opinion of the experts in the field of Extension Education and Animal Husbandry and Dairying, the various independent and dependent variables were selected for the study and used in the research field. From the obtained material on selected variables, investigator has to infer the many causes and effect effectively. The variables selected for study and procedure used for their measurement have been presented as follows.

The independent variables like age, education, occupation, family size, family type, annual income, herd size, sources of milk, daily milk production, daily milk sale, sale of milk products, risk preference was studied.

Considering the objectives in view, the dependent and independent variables have been selected for the present study. The measures have given below in table.

List of variables and their measurement

Sr. No.	Variable	Measurement
A)	**Independent variables**	
1	Age	The chronological age of rural dairy farmers in completed years at the time of data collection.
2	Education	The standards of formal education completed by an individual member considered as a score.
3	Occupation	Profession of rural dairy farmers.
4	Family size	Total number of members in the family of each rural dairy farmers residing under a common roof and having blood relation.
5	Family type	Family type was ascertained by knowing their way of living as a joint or nuclear.
6	Annual income	The total income earning of the family obtained from dairy/agril. in year.
7	Herd size/ livestock possession	The total number of dairy milch animals possessed by individual dairy farmers.
8	Sources of milk	Milk in litre collected by dairy farmers from the others and owned milk.
9	Daily milk production	Total quantity of milk produced in single day.
10	Daily sale of milk	Quantity of milk sold in liters per day on an average basis by the dairy farmers throughout the year.

11	Sale of milk product	Quantity of milk product in kg/ litre sold by farmer per day on an average basis throughout the year.
12	Risk preference	It is the degree of which the farmers are oriented towards the risk and uncertainty accepting new ideas of dairy farming. It was measured with the help of scale developed by Supe (1969)
B)	**Dependents Variables** Constraints	The Oxford English Dictionary meaning of the term constraint is confinement, restriction of liberty or compulsion of circumstances or compulsion put upon behavior. In the present study, constraints have been operationally defined as the problems encountered by the dairy farmers with regards to the challenges faced by rural dairy farmers in milk processing and milk products manufacturing. Even identified constraints with farmers has been measured on the three-point continuum according to the degree of severity. i.e. high, medium and low severity at all with a score of two, one and zero respectively.

3.6 Operationalisation, measurement and categorization of variables

For any study to be undertaken in social science it is customary to explain precisely the variables selected with their connection. The variables selected for this study along with its operational definitions and procedures employed to measure them are delineated as under.

3.6.1 Independent variables

The independent variable is the variable on the basis of which the prediction about the dependent variables is made. In present study the investigator tried to select such independent variables that the total pool of these variables which are likely to influence the dependent

variables. For this study researcher had selected personal, socio-economic and psychological characteristics of rural dairy farmers and challenges faced by dairy farmers as dependent variable.

The important personal, socio-economic and psychological characteristics of rural dairy farmers that are intended and studied in present investigation and which are assumed to be affecting dependent variable under study were.

3.6.1.1 Age

Age has been defined as the chronological age of the rural dairy farmers in completed years was considered as the age and taken as such score. The categorization was done as young, middle and old age on the basis of actual age of rural dairy farmers at the time of data collection.

Sr. No.	Categories	Age
1	Young	Up to 35 years
2	Middle	36 to 50 years
3	Old	Above 50 years

3.6.1.2 Education

The number of years of schooling undergone by the individual dairy farmer and standard passed by him was considered as education.

Based on the number of years of schooling, they were grouped into six categories and were reported in frequency and percentage.

The formal schooling completed by an individual dairy farmer was considered and taken as score. The standard categorization of the education according to standard completed was given as follows. It was classified on the basis of norms of Government of Maharashtra.

Sr. No.	Categories	standard	Score
1	Illiterate	No Schooling	0
2	Primary	1 to 4^{th}	1-4
3	Middle School	5^{th} to 7^{th} std	5-7
4	High School	8^{th} to 10^{th}	8-10
5	Higher Secondary	11^{th} to 12^{th}	11-12
6	Graduation	Above 12^{th}	13-15

3.6.1.3 Occupation

The occupation held by the dairy farmers such as Agriculture, Animal husbandry and other related activities etc. were included in this study. Scoring and categorization was made on the basis of teacher made scale as follows:

Sr. No.	Occupation	Score
1	Dairy	1
2	Dairy+ Agriculture	2
3	Dairy+ Agricultural labour	3
4	Dairy + Service	4
5	Dairy + other occupation	5

3.6.1.4 Family size

It refers as the total number of consisting of men, women and children living together in a family of rural dairy farmers. They were categorized in to three classes, on the basis equal interval method, and were reported in frequency and percentage.

Sr. No	Categories	Score
1	Small	Up to 4
2	Medium	5 to 8
3	Large	Above 8

3.6.1.5 Family type

Family type was ascertained by knowing their way of living as nuclear and joint. The information was collected and grouped as below. It was asserted one score for nuclear family and score two for joint family and they were reported in frequency and percentage.

Sr. No.	Family type	Score
1	Nuclear	01
2	Joint	02

3.6.1.6 Annual income

It is defined as, the total earning of the family through main and subsidiary occupation in a year. The rural dairy farmers were categorized as shown below on the basis of equal interval method. Annual income was categorized into three groups as low, medium and high annual income and were reported in frequency and percentage.

Sr. No.	Category	Income Rs
1	Low	Up to 2,00,000
2	Medium	2,00,000-3,00,000
3	High	Above 3,00,000

3.6.1.7 Size of herd

It is operationally defined as the number of dairy animals possesses by the dairy farmers. A score of one was given for each dairy animal and it was categorized as follows on the basis of Mean $\pm$ S.D., viz, small, medium, large herd size.

Sr. No.	Herd size	Score Range
1	Small	Up to 6
2	Medium	7 to 14
3	Large	Above 14

Plate 1. Collection of social-economical information from rural dairy farmers with personal interaction

3.6.1.8 Sources of milk

It is quantity of milk in litre used for manufacturing and processing of milk product by dairy farmers. A score of one was given for each 5 lit. of milk and it was categorized as follows on the basis of Mean ± S.D., deviation.

Sr. No.	Category	Score Range
1	Owned Dairy	Up to 10 lit.
2	Owned + Collection from other	10-20 lit. and above

3.6.1.9 Daily milk production

It is the quantity of milk in liter produced in single day. The dairy farmers were categorized as shown below. It was measured by directing questioning on following points. The categorization done on the basis of Mean ± S.D., viz, low, medium and high daily milk production and were reported in frequency and percentage.

Sr. No.	Category	Milk production (liter)
1	Low	Up to 15 lit.
2	Medium	15 – 25 lit.
3	High	Above 25 lit.

3.6.1.10 Daily milk sale

It is the quantity of milk sold by rural dairy farmers in single day and the rural dairy farmers were categorized as shown below. It was measured by directing questioning on following points. The categorization done on the basis of Mean ± S.D., viz, low, medium and high daily milk sale and were reported in frequency and percentage.

Sr. No.	Category	Milk score
1	Low	Up to 5 liters
2	Medium	5 – 10 liters
3	High	Above 10 liters

Plate 2. Collection of social-economical information from rural dairy farmers with personal interaction

3.6.1.11 Sale of milk products

It is total milk product (kg) sold by the rural dairy farmers and they were categorized as shown below. It was measured by the directing questioning on following points. The categorization was done on the basis of Mean $\pm$ S.D., viz, low, medium and high sale of milk products. And were reported in frequency and percentage.

Sr. No.	Milk product	Category
1	Paneer	Medium
2	Dahi	High
3	Pedha	Medium
4	Khoa	Medium
5	Ghee	Low
6	Shrikhand	Low
7	Other	Low

3.6.1.12 Risk preference

It is the degree of which the farmers are oriented towards the risk and uncertainty accepting new ideas of milk processing and milk products manufacturing. It was measured with the help of scale developed by Supe (1969).

There are six statements in this scale, out of these, statement numbers 1, 2, 3, 4 and 5 are positive, while statement number 6 is negative.

The response to each statement is rated on a five points continuum as strongly agree, agree, undecided, disagree and strongly disagree against each statement. A score of 5, 4, 3, 2, and 1 is

assigned to the above response categories in case of positive statements and the scoring pattern is reversed for negative statement.

According to the total score obtained the respondents were classified into three categories on the basis of Mean ± S.D., viz, low, medium and high risk preference.

Sr. No.	Risk preference (Category)	Score range
1	Low	Up to 19
2	Medium	20 to 24
3	High	Above 24

3.6.2 Dependent variables

3.6.2.1 Constraints

Constraints are the factors that limit the farmers development process and hence these can't be over looked. In the present study, constraints have been operationally defined as the problems encountered by the rural dairy farmers with regard to the challenges faced by rural dairy farmers in milk processing and milk products manufacturing.

Constraints found during present study were structured and further classified into different categories viz. infrastructural, economical, marketing, technological, socio-psychological and communicational constraints. A query was made to the rural dairy farmers to elicit their responses with regard to the problems or difficulties they encountered during milk processing, milk products manufacturing and it's marketing. The responses were recorded against the structured constraints. The frequency and percentage of each constraint were worked out to measure the constraints encountered by the rural dairy farmers.

List of constraints faced by dairy farmers in milk processing and milk products manufacturing was prepared. It was measured on two point continuum i.e. yes or no. Constraints expressed by dairy farmers during data collection were classified into different categories. The frequency and percentage of each constraint was work out for interpretation.

3.8 Statistical procedure used for analysis of data

After collection of data, entries in the schedule were checked for completeness, consistency and uniformity in the nature of responses. The entire schedule was numbered serially to facilitate the work of tabulation and analysis. All schedules were tabulated in different tables and the categorized and tabulated. The frequencies were converted into percentage for giving better and clear expression to the data. The analysis was done, keeping in view the objectives of the study.

The statistical methods used in this study were mean and standard deviation for the purpose of categorization.

3.8.1 Arithmetic mean

Arithmetic mean was calculated by sum of all the various score and dividing it by number of cases. Mean of sample was calculated by summing all the individual score and dividing it by number of cases. The formula is,

$$\bar{X} = \frac{\sum X}{N}$$

Where,

$\bar{X}$ = Arithmetic mean

$\sum X$ = Sum of dairy farmers score

N = Number of dairy farmers

3.8.2 Standard deviation

Standard deviation measure of variability calculated around mean. The usual symbol for “S.D.” was the Greek letter “σ” Sigma.

$$\delta = (S.D.) = \frac{\sqrt{N\sum X^2 - (\sum X)^2}}{N}$$

Where,

δ = Standard deviation

$\sum X^2$ = Sum of square of ‘X’ series

$(\sum X)^2$ = Square of summation of ‘X’ series

N = Number of dairy farmers

Chapter IV

RESULTS AND DISCUSSION

The data collected by adopting the procedure presented earlier in the methodology. The results obtained from the analysis of the data in accordance of the objectives along with logical discussion have been given to interpret the observed phenomena. The data were collected from 100 rural dairy farmers in Shirur tahsil of Pune district by conducting field survey.

The survey was conducted for collection of data for research work. The data pertaining to specific objectives of the study was collected from rural dairy farmers by personally interviewing them. The data obtained from them were tabulated and analysed by applying appropriate statistical tools to investigate the realities. The collected data have been analysed taking into account the study objectives. The results have been presented under following subheads.

4.1 Socio-economic characteristics of rural dairy farmers

4.1.1 Distribution of independent variables

4.1.2 Distribution of dependent of variables

4.2 Constraints faced by rural dairy farmers

4.3 New techniques and opportunities available for rural dairy farmers

4.1 Socio-economic characteristics of rural dairy farmers

The first objective of the present study was to assess the personal, socio-economic, characteristics of rural dairy farmers. The findings and discussion relating to this part of the study are being presented in this section. The frequency distribution and percentage scores of selected rural dairy farmers for each independent variable

has been worked out and presented here separately through different tables and graphs.

4.1.1 Distribution of independent variables

It comprises of findings related to the personal, Socio-economic, profile of rural dairy farmers.

The characteristics namely age, education, family type and family size, occupation, annual income, Herd size, daily sale of milk, milk production, sale of milk products, risk factor were studied and the observation have been presented in the section.

4.1.1.1 Age

Age is normally an indicator of the maturity, experience, depth of knowledge and physical strength/fitness of the rural dairy farmers. This factor was important because it involve physical fitness hence it has been considered in the present study. The age wise distribution of rural dairy farmers is presented Table 1.

