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Sabin George

ECONOMICS OF DAIRY FARMING SYSTEMS IN KERALA

SABIN GEORGE

(2010-23-102)



DEPARTMENT OF LIVESTOCK PRODUCTION MANAGEMENT

COLLEGE OF VETERINARY AND ANIMAL SCIENCES

MANNUTHY, THRISSUR 680651

KERALA, INDIA

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SABIN GEORGE

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THESIS

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Kerala Veterinary and Animal Sciences University



DEPARTMENT OF LIVESTOCK PRODUCTION MANAGEMENT

COLLEGE OF VETERINARY AND ANIMAL SCIENCES

MANNUTHY, THRISSUR 680651

KERALA, INDIA

DECLARATION

I hereby declare that this thesis entitled “ **Economics of dairy farming systems in Kerala**” is a bonafide record of research done by me during the course of research and that the thesis has not previously formed the basis for the award of any degree, diploma, fellowship or other similar title, of any other University or Society .

Mannuthy,
20-06-2016

SABIN GEORGE
(2010-23-102)

Dr. P.C.Saseendran

Professor and Head (Retd.),
Department of Livestock Production Management,
College of Veterinary and Animal Sciences,
Mannuthy, Thrissur, Kerala 680651

CERTIFICATE

Certified that the thesis, entitled **“Economics of dairy farming systems in Kerala”** is a record of research work done independently by **Sabin George (2010-23-102)** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to him.

Mannuthy,
20 -06-2016

P.C Saseendran
Chairman
Advisory Committee

CERTIFICATE

We, the undersigned committee of the advisory committee of **Sabin George (2010-23-102)**, a candidate for the degree of Doctor of Philosophy of Livestock Production Management, agree that this thesis entitled “**Economics of dairy farming systems in Kerala**” may be submitted by **Sabin George (2010-23-102)** in partial fulfilment of the requirement for the degree.

Dr. P.C.Saseendran

Professor and Head (Retd.),
Department of Livestock Production Management
College of Veterinary and Animal Sciences
Mannuthy, Thrissur , Kerala 680651
(Chairman)

Dr. Anil. K.S

Professor and Head
Department of Livestock Production Management
College of Veterinary and Animal Sciences
Mannuthy, Thrissur, Kerala 680651
(Member)

Dr. Joseph Mathew

Professor and Registrar
Kerala Veterinary and Animal Sciences University
(Member)

Dr. P.J. Rajkamal

Professor and Head (Retd.)
Department of Veterinary and AH Extension
College of Veterinary and Animal Sciences
Mannuthy- 680651
(Member)

Dr. Gleeja V.L

Assistant Professor
Department of Statistics
College of Veterinary and Animal Sciences
Mannuthy- 680651
(Member)

Dr. Shaheena. P

Associate Professor
Department of Developmental Economics
College of Co-Operation, Banking and Management
Kerala Agricultural University, Vellanikkara
(Member)

EXTERNAL EXAMINER

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MANNUTHY, THRISSUR 680651

KERALA, INDIA

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1. INTRODUCTION

Evidence from natural history indicates that cattle were domesticated at multiple sites, with the earliest event recorded around 8,000 years before present. Animal husbandry and dairying were therefore ancient occupations practised by mankind. India is home to the world's largest herds of cattle and buffaloes. Its dairy system is traditionally an enterprise operated by small holders. Efforts to modernise dairy sector was initiated by the colonial rulers of India. Establishment of military dairy farms (1889), Milk colonies in large municipalities (1920), Royal commission on agriculture (1928) etc were some of the steps taken in this direction. However, the impacts of these programs were limited and dairy sector attained an accelerated growth after the inception of Anand Pattern Co-operative societies (APCOS). Economic liberalisation policies initiated in 90's transformed the socio-economic conditions of the country. Stage was thereby set to the development of intensive system of dairy farming in the country, with the sector opening up for establishment of capital intensive units.

The dairy sector of Kerala faces unique problems. The cattle population of Kerala peaked in 1987, (34.24 lakhs) which had dropped to 12.11 lakhs female cattle in 2012. The shift in agricultural pattern from food crops to cash crops, the decline in area under rice cultivation, rising cost of inputs, low individual land holding and mechanization of agriculture had reduced the need of farmers to maintain dairy/draught cattle. Industrialisation, development of information technology (IT) and IT enabled services (ITES) had brought in numerous employment opportunities. Availability of quality education, equal opportunity to women and the continuing exodus of youth to foreign countries in search of employment also reduced the scope of agriculture and dairying in the state. The gap between demand and supply of milk widened with time. Subsequently, Kerala started importing milk from neighbouring states, which often raised quality concerns. Of late the matter has received the attention of policy makers and several schemes were churned off by the Animal Husbandry Department, Kerala Co-operative Milk Marketing Federation, Dairy Development Department, Non-

Governmental Organizations(NGOs) and Local Self Governments. Successive studies indicate that milk production of the state is gradually increasing since 2005, in response to these efforts.