Table 1. Distribution of the rural dairy farmers according to their age

Sr. No.	Age	(n = 200)	
		Frequency	Percentage (%)
1	Young (Up to 35)	76	38.00
2	Middle (36 – 50)	84	42.00
3	Old (Above 50)	40	20.00
	Total	**200**	**100.00**

Mean = 40.27 S.D = 10.64

The data presented in Table 1 revealed that (38%) of the rural dairy farmers belongs to young age group up to 35 years followed by (42%) of dairy farmers belongs to middle age group i.e. between 36 to 50 years and only (20%) dairy farmers belongs to old age category that is above 50 years.

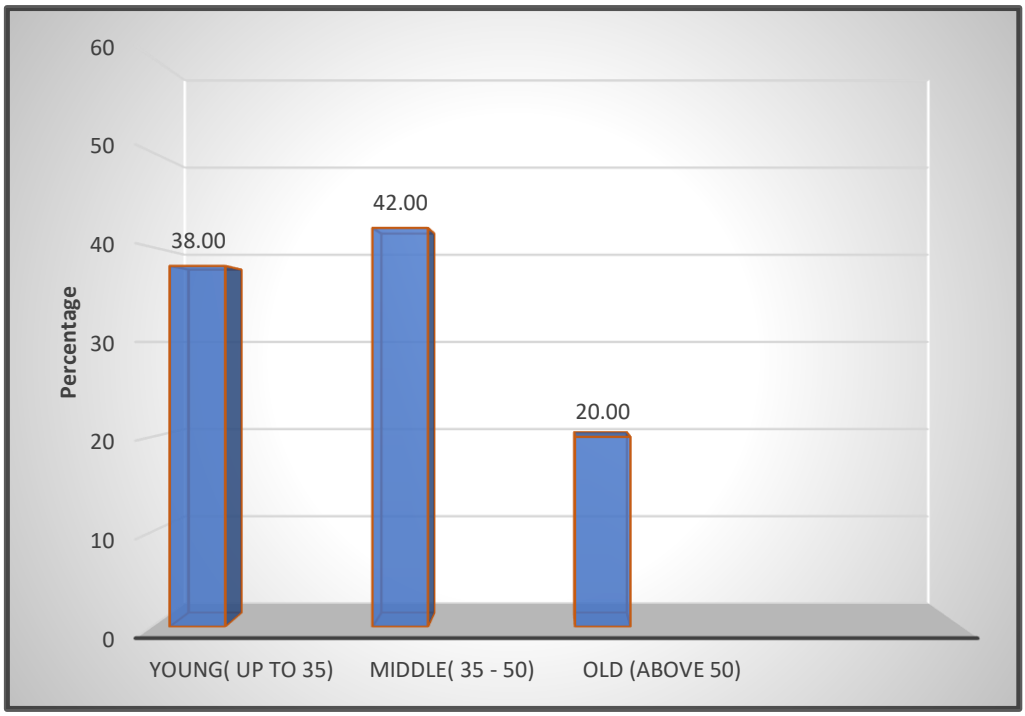

Fig. 2. Distribution of the rural dairy farmers according to their age

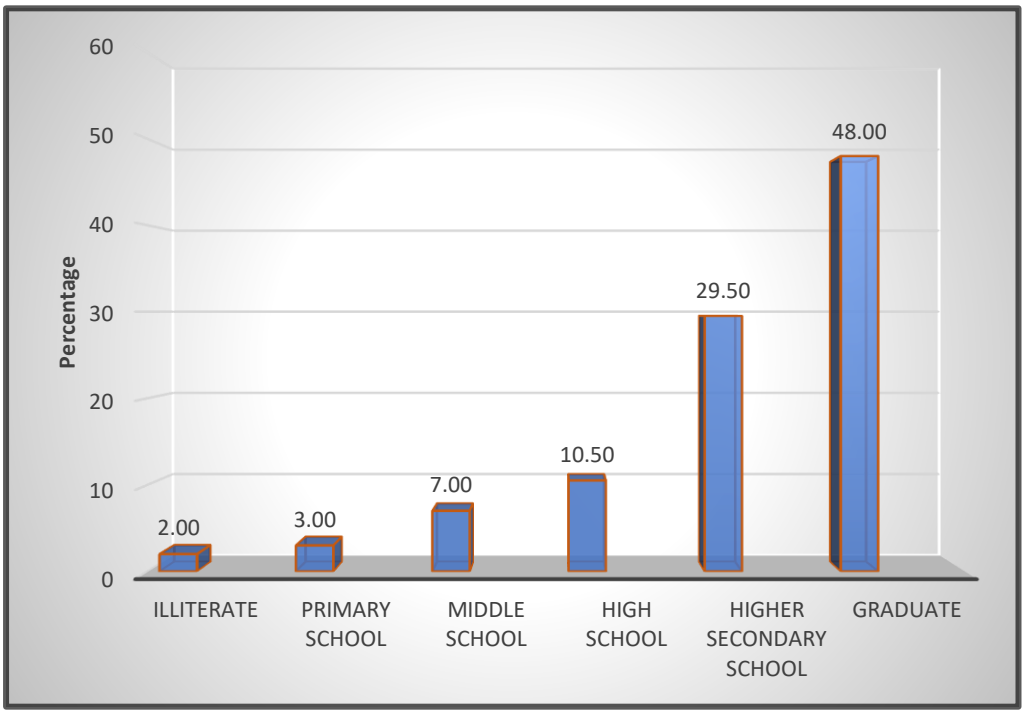

Fig. 3. Distribution of the rural dairy farmers according to their education

Data indicated that most of the dairy farmers were found in young age and middle age category. The young and middle age farmers are enthusiastic, innovative and have more risk orientation and they can take up an independent decision to implement their new ideas or ventures for maximum economic gain and try to satisfy their basic as well as modern needs in this era.

These findings were supported by Chaurasiya (2015) and in line with the findings of Sharma *et al*. (2018).

4.1.1.2 Education

Education is an important indicator that determines the rate of adoption of new innovation. It has been observed that higher the level of education greater is the technology adoption. It is easier to convince an educated entrepreneur about usefulness of any technology as compared to any illiterate entrepreneurs. Education is an important factor, which can positively influence the knowledge, utilization and skill of rural dairy farmers. The distribution of dairy farmers according to their education has been presented in Table 2.

Table 2. Distribution of the rural dairy farmers according to their education

Sr. No.	Education	(n = 200)	
		Frequency	Percentage
1	Illiterate (No schooling)	04	2.00
2	Primary school (1^{st} to 4^{th})	06	3.00
3	Middle school (5^{th} to 7^{th})	14	7.00
4	High school (8^{th} to 10^{th})	21	10.50
5	HSC (11^{th} to 12^{th})	59	29.50
6	Graduation (Above 12^{th})	96	48.00
	Total	**200**	**100.00**

It is evident from the data presented in Table 2 that exactly (48 %) of the dairy farmers were educated up to college (above 12th std.) level, followed by (29.50%) of the dairy farmers were educated up to higher secondary school (11th to 12th std.) level; whereas (10.50%) of dairy farmers were having education up to high school (8th to 10th std.) and (07%) of dairy farmers as well as (03%) of dairy farmers were having education up to middle school (5th to 7th std.) and primary school (1st to 4th std.) respectively. It was also observed that (02%) of the dairy farmers were found to be illiterate.

It is clearly indicated that the education level of rural dairy farming community has been increased, the probable reason was the realization of importance of formal education, the facilities available locally and government education policy and campaign might have motivated them to pursue higher education. It was surprising to note that 02.00% of rural dairy farmers were illiterate.

These findings were supported by Lohakare (2015) and Patel *et al.* (2018).

4.1.1.3 Occupation

Table 3. Distribution of the rural dairy farmers according to their occupation

Sr. No.	Occupation	(n = 200)	
		Frequency	Percentage
1	Dairy	22	11.00
2	Dairy + Agriculture	98	49.00
3	Dairy + Agricultural labour	41	20.50
4	Dairy + service	29	14.50
5	Dairy + Other occupation	10	05.00
Total		**200**	**100.00**

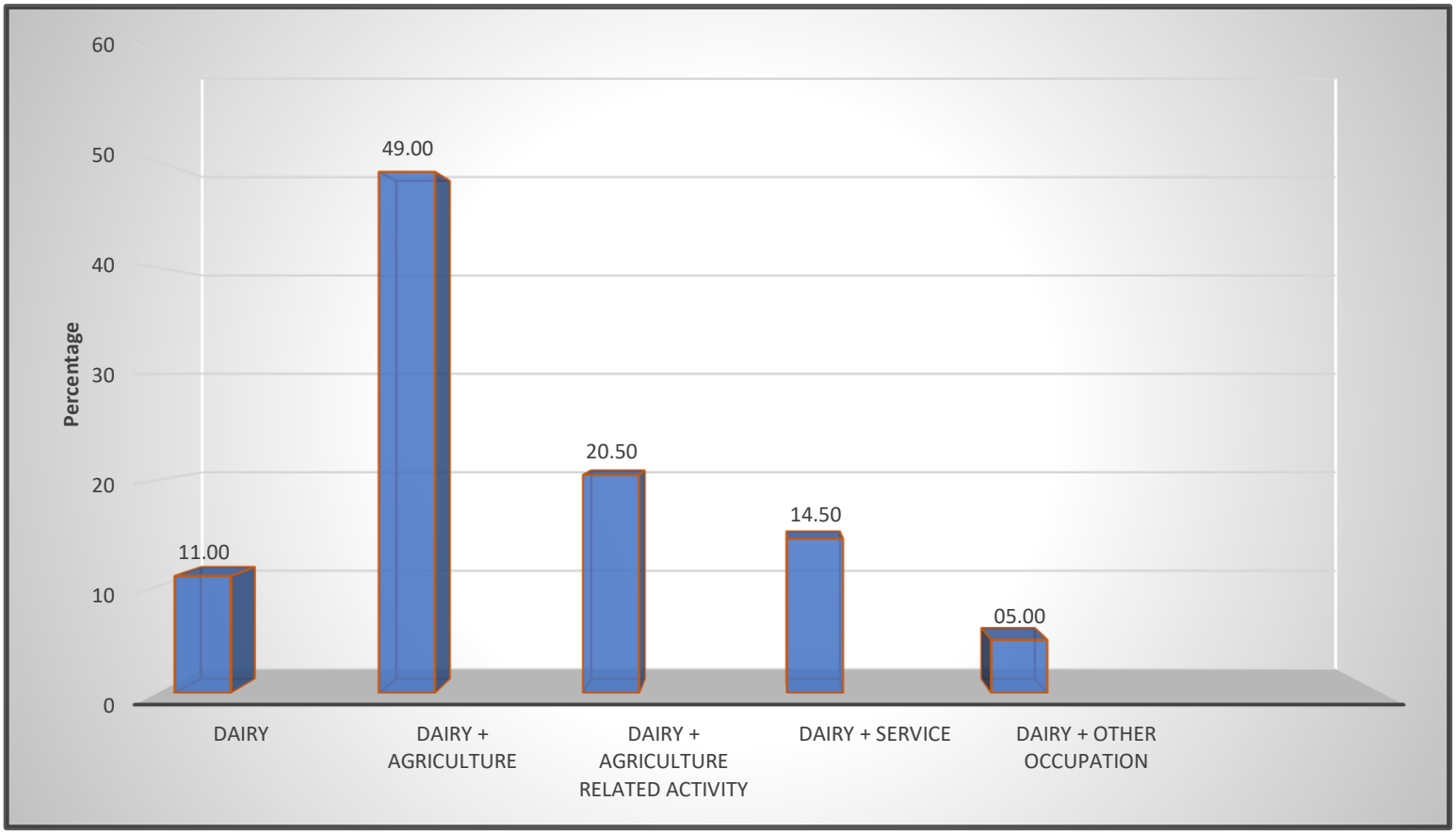

Fig. 4. Distribution of the rural dairy farmers according to their occupation

It is apparent from the Table 3 that great majority (49%) of the dairy farmers were engaged in dairy and agriculture occupation. Relatively fewer dairy farmers were engaged in dairy along with agricultural labour and dairy as well as service (20.50%) and (14.50%) respectively. It was observed that (11 %) of the dairy farmers were engaged in dairy occupation and only (05%) of the dairy farmers were engaged in dairy and other occupation.

These findings were supported by Rathod *et al.* (2011) also in line with the findings of Rathod and Damodhar (2015).

4.1.1.4 Family size

Table 4. Distribution of the rural dairy farmers according to their Family size

Sr. No.	Categories	(n = 200)	
		Frequency	Percentage
1	Small (Up to 4 members)	28	14.00
2	Medium (5 to 8 members)	123	61.50
3	Large (Above 8 members)	49	24.50
Total		**200**	**100.00**

Mean = 07.41 S.D = 07.62

The data furnished in Table 4 indicated that maximum number (61.50%) of the dairy farmers had medium family size (5 to 8 members) whereas, (14%) of dairy farmers belonged to small family size (Up to 4 members) and (24.50%) of dairy farmers belonged to large family size (Above 8 members).

These findings were supported by Chandrasekar *et al.* (2017), Gopi *et al*. (2017).

4.1.1.5 Family type

Data from the Table 5 indicated that majority, (63%) of the dairy farmers belonged to nuclear type family and (37%) of the dairy farmers belonged to joint type family.

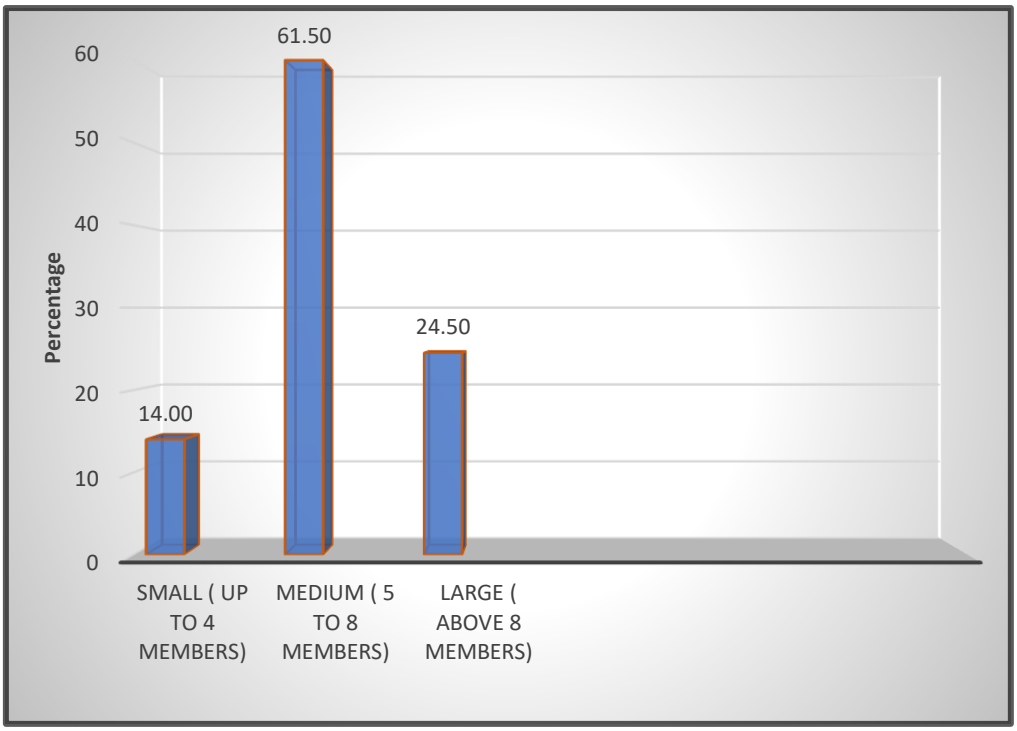

Fig. 5. Distribution of the rural dairy farmers according to their family size

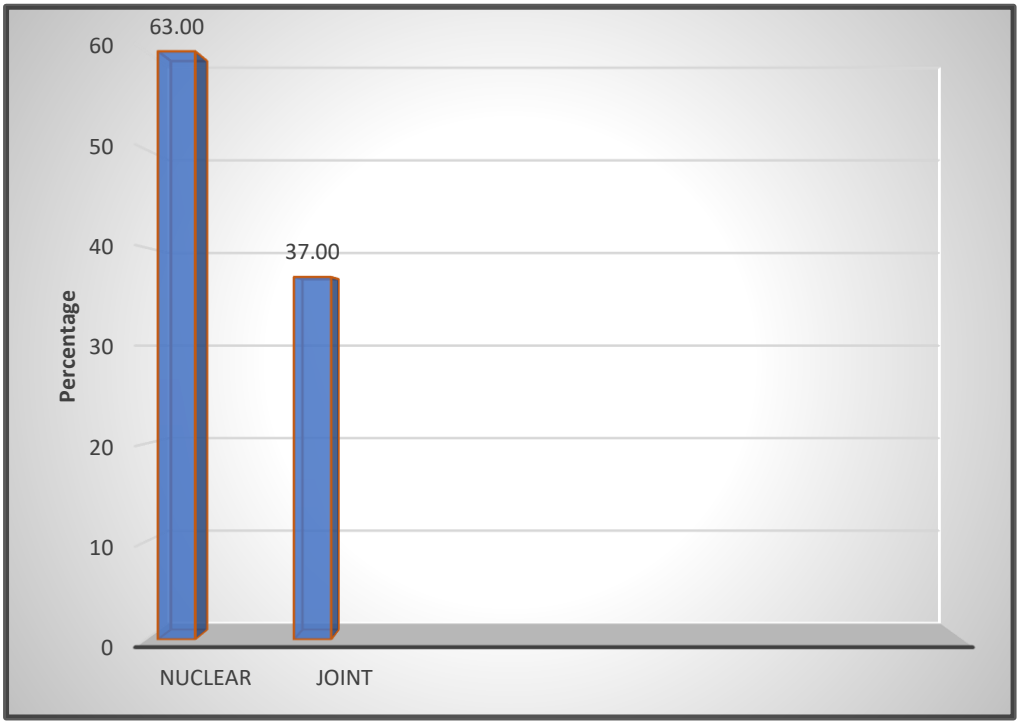

Fig. 6. Distribution of the rural dairy farmers to their family type

Table 5. Distribution of the rural dairy farmers according to their Family type

Sr. No.	Family type	(n = 200)	
		Frequency	Percentage (%)
1	Nuclear	126	63.00
2	Joint	74	37.00
	Total	**200**	**100.00**

The smaller family sizes in the households with small holding might be due to division of the joint families. Some of the dairy farmers wanted to remain as small nuclear family for ease of family management in most economic way. In family type (63%) dairy farmers belongs to nuclear type while (37%) belongs to joint type.

This result obtained in present study was in line with that of Sabapara et al. (2016), Singh *et al.* (2016) and Gopi *et al.* (2017).

4.1.1.6 Annual income

Table 6. Distribution of the rural dairy farmers according to their annual income

Sr. No.	Annual income (Rupees)	(n = 200)	
		Frequency	Percentage (%)
1	Low (Up to 2,00,000)	58	29.00
2	Medium (2,00,000 to 3,00,0000)	107	53.50
3	High (Above 3,00,000)	35	17.50
Total		**200**	**100.00**

Mean = 2,23,250.0

In case of total annual income (53.50%) maximum dairy farmers had medium level of annual income i.e. (2,00,000 to 3,00,000) followed by (29%) of dairy farmers who had low level of annual income (Up to 2,00,000), while only (17.50%) of the dairy farmers had high level of annual income (Above 3,00,000).

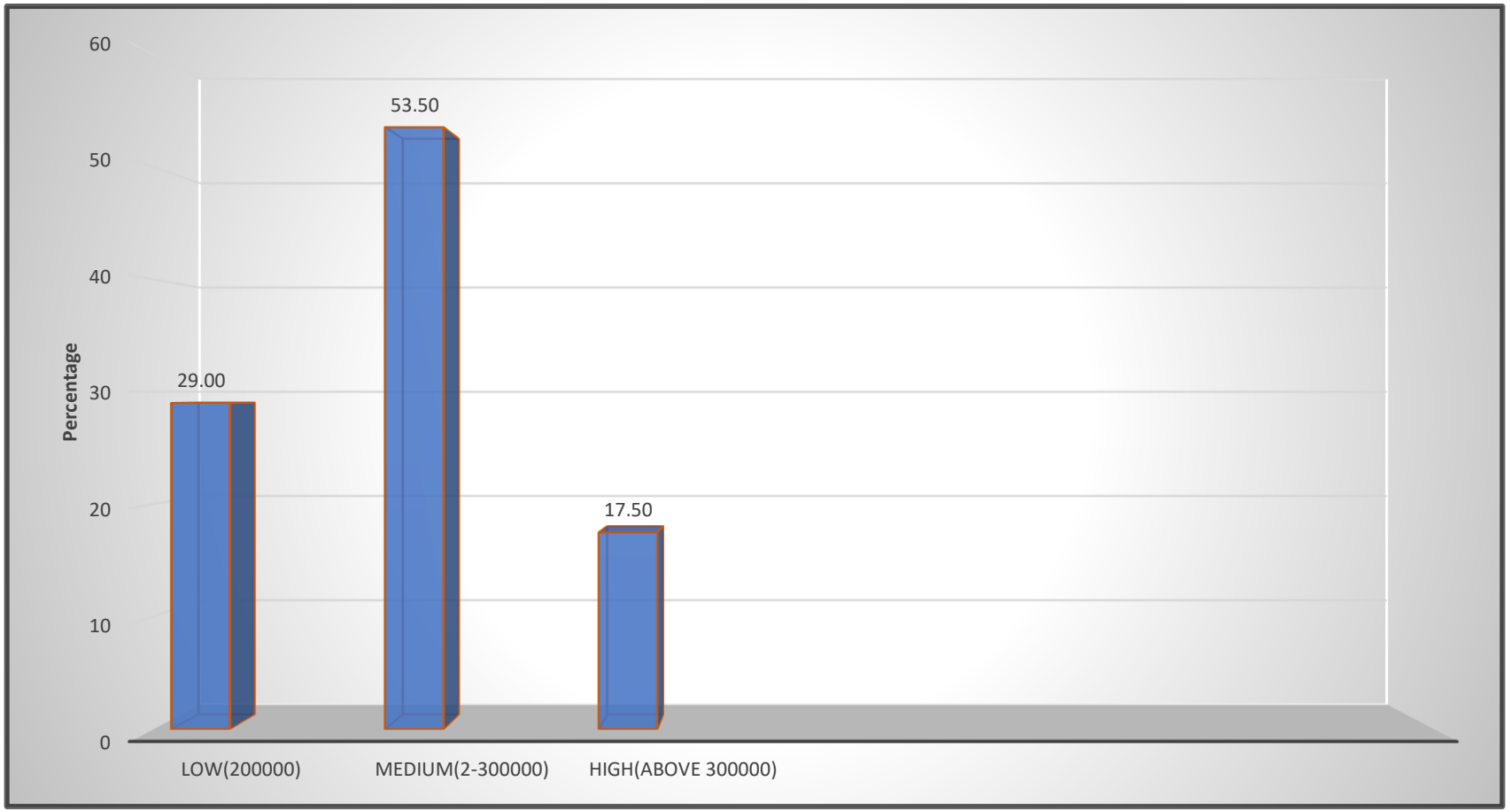

Fig. 7. Distribution of the rural dairy farmers according to annual income

The results are in accordance with the findings of Bhushan *et al.* (2015) and Deepa Narayana *et al.* (2015).

4.1.1.7 Size of herd

Table 7. Distribution of the rural dairy farmers according to their size of herd

Sr. No.	Herd size (Numbers)	(n = 200)	
		Frequency	Percentage (%)
1	Small (Up to 06)	68	34.00
2	Medium (07 to 14)	92	46.00
3	Large (Above 14)	40	20.00
Total		**200**	**100.00**

Mean = 09.49 S.D = 04.26

It was indicated that (46%) of dairy farmers possessed medium (07 to 14 animals) herd size. Whereas, (34%) of dairy farmers had small herd size (Up to 06) and (20%) of dairy farmers were having large herd size above 14 animals so, they are categorized under large herd size category.

The results are in the line with the findings of Gopi *et al.* (2017) who reported that majority of the dairy farmers were having medium herd size. The findings are also supported by Chandrasekar *et al.* (2017).