Data available with Government agencies indicate that small holders (1-2 cattle) constitute majority of milk producers in the state. Medium (up to 10 cattle) and large enterprises (>10 cattle) also appear as significant players. A section of dairy entrepreneurs are engaged solely in farming which is based on a major crop such as paddy or coconut. Groups of farmers also rear animal with or without cultivated fodder in their premises.

Milk production is also influenced by climate/weather variables. There are five well defined agro-climatic zones in Kerala viz. North Zone, Central Zone, South Zone, High altitude Zone and Wet land (NARP, 1989). Information on agro-climatic zones helps to define normal fluctuations in weather/climate variables. Breeds or varieties of animals and the requirement of animal housing best suited for a particular climatic zone will influence returns from the enterprise. This data will also help to chalk out control strategies for parasitic / vector borne diseases. Thermal imbalances can lead to adverse effects on animal productivity. The expenditure on contingencies associated with disease or defective housing has a negative influence on profitability. The socio-economic profile of farmers and management practises adopted at farm level affect productivity of the animals. The extent of adoption of standard management practises by farmers helps to maintain bio-security, reduce incidence of diseases and assure maximum production from animals with genetic capacity for higher production.

The cost of production of milk is a function of several variables. Capital investments include the cost of animals, housing etc. along with the expenditure to develop permanent infrastructure of the enterprise. Recurring expenditure is accounted by cost of feeds stuff, labour and other contingent expenses. The scale of production is another factor which influences the cost effectiveness. Large scale systems can reduce recurring costs by making bulk purchase of feed ingredients, mechanisation and optimum use of labour.

The organised dairy sector of Kerala consists of about 3000 co-operative societies at primary level, three Milk Producers unions at regional level and the apex body, Kerala Co-operative Milk Marketing Federation (KCMMF) at the state level. This setup helps the farmers to market their milk in a hassle free manner thereby assuring a steady market and a stable price to them.

Profitability is the key word which drives any enterprise. A critical analysis of the aforementioned factors and evolution of a formula to arrive at a fair price is deemed to be an issue which should be addressed at the earliest. Efficiency analysis is an important tool which evaluates performance of individual enterprises from an economic perspective. Since dairy production is a complex function of aforementioned variables, the present study attempts to identify and document factors which affects price of milk under different systems of milk production, impact of efforts public/co-operative/private sector to uplift dairying and to evaluate farm level management practises. The study also attempts to generate mathematical models to arrive at a price for milk giving weightage to factors like milk quality, variations in the feed cost, labour cost, consumer price index and interest rate of banks considering their relative importance.

To arrive on meaningful associations among the aforementioned variables, a study was designed with the following objectives adopting standard procedures.

1. To study the management practices, trends and issues of various dairy production systems in Kerala.
2. To study the variation in cost and profitability of milk production under different dairy production systems of Kerala.
3. To assess the influence of various assistance schemes in the economy of milk production.
4. To evaluate the present milk pricing policy of Kerala and suggest modifications.

2. REVIEW OF LITERATURE

This section deals with reporting some past studies that have direct or indirect relevance to the present study. Accordingly, relevant literatures had been reviewed and presented under different headings and subheads.

2.1 AGRO –CLIMATIC/ECOLOGICAL ZONES

The National Agricultural Research Project (NARP, 1989) stratified the state of Kerala into five agro-climatic zones viz. South, Central, North, High ranges and problem zone of Kuttanad wet land.

Sastry (2000) pointed out that such zoning is a prerequisite for regional planning for livestock development and integration of such regional plans into state and national plans.

There were four parameters which together evolved very distinct agronomic environments viz. altitude, pattern of rainfall, soil type and topography. In these environments, distinct cropping patterns were flourished. Using a matrix built upon these parameters, the state of Kerala had been delineated into thirteen agro climatic zones. They were “Southern, Central and Northern midlands, Onattukara, Coastal sandy Malappuram type, Malayoram, Palakkad plains, Red loam, Chittoor black soil, Kuttanad, River bank alluvium and High range” (KAU, 2011).