4.1.1.8 Sources of milk

Table 8. Distribution of the rural dairy farmers according to their sources of milk

Sr. No.	Category	(n = 200)	
		Frequency	Percentage (%)
1	Owned dairy milk	102	51
2	Owned + collection from other	98	49
Total		**200**	**100.00**

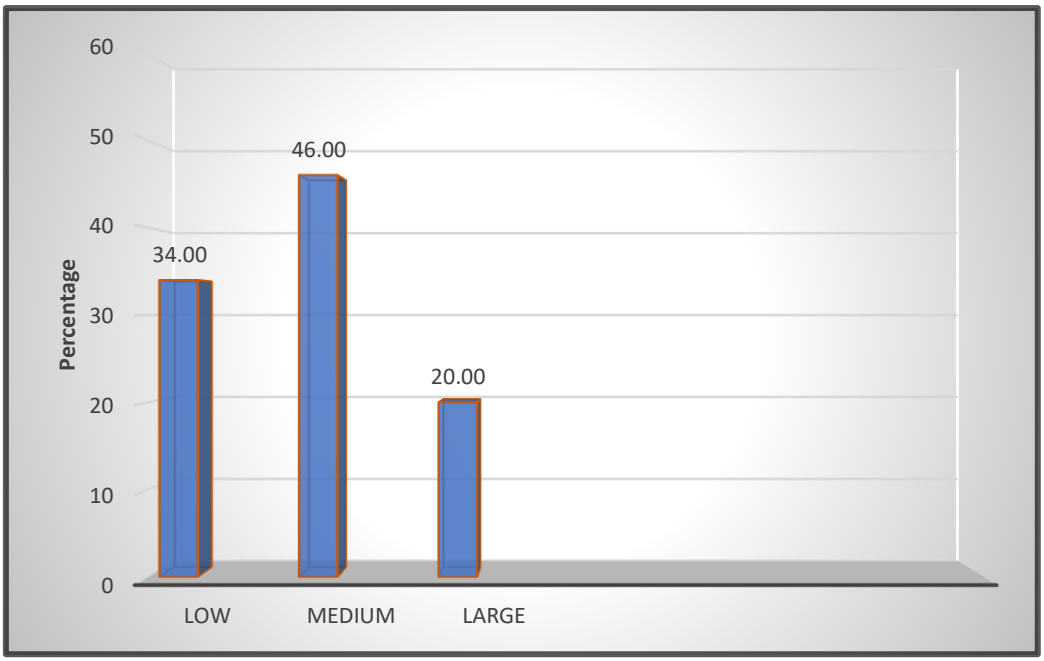

Fig. 8. Distribution of the rural dairy farmers according to size of herd

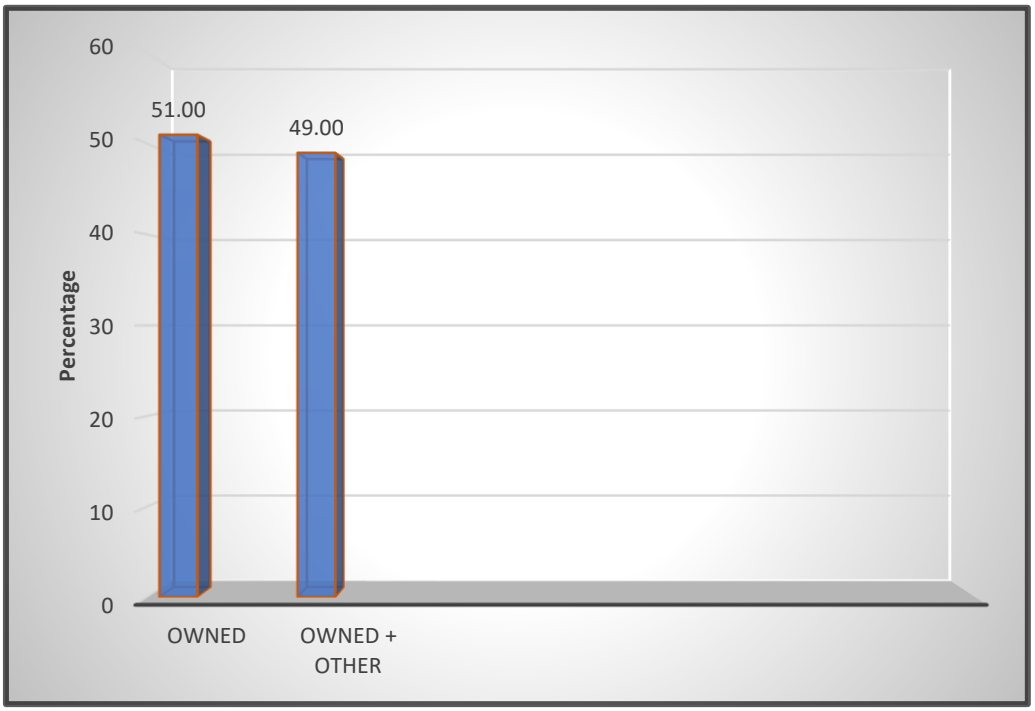

Fig. 9. Distribution of the rural dairy farmers according to sources of milk

Plate 3. Collection of milk from other dairy farmers for processing and equipment available for milk testing and processing

It was indicated that (51%) of dairy farmers used owned dairy milk and (49%) of dairy farmers had used milk collected from other for processing of milk and milk products manufacturing.

4.1.1.9 Daily milk production

Table 9. Distribution of the rural dairy farmers according to daily milk production

Sr. No.	Milk production (Lit.)	(n = 200)	
		Frequency	Percentage (%)
1	Up to 15 litres (Low)	52	26.00
2	15 – 25 litres (Medium)	68	34.00
3	Above 25 litres (High)	80	40.00
Total		**200**	**100.00**

Mean = 24.39 S.D = 11.07

In case of daily milk production (26%) of the dairy farmers had low level of daily milk production i.e. (Up to 15 litre) followed by (34%) of dairy farmers who had medium level of daily milk production (15-25 litre), while (40%) of the dairy farmers had high level of daily milk production (Above 25 litre).

This result obtained in present study was in line with that of Ashwar *et al.* (2011), Meena *et al.* (2012) and Jaisridhar *et al.* (2017).

4.1.1.10 Daily milk sale

Table 10. Distribution of the rural dairy farmers according to their daily milk sale

Sr. No.	Milk sale (Lit.)	(n = 200)	
		Frequency	Percentage (%)
1	Up to 5 liters (Low)	96	48.00
2	5-10 liters (Medium)	62	31.00
3	Above 10 liters (High)	42	21.00
Total		**200**	**100.00**

Mean = 06.55 S.D = 03.45

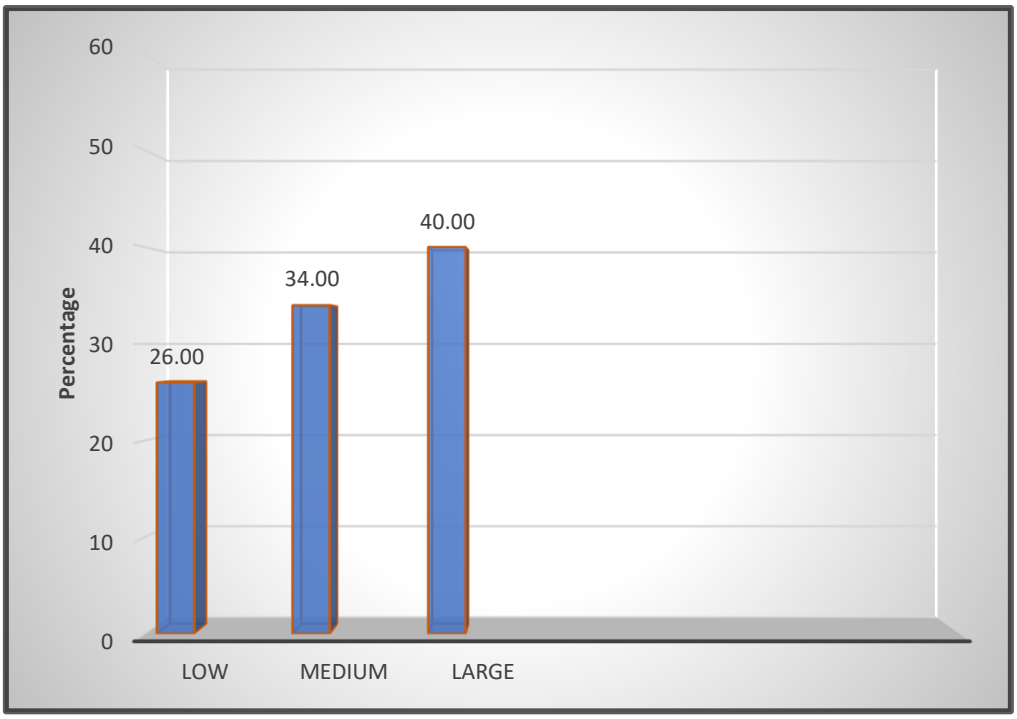

Fig. 10. Distribution of the rural dairy farmers according milk production

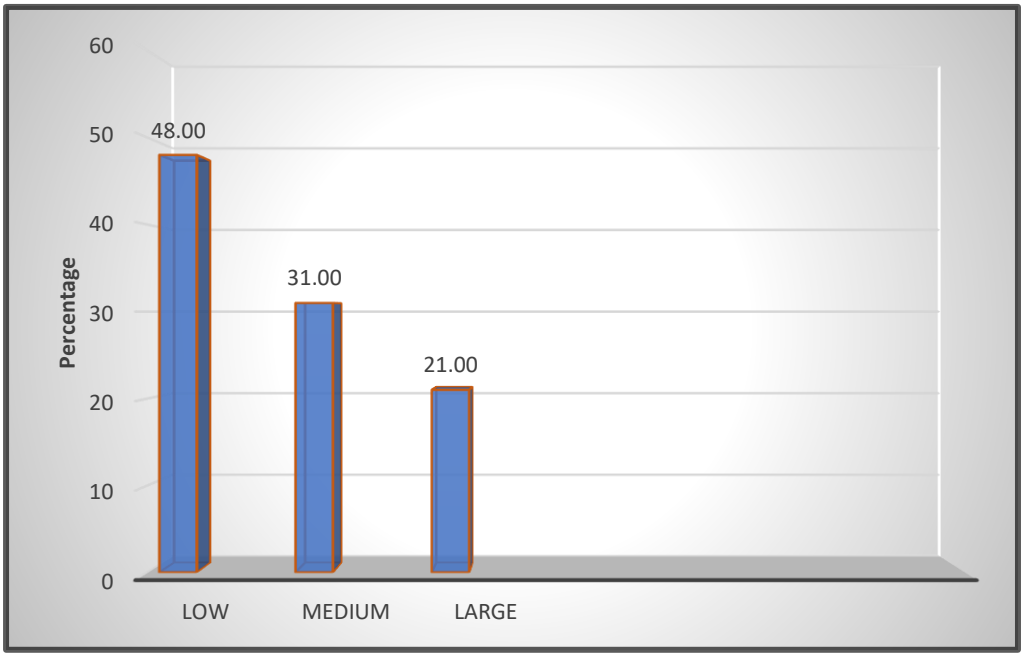

Fig. 11. Distribution of the rural dairy farmers according daily milk sale

It was evident from Table 10 that nearly half of dairy farmers (48%) had low level of daily sale of milk i.e. (Up to 5 litre) followed by (31%) of dairy farmers had medium level of daily milk sale (5-10 litre), while (21%) of dairy farmers had high level of daily sale of milk (Above 10 litre). As table 9 indicates maximum (40%) of dairy farmers producing more than 25 litre milk per day and these farmers utilize milk in manufacturing of the different milk products.

The results obtained in the present study are in line with that of Nishi *et al.* (2011) and Lohakare *et al.* (2015).

4.1.1.11 Sale of milk products

Table 11. Distribution of the rural dairy farmers according to their sale of milk products

Sr. No.	Milk product sale	(n = 98)	
		Frequency	Percentage
1	Paneer	12	12.24
2	Dahi	26	26.53
3	Pedha	14	14.29
4	Khoa	16	16.33
5	Ghee	14	14.29
6	Shrikhand	10	10.20
7	Other	06	06.12
Total		**98**	**100.00**

In case of sale of milk products out of 200 dairy farmers (49.00%) dairy farmers i.e. (98 farmers) sale different milk products in study area among them (12.24%) of the dairy farmers had sold the milk product paneer, (26.53%) of dairy farmers had sold dahi and (14.29%) dairy farmers had sold pedha. However, (16.33%) of dairy farmers had sold khoa followed by (14.29%) of dairy farmers sold ghee. Only (06.12 %) of dairy farmers had sold other milk products and about (10.20%) of dairy farmers had sold shrikhand.

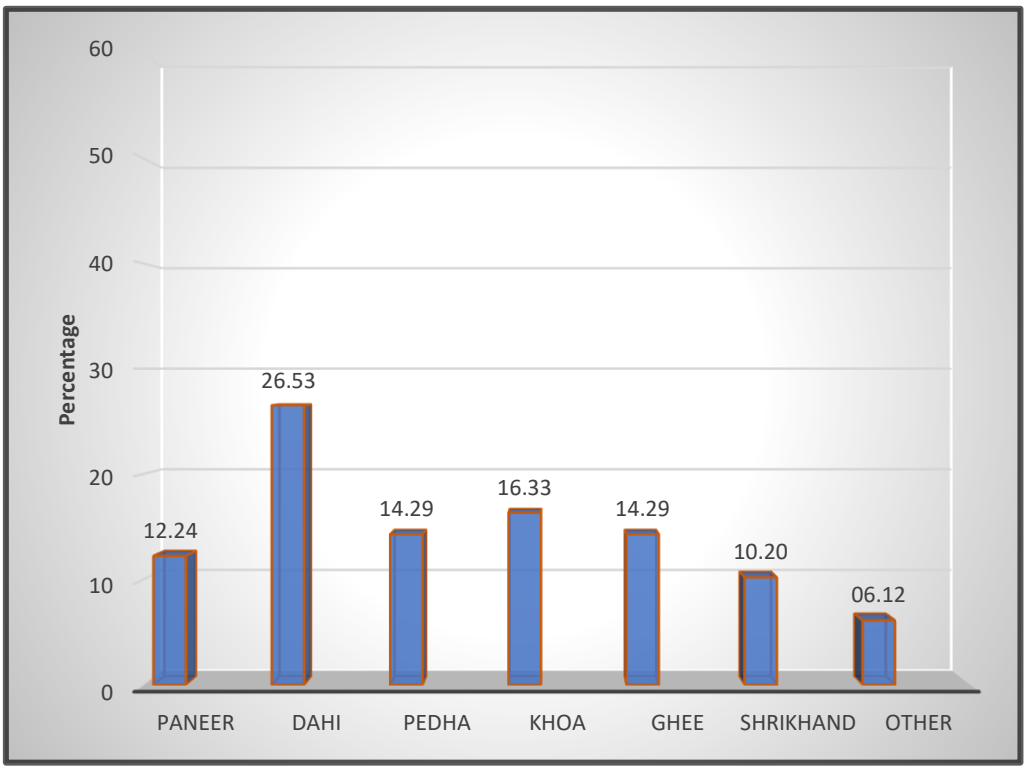

Fig. 12. Distribution of the rural dairy farmers according sale of milk products

Plate 4. Different milk products prepared and sold by dairy farmers in village level at own shop

4.1.1.12 Risk preference

Risk preference was operationally defined as the degree of which the dairy farmers is oriented towards risks and uncertainty in milk processing and milk products manufacturing. It was measured with the help of scale developed by Supe (1969). The distribution of the selected dairy farmers as per the risk preference has been presented as under in Table 12.

Table 12. Distribution of the rural dairy farmers according to their risk preference

Sr. No.	Risk preference	(n = 200)	
		Frequency	Percentage
1	Low (Up to 19)	64	32.00
2	Medium (20 to 24)	86	43.00
3	High (Above 24)	50	25.00
Total		**200**	**100.00**

Mean = 23.92 S.D = 07.38

In case of risk preference, it was observed that from table 12 that majority of the dairy farmers i.e. (43.00%) had medium level of risk preference; however (32%) of the dairy farmers had low level of risk preference whereas, about (25.00%) of the dairy farmers had high risk preference. The risk bearing capacity of an individual depends upon the personal, socio-economic and psychological characteristics. The young to middle age educated farmers with more farming experience and higher income had medium risk preference. The results are in accordance with the findings of Patel *et al.* (2014) and Patel *et al.* (2015).

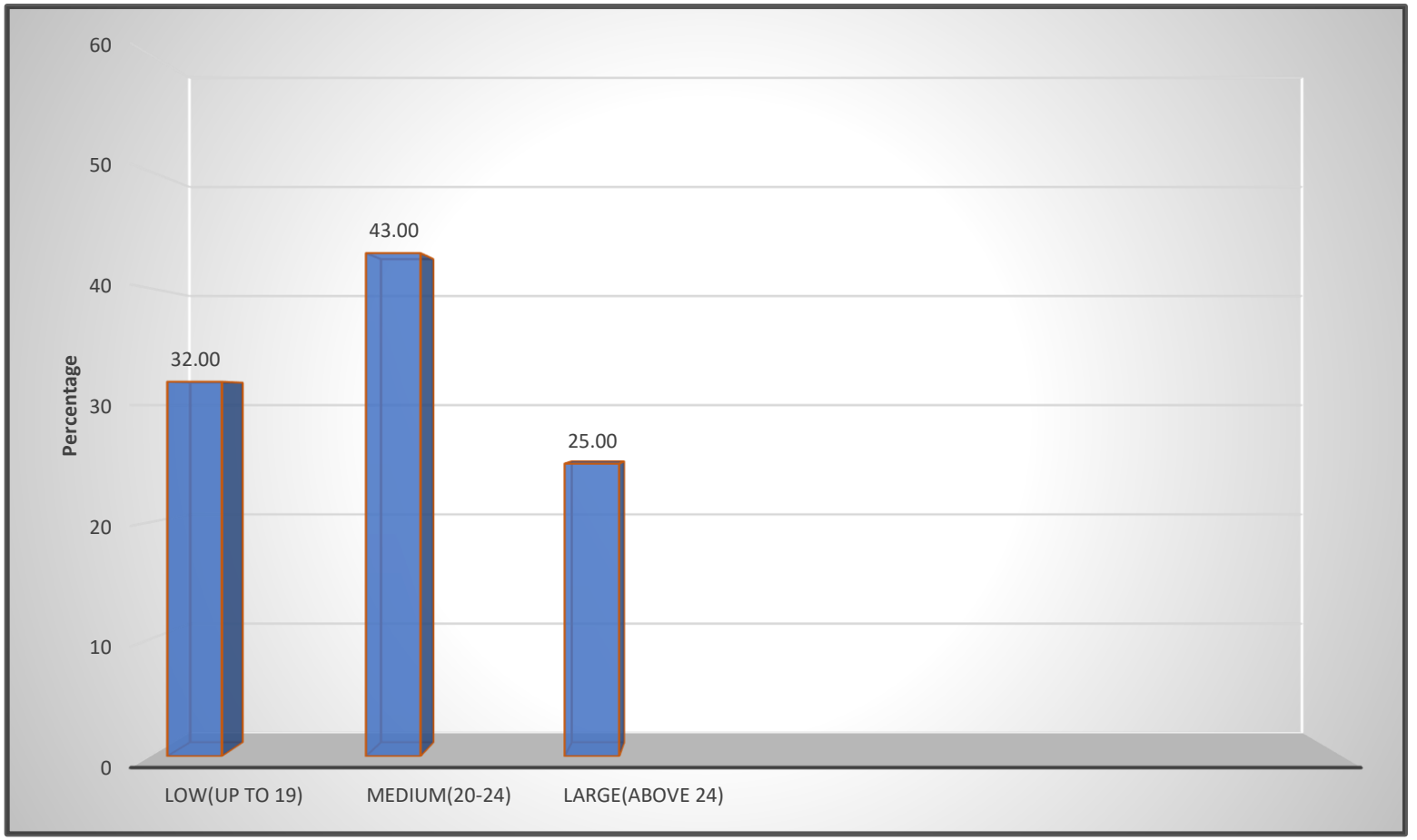

Fig. 13. Distribution of the rural dairy farmers according to risk preference

4.2 Constraints faced by rural dairy farmers

Dairy farming is one of the important enterprises which dominates the economic activities of the people in rural areas of Maharashtra. This sector also offers an efficient means of cash savings and economic security to the rural dairy farmers. Advent of “Operation Flood” has made the rural farmers in rural areas to realize the importance of dairy enterprise as the potential source of additional income and employment. In recent years dairy farming has been growing rapidly because of increasing demand for milk and milk products.

Promotion of entrepreneurship in dairy farming has been also emphasized as a popular poverty alleviation strategy in the study area. In spite of its shining segment, entrepreneurs involved in dairying have been confronted with numerous constraints which need to be addressed. Therefore, an effort was made to study the main constraints faced by rural dairy farmers in the milk processing and milk products manufacturing.

Constraints refer to the situation or circumstances which is responsible to restrict or limit the activity or performance of an individual. In this study, it is operationalized as the items of difficulties experienced by the dairy farmers in milk processing and milk products manufacturing. Constraints play a vital role in adoption as well as transfer of technology. To obtain better result of any type of extension services, it is very essential to minimize the constraints. For which, constraints in flow of services should be made for rapid action. The information regarding constraints experienced by the dairy farmers were collected by using open ended questions. Agreements of each dairy farmer against enumerated constraints were sum up separately and converted into percentage.

The attempt was made to find out constraints faced by rural dairy farmers in milk processing and milk products manufacturing and the data is presented in Table 13.

Table 13. Distribution of the rural dairy farmers according to economics constraints faced by dairy farmers

Sr. No	Constraints	(n = 200)	
		Frequency	Percentage
A.	**Economic constraints**		
1	Low price for milk offered	200	100.00
2	Low provision of loan for purchase modern machinery	178	89.00
3	Delay payment for milk and milk products	112	56.00
4	High interest on loan	148	74.00
5	Non availability of credit at proper time	160	80.00
6	High cost of modern machines and equipment	182	91.00
7	High charges for insurance	190	95.00

It is evident from Table 13 that regarding economical constraints (100%) farmers had faced the constraints about low price for milk offered, (95%) dairy farmers encountered constraint high charges for insurance as well as (91%) farmers faced constraint high cost of modern machines and equipment, (89%) dairy farmers expressed low provision of loan for purchase modern machinery, while (80%) dairy farmers expressed non availability of credit at proper time. About (74%) dairy farmers expressed the constraints high interest on loan, while only (56%) dairy farmers had expressed the constraints delay payment for milk and milk products.

Table 14. Distribution of the rural dairy farmers according to marketing constraints faced by farmers

Sr. No.	Constraints	(n = 200)	
		Frequency	Percentage
A.	**Marketing constraints**		
1	Irregular sale of milk products	166	83.00
2	Advertisement of own product	200	100.00
3	Less knowledge about marketing strategy	118	59.00
4	Transportation problem	156	78.00
5	Inadequate marketing intelligence	178	89.00
6	Irregular payment/advanced payment	182	91.00
7	Lack of time for marketing	138	69.00

As regards to marketing constraints (100%) dairy farmers had faced constraints about advertisement of owned products and (91%) dairy farmers had faced constraints about irregular payment followed by (89%) dairy farmers had expressed constraints about inadequate marketing intelligence, while (83%) dairy farmers had faced constraints about irregular sale of milk products. Nearly more than half of total dairy farmers i.e. (59%) of dairy farmers had expressed constraints about less knowledge about marketing strategy and (69%) of dairy farmers had faced constraints lack of time for marketing, while (78%) dairy farmers had expressed constraints about transportation problem in rural area.