The Kerala Agricultural University also identified 17 agro climatic zones by superimposing six moisture availability regimes over seven soil groups which were “dry forest loam, semidry red loam, semidry laterite, semidry alluvium, semidry black soil, semidry forest loam, sub humid forest loam, humid laterite, humid alluvium, humid greyish, Onattukara, humid saline, humid forest loam and per humid laterite” (KAU, 2011).

The Strategic Research and Extension Plan prepared by Agricultural Technology Management Agency (SREP, ATMA, 2013) gave detailed account various agro-climatic zones and agro-ecological situations present in each district of Kerala.

“It was essential to prepare strategies and action plan for each agro-ecological zone for the development of agriculture and allied sectors” (Economic Review, GoK, 2015)

Sastry and Thomas (2015) pointed out that there was large variation amongst livestock production systems between various regions of the country. There was influence of agro-ecology on farming system developed in an area. On the basis of rainfall, temperature, geographical features and soil, which influenced the type of agriculture and quality of livestock in a region the Indian council of Agricultural Research (ICAR) delineated India into 15 agro-climatic-regions. Based on these they had attempted to analyze the livestock production patterns in those regions which they called as ‘Livestock farming Zones’ in India.

2.2 DAIRY FARMING/ PRODUCTION SYSTEMS

Thomas and Sastry (1991) classified dairy farms depending on the mode of ownership and organization as individually owned, cooperatives, government and collective. The type of farming could be specialized farming, diversified farming and mixed farming depending on how income is derived from a farming enterprise.

Prasad (1997) defined mixed farm as a farm where at least 10 per cent of its income was contributed by livestock. The upper limit of gross income to be contributed by livestock activities was fixed at 49 percent under Indian conditions. His definition restricted scope of mixed farming to the livestock activities which largely include milch, cattle and buffaloes. Mixed farming extended by supplementary enterprises like goat, poultry or fishing was classified under diversified farming and bullocks were not considered as a part of livestock enterprise. He further defined specialized dairy farming as a system of production of receiving 50 per cent or more of the income from dairying and also described advantages, disadvantages and comparative economics of each system.

Devendra (2001) discussed about the small holder dairy production systems in developing countries describing the potential, characteristics, opportunities and performance indicators of each for improvement. Three types of dairy systems

were identified viz. small holder systems, small holder cooperative dairy production systems and intensive dairy production system.

Balaraman (2003) described the dairy scenario in India with emphasis on milk production systems. He described the different dairy production systems like crop-livestock integrated farming system, intensive dairy farming and nomadic farming system, along with their constraints and limitations.

Rao and Birthal (2005) reviewed the crop-livestock systems in India and concluded that small scale mixed crop-livestock systems was the dominant production system in India. The emergence of commercial systems close to the demand centres were also observed. But he concluded that major share of future growth in demand for livestock products was expected to met from the small mixed systems.

Taneja and Birthal (2005) reviewed the experiences and development prospects of small holder dairying in India. Smallholders, defined as the households possessing less than two ha land, dominate Indian agriculture (62% of rural households) and own 34 per cent of the arable land. The marginal farmers with less than one ha and landless constitute 48 percent and 22 percent respectively. The large households with more than four ha comprise only six per cent and control 42 per cent of arable land.

Ghosh (2007) narrated the trends and issues of livestock production systems and classified livestock systems, based on criteria such as integration with crops, relation to land and agro-ecological zone. He further described few forms of dairy production systems based on above criteria as solely livestock production system (SLPS) (more than 90 per cent of dry matter fed to animals from range and, pastures, annual forage and purchased feeds), landless livestock production system, grassland based system, mixed farming system (more than 10 per cent of dry matter fed to animals came from crop by-products) and irrigated mixed farming systems.

Suresh *et al.*, (2008) opined that the regions with favourable cultivation environments were dominated by the small holdings and the less favourable environment was dominated by relatively large farmers and their livestock

composition varied significantly. Hence there was a need to develop feed management strategy suitable for different-agro-ecological conditions.

Kumar and Singh (2008) made an attempt to assess the livestock profile and their changing dynamics, across different agro-ecological regions of India. .

Dairy farmers of the Kerala belong to three categories viz. a) average farmers who possessed not more than two or three milch animals with their calves b) rural milk producers who contained an average of 20 animals including about 12 milch animal, their followers and a pair of bullocks and c) large dairy farms (KAU, 2010).

Dairying in India is a sub system of agriculture, with the milk animals being fed with crop residues, agricultural and industrial by products, compounded cattle feed and green fodder, making the cost of milk production one of the lowest in the world (Reddy and Reddy, 2010).

Shah and Dave (2010) opined that the transformation of specialized farming in dairy sector is a welcome development because of increasing demand for milk. This