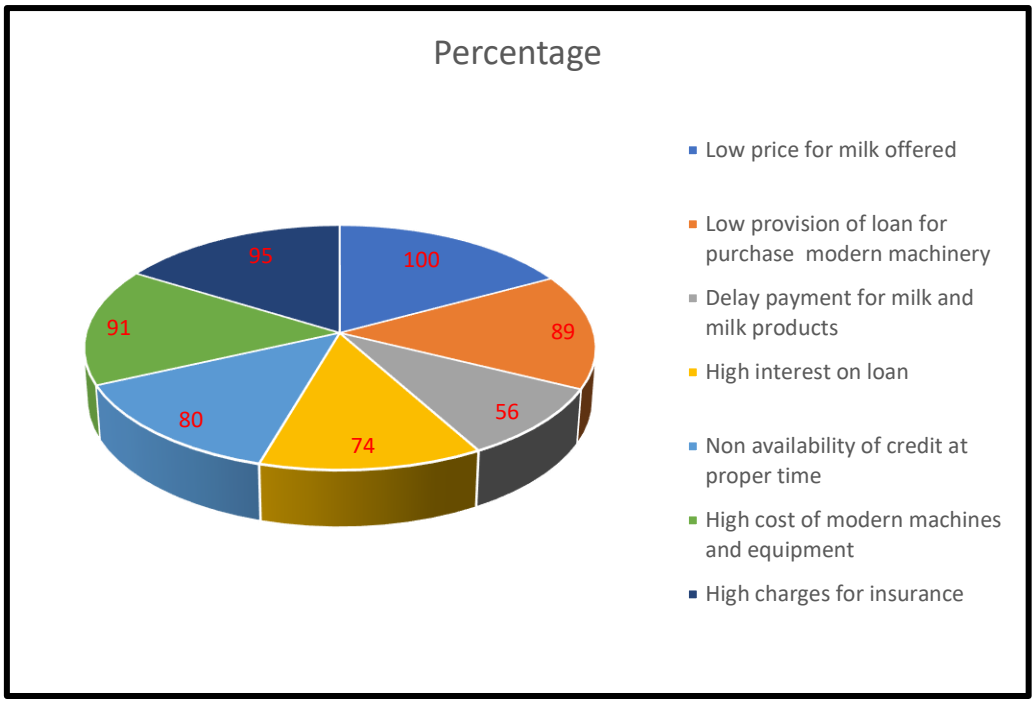

Fig. 14. Distribution of the rural dairy farmers according to economic constraints faced by farmers

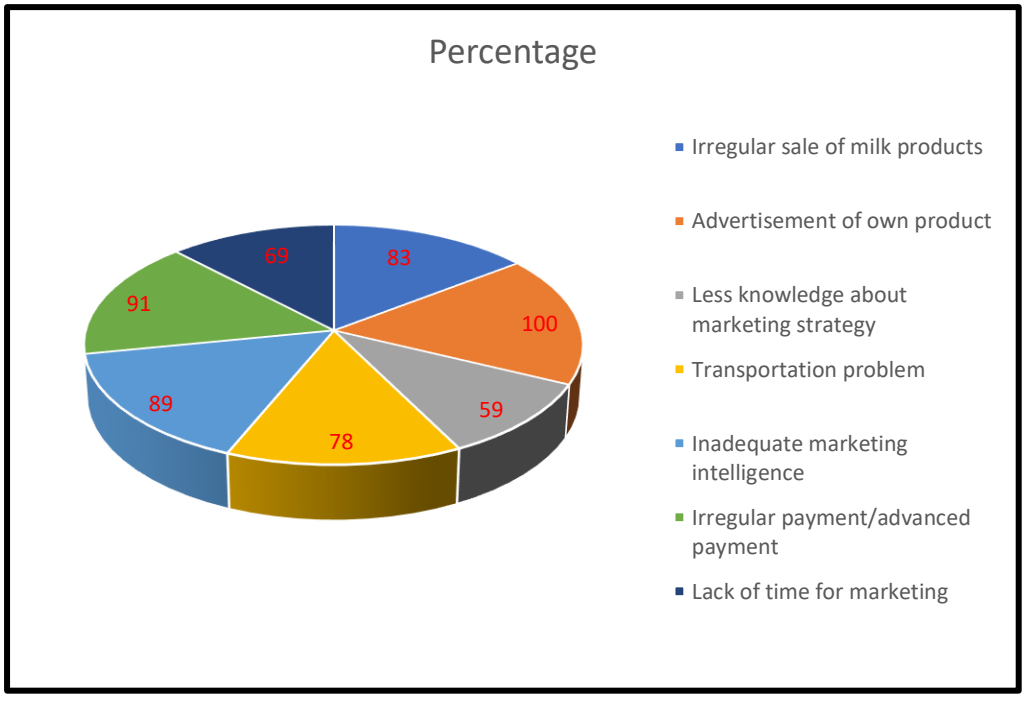

Fig. 15. Distribution of the rural dairy farmers according to marketing constraints faced by farmers

Table 15. Distribution of rural dairy farmers according to technical constraints faced by farmers

Sr. No.	Constraints	(n = 200)	
		Frequency	Percentage
A.	**Technical constraints**		
1	Lack of scientific knowledge about milk processing and products manufacturing	146	73.00
2	Lack of technical guidance	122	61.00
3	Lack of knowledge of modern machinery	94	47.00
4	High cost of modern technologies	200	100.00

In technical constraints majority i.e. (100%) dairy farmers faced the constraints regarding high cost of modern technologies followed by (73%) of the dairy farmers had encountered constraints like lack of scientific knowledge about milk processing and milk products manufacturing and (61%) of the dairy farmers had expressed constraints about lack of technical guidance, while only (47%) of the dairy farmers had encountered constraints like lack of knowledge of modern machinery.

Table 16. Distribution of the rural dairy farmers according to Socio-psychological constraints faced by dairy farmers

Sr. No.	Constraints	(n = 200)	
		Frequency	Percentage
A.	**Socio-psychological constraints**		
1	Lack of purchasing power	128	64.00
2	Lack of time due to busy in agricultural Work	56	28.00
3	Less risk bearing capacity of the farmers	142	71.00
4	Lack of training and information source	152	76.00
5	Lack of co-operation and co-ordination	178	89.00

The data with regards to socio-psychological constraints in milk processing and milk products manufacturing presented in Table 16 revealed that lack of co-operation and co-ordination (89%) had major socio-psychological constraints mentioned by the farmers, followed by lack of training and information source (76%) had encountered by the farmers, and (71%) of dairy farmers mentioned the constraints less risk bearing capacity of the farmers, while (64%) of dairy farmers mentioned the constraints lack of purchasing power. About socio-psychological constraints only (28%) dairy farmers encountered the constraints lack of time due to busy in agricultural work.

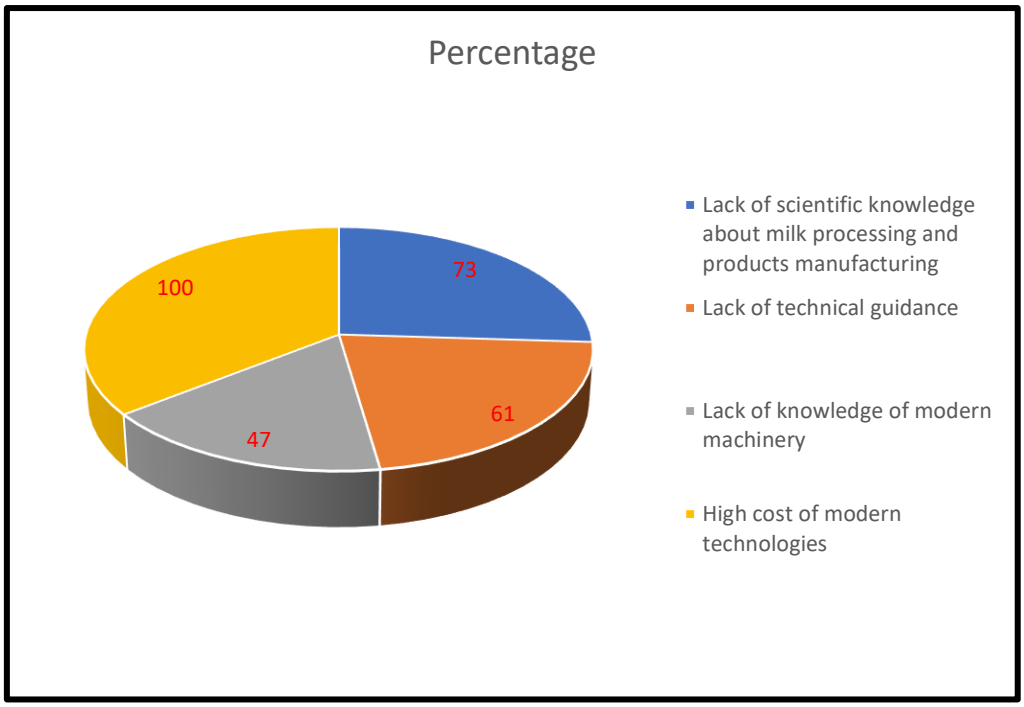

Fig. 16. Distribution of the rural dairy farmers according to technical constraints faced by farmers

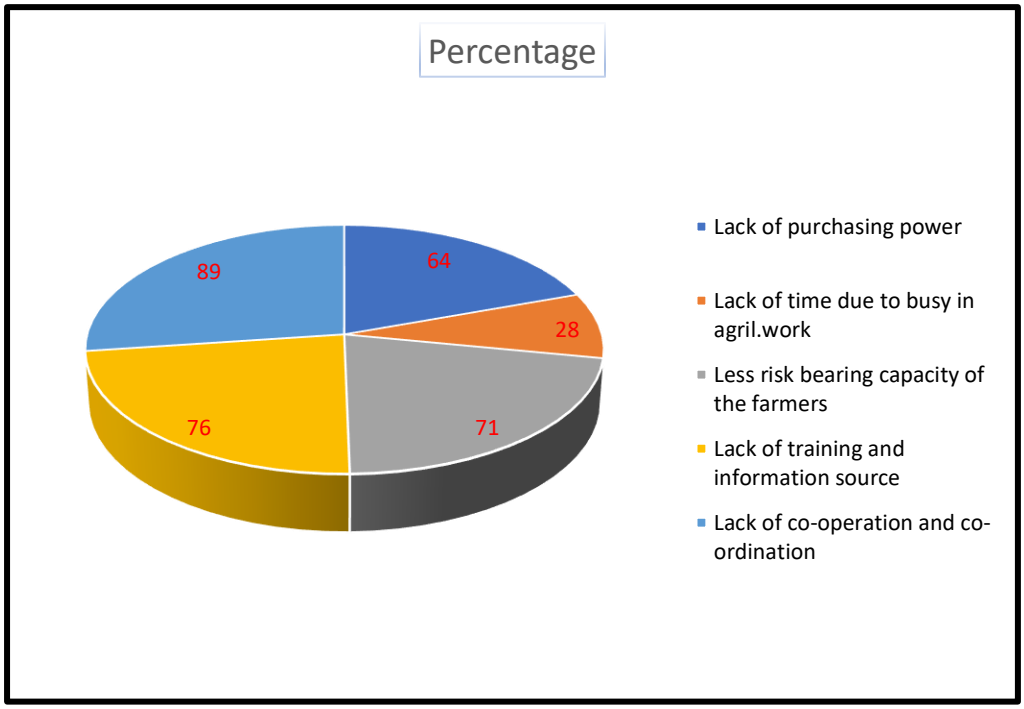

Fig. 17. Distribution of the rural dairy farmers according to Socio-psychological constraints faced by farmers

Table 17. Distribution of the rural dairy farmers according to communicational constraints faced by rural dairy farmers

Sr. No.	Constraints	(n = 200)	
		Frequency	Percentage
A.	**Communicational constraints**		
1	Inadequate access to training programme	170	85.00
2	Inadequate information about government scheme pertaining dairy enterprises	78	39.00
3	Poor rapport with extension agencies	86	43.00
4	Poor communicational facilities	112	56.00
5	Low social mobility of dairy farmers	158	79.00

In communicational constraints majority i.e. (85%) dairy farmers faced the constraints regarding inadequate access to training programme followed by (79%) of the dairy farmers had encountered constraints low social mobility of dairy farmers and (56%) of the dairy farmers had expressed constraints about poor communicational facilities, while (43%) of the dairy farmers had encountered constraints like poor rapport with extension agencies and only (39%) dairy farmers had encountered constraints like inadequate information about government scheme pertaining dairy enterprises about milk processing and milk products manufacturing.

Table 18. Distribution of the rural dairy farmers according to infrastructural constraints faced by dairy farmers

Sr. No.	Constraints	(n = 200)	
		Frequency	Percentage
A.	**Infrastructural constraints**		
1	Lack of availability of skilled labour	166	83.00
2	Lack of improved equipment	98	49.00
3	Lack of training facilities	172	86.00
4	Lack of chilling facilities	136	68.00
5	Lack of quality testing facilities	184	92.00
6	Weak supply of milk chain	186	93.00

The data with regards to infrastructural constraints in milk processing and milk products manufacturing presented in Table 18 revealed that lack of quality testing facilities (92%) had major infrastructural constraints mentioned by the farmers, followed by (86%) of dairy farmers had encountered constraints lack of training facilities and (83%) of dairy farmers mentioned the constraints lack of skill labour availability, while (68%) of dairy farmers mentioned the constraints lack of chilling facilities. About (93%) of dairy farmers had encountered the constraints weak supply of milk chain, while only (49%) dairy farmers encountered the constraints lack of improved equipment.

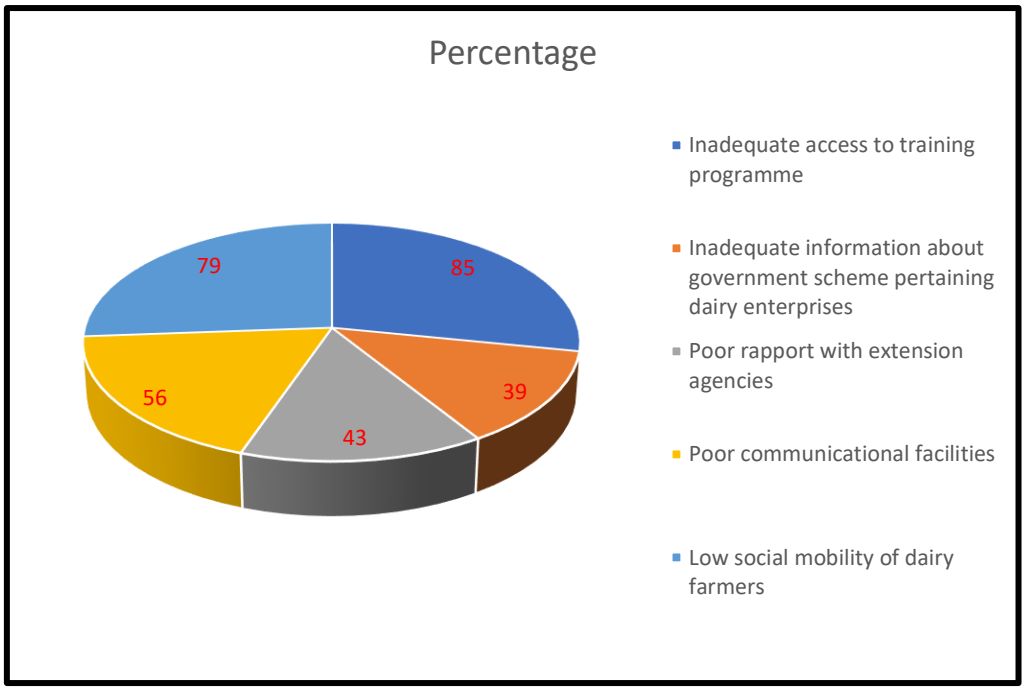

Fig. 18. Distribution of the rural dairy farmers according to communicational constraints faced by farmers

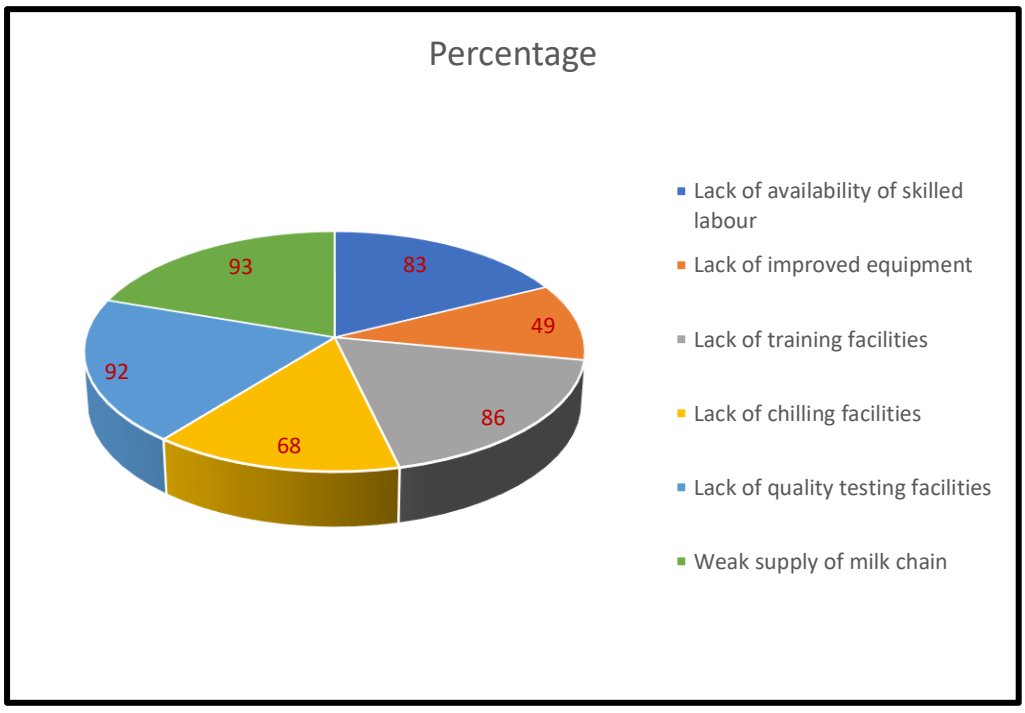

Fig. 19. Distribution of the rural dairy farmers according to infrastructural constraints faced by farmers

4.3 New techniques and opportunities available for rural dairy farmers in milk processing and milk products manufacturing

New techniques and opportunities available for dairy farmers related to milk processing and milk products manufacturing the data and information has been worked out and presented separately through different tables and graphs.

Table 19. Distribution of the rural dairy farmers according to new equipment available for dairy farmers

Sr. No.	New equipment	(n = 200)	
		Frequency	Percentage
1	Paneer pressing machine	10	05.00
2	Milk cooler	64	32.00
3	Cone shaped milk can	162	81.00
4	Electric milk tester	88	44.00
5	Lactometer	68	34.00
6	Milk boiler	98	49.00

The data with regards to new equipment available for dairy farmers in milk processing and milk products manufacturing presented in Table 19 revealed that majority of dairy farmers i.e. (49%) dairy farmers use milk boiler followed by (34%) dairy farmers use lactometer for check specific gravity of milk and (44%) of dairy farmers uses electric milk tester for check fat and SNF of receiving milk while (81%) dairy farmers use cone shaped milk can for store the milk for some time. However (05%) dairy farmers use paneer pressing machine for pressing paneer and (32%) of dairy farmers utilizes milk cooler for cool the milk before use for processing.

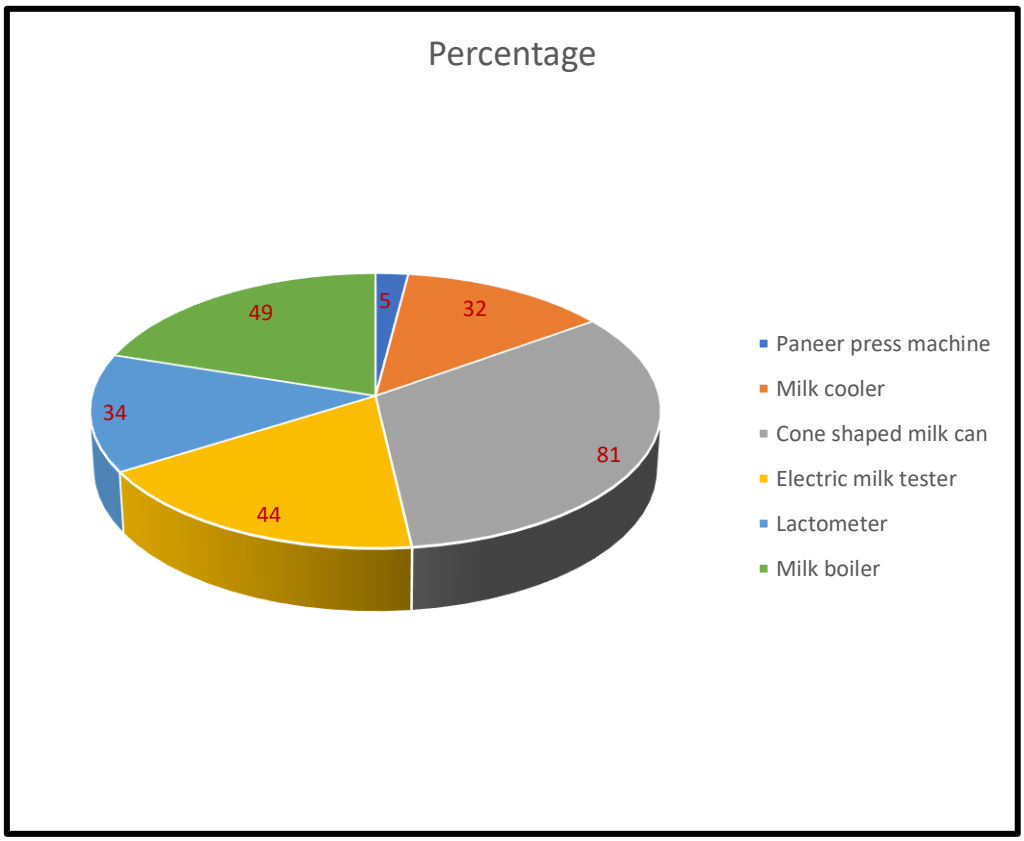

Fig. 20. Distribution of the rural dairy farmers according to new equipment available for dairy farmers

Plate 5. New improved equipment used by dairy farmers in milk processing

Table 20. Distribution of the rural dairy farmers according to new machine equipment available for dairy farmers

Sr. No.	New equipment	(n = 200)	
		Frequency	Percentage
1	Khoa making machine	12	06.00
2	Pedha making machine	10	05.00
3	Ghee making machine	08	04.00
4	Gerber centrifuge machine	28	14.00
5	Shrikhand making machine	08	04.00
6	Electric churner machine	18	09.00

It is evident from Table 20 that (06%) dairy farmers uses khoa making machine followed by (05%) dairy farmers uses pedha making machine for production of pedha while (04%) dairy farmers uses ghee making machine for fast ghee production and (14%) of dairy farmers utilises Gerber centrifuge machine for milk fat determination. However (04%) dairy farmers utilises shrikhand making machine and (09.00%) of dairy farmers uses electric churner machine.

Table 21. Distribution of the rural dairy farmers according to new techniques available for dairy farmers

Sr. No.	New techniques	(n = 200)	
		Frequency	Percentage
1	Homogenization	04	02.00
2	Standardization	08	04.00
3	Cooling/chilling	96	48.00
4	Fermentation	50	25.00
5	Cream separation by traditional method	90	45.00
6	Cream separation by improved method	14	07.00
7	Preservation	04	02.00
8	Packaging	98	49.00
9	Boiling/heating	98	49.00

The data with regards to new techniques available for dairy farmers in milk processing and milk products manufacturing presented in Table 21 revealed that majority of dairy farmers i.e. (49%) uses boiling/heating technique for milk processing and also same per cent i.e. (49%) of dairy farmers utilizes packaging technique in milk processing and milk products manufacturing. About (02.00%) dairy farmers uses preservation technique and (45%) of dairy farmers utilizes cream separation by traditional method technique and cream separation by improved method (07%) for produce ghee while (25%) dairy farmers uses fermentation techniques for produce shrikhand and other fermented products, (48%) of dairy farmers uses cooling/chilling technique while only (04%) and (02%) of dairy farmers utilizes standardization and homogenization technique respectively in milk processing.

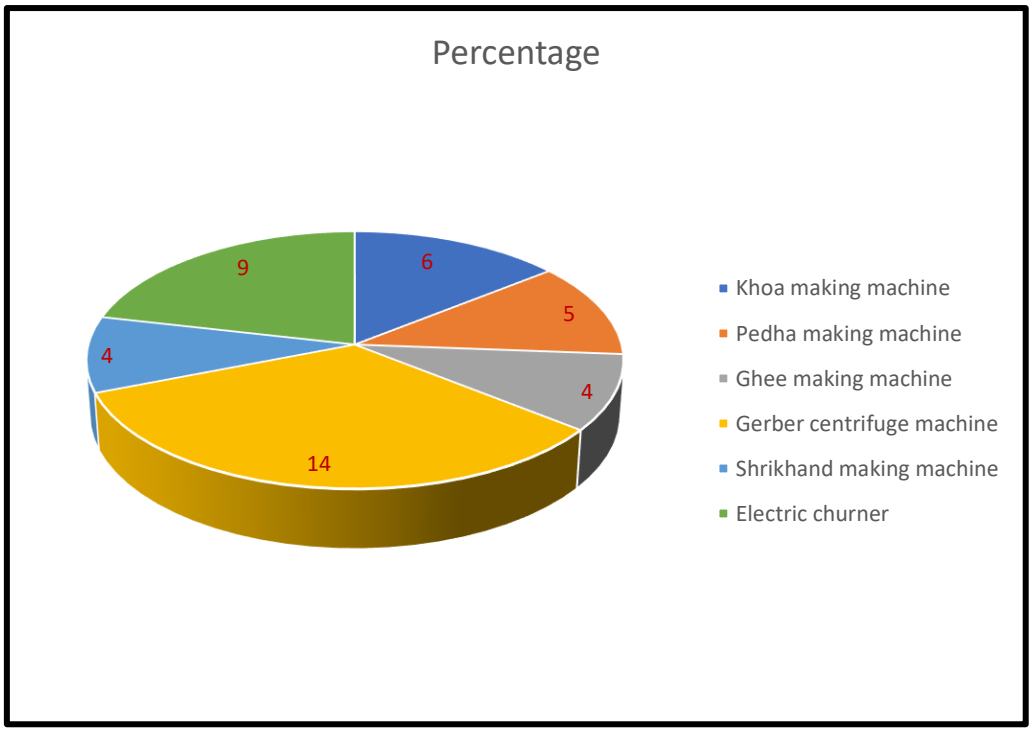

Fig. 21. Distribution of the rural dairy farmers according to new improved machines available for dairy farmers

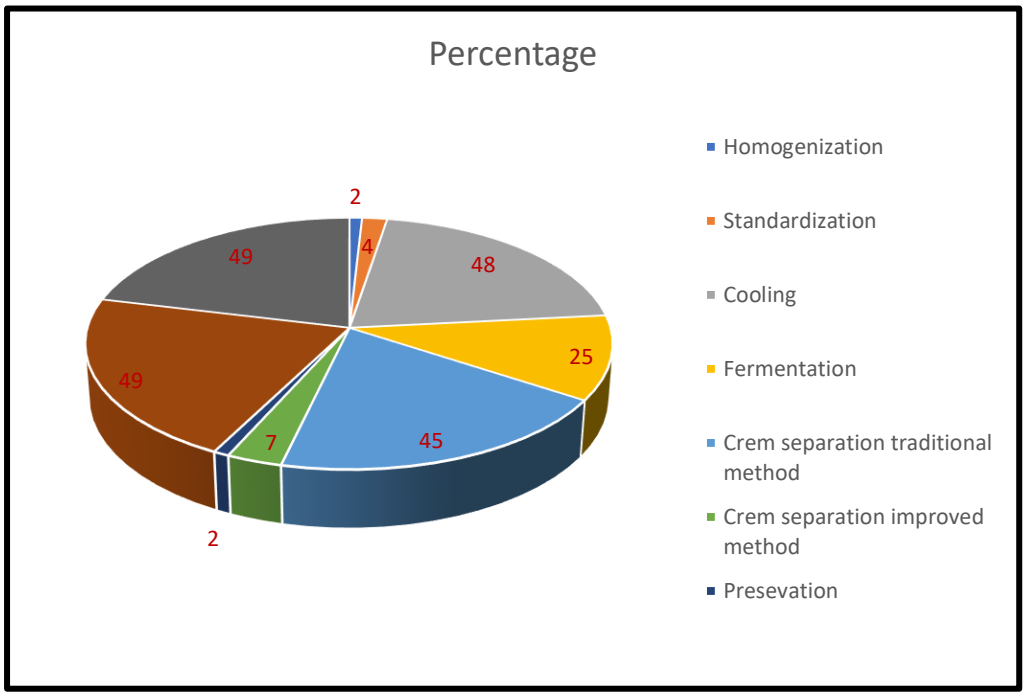

Fig. 22. Distribution of the rural dairy farmers according to new techniques available for dairy farmers

Chapter V

SUMMARY AND CONCLUSIONS

The present investigation was carried out to study the “Studies on challenges faced by rural dairy farmers in milk processing and milk products manufacturing in Shirur tahsil of Pune district” of Maharashtra state during 2021-22. The data collected was primarily on survey, conducted through an interview based on a well-constructed questionnaire schedule, from randomly selected 200 dairy farmers from 25 villages has been summarized in this chapter. The objectives of study were as follows

1. To study the socio-economic condition of dairy farmers in tahsil
2. To identify the constraints faced by dairy farmers in processing and marketing
3. To study the new technologies and opportunities available in milk processing and milk products manufacturing to rural dairy farmers

5.1 Summary

The salient finding of the present study are summarized as below

In case of age, education, occupation, family size, type of family (42%) dairy farmers belongs to middle age group, (48%) of dairy farmers educated up to degree level, (49%) of dairy farmers belongs to dairy and agriculture occupation, (61.50%) of dairy farmers belongs medium category family size while (63%) dairy farmers belongs to nuclear type of family.

In case of annual income, herd size, sources of milk, daily milk production, daily milk sale, milk product sale, and risk preference about (53.50%) dairy farmers had medium level of annual income, (46%) of dairy farmers had medium herd size, (51%) of dairy farmers had

high level of used owned milk, (40%) of dairy farmers had high level of daily milk production, (48%) of dairy farmers had sale milk of low level, (26.53%) of dairy farmers had sale high level of dahi, while majority of dairy farmers (43%) had medium level of risk preference.

As regards to challenges faced by dairy farmers in milk processing and milk products manufacturing, they were classified mainly in six categories like Infrastructural, communicational, economical, marketing, socio-psychological and technical etc.

In case of infrastructural constraints lack of quality testing facilities (92.00%) and weak supply of milk chain i.e. (93.00%) were major constraints mentioned by rural dairy farmers, followed by about (86.00%) and (83.00%) of rural dairy farmers had encountered constraints like lack of training facilities and lack of availability of skilled labour respectively. However, Lack of chilling facilities (68.00%) followed by lack of improved equipment i.e. (49%) rural dairy farmers were faced the constraints respectively.

In case of communicational constraints (85%) respondents had expressed major constraints about inadequate access to training programme followed by (79.00%) of the rural dairy farmers encountered the constraints like low social mobility of rural dairy farmers while, (56.00%) rural dairy farmers had faced the constraints of poor communicational facilities. However, near about (43%) and (39%) of rural dairy farmers mentioned the constraints poor rapport with extension agencies and inadequate information about government scheme pertaining dairy enterprises respectively.

In case of economic constraints, the major constraints faced by rural dairy farmers were low price for milk offered (100%) and high charges for insurance i.e. (95%). While, (91%) of rural dairy farmers and (89%) of rural dairy farmers were encountered the constraints like high cost of modern machines & equipment and low provision of loan for purchase modern machinery respectively.

However (80%) and (74%) of the rural dairy farmers were mentioned the constraints non availability of credit at proper time and high interest on loan respectively and (56%) rural dairy farmers were encountered the constraints delay payment for milk and milk products.

In marketing constraints, the major constraints mentioned by rural dairy farmers were advertisement of owned milk products (100%) and irregular payment / advanced payment (91%). About (89%) of respondents faced the constraints like inadequate marketing intelligence followed by (83%) rural dairy farmers irregular sale of milk products. However (78%), (69%) and (59%) rural dairy farmers encountered the constraints in transportation followed by lack of time for marketing and less knowledge about marketing strategy respectively.

In socio-psychological constraints the major constraints encountered by the rural dairy farmers were lack of co-operation and co-ordination (89%) and lack of training and information source i.e. (76%) respectively. However (71%) of rural dairy farmers faced the constraints less bearing capacity of the farmers followed by (64%) rural dairy farmers encountered the constraints lack of purchasing power. While only (28%) of rural dairy farmers encountered the constraints lack of time due to busy in agricultural work.

As regards to technical constraints high cost of modern technologies (100%) was major constraints mentioned by rural dairy farmers followed by (73%) lack of scientific knowledge about milk processing and products manufacturing. However (61%) and (47%) of rural dairy farmers had expressed the constraints lack of technical guidance & lack of knowledge of modern machinery respectively.

As regards to new equipment (49%) of dairy farmers used milk boiler followed by (34%) dairy farmers used lactometer and (44%) dairy farmers used electric milk tester while (81%) dairy farmers used cone shaped milk can. However (05%) of dairy farmers used paneer press

machine while (32%) dairy farmers used milk cooler in milk processing and milk products manufacturing.

In case of new improved machines available for dairy farmers in milk processing and milk products manufacturing about (06%) dairy farmers used khoa making machine followed by (05%) dairy farmers used pedha making machine and (04%) of dairy farmers used ghee making machine. However (14%) dairy farmers used centrifuge machine while (04%) dairy farmers used shrikhand making machine and about (09%) dairy farmers used electric churner machine for milk processing and milk products manufacturing.

In new technique in milk processing majority of dairy farmers (49%) used packaging technique and same i.e. (49%) of dairy farmers used boiling/heating technique and only (02%) dairy farmers used preservation technique while (45%) of dairy farmers used cream separation by traditional method technique while (07%) dairy farmers usd cream separation by improved method. However (25%) of dairy farmers used fermentation technique and (48%) of dairy farmers used cooling/chilling techniques while (04%) and (02%) dairy farmers used standardization and homogenization technique respectively.

5.2 Conclusions

It is concluded from the results of this investigations as,

1. The findings of this study revealed that the most of the dairy farmers involved in dairying + agriculture were from middle age group with medium herd size and with high level of daily milk production. Milk processing and dairying was doing as the collateral business with agriculture by most of the rural dairy farmers in the study area.
2. The present study envisaged that, major constraints faced by dairy farmers in milk processing and milk products manufacturing were low price for milk, advertisement of own products, high cost of

modern technologies, inadequate access to training programme and weak supply of milk chain.

3. As regards to new modern equipment new modern machines low level of dairy farmers were used such new modern equipment and machineries and only few numbers of dairy farmers were used such modern improved technique in milk processing.

Hence, it is concluded that there is need to provide training, guidance, scientific knowledge, credit and loan facility for purchasing of different machinery and equipment for processing and manufacturing milk products to rural dairy farmers, so as to increase the milk processing and milk products manufacturing in rural area i.e., in study area.

As per data collected and analysis, the hypothesis is rejected, it means that the rural dairy farmers have lot of constraints for processing of milk and manufacturing of milk products.

Chapter VI

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APPENDIX

Questionnaire/ Interview appendix

STUDIES ON CHALLENGES FACED BY RURAL DAIRY FARMERS IN MILK PROCESSING AND MILK PRODUCTS MANUFACTURING IN SHIRUR TEHSIL OF PUNE DISTRICT

A. General Information

I) Name of dairy farmers: - …….

II) Village-…….. Tahsil- Shirur
District-Pune

B. Social & Economical Information

1) Age

a) Young …….

b) Middle ……

C) Old …….

2) Education

a) Primary ……..

b) Middle school ……..

c) High school ……..

d) HSC ……..

e) Graduation ……..

3) Occupation

a) Dairy …….

b) Dairy + Agriculture ……

c) Dairy + Agri + related activity …….

d) Dairy + Service …….

e) Dairy + other occupation …….

4) Family Size

a) Small ……..

b) Medium ……..

c) Large ……..

5) Family type

a) Joint ……

b) Nuclear ……

6) Annual income

a) low ……

b) Medium ……

c) High ……

7) Herd size

a) Small ……

b) Medium ……

c) Large ……

8) Sources of milk

a) Owned dairy ……

b) Owned + Collection from other ……

9) Daily milk production

a) Low ……

b) Medium ……

c) High ……

10) Daily milk sale

a) Low ……

b) Medium ……

c) High ……

11) Sale of milk products

a) Paneer ……..

b) Dahi ……..

c) Pedha ……..

d) Khoa ……..

e) Ghee ……..

f) Shrikhand ……..

g) Other ……..

12) Risk preference

a) Low …….

b) Medium …….

c) High ……

C. Constraints faced by dairy farmers in milk processing and products manufacturing

a) Economical ……..

b) Marketing …….

c) Technical ……..

d) Socio-psychological ……..

e) Communicational ……..

f) Infrastructural ……..

g) Other Constraints ……

D. General information about dairy business activities

a) Why you start milk processing & products manufacturing?

i) More profit ……

ii) Side business ……

iii) Other ……

b) Where you sell your products?

i) Market ……..

ii) Village …….....

iii) Town …….

c) What is the main important thing in dairy business?

i) Capital …….

ii) Marketing …….

iii) Advertisement ……

d) What is the main barrier in marketing of your own products?

i) ……

ii) ……..

iii) …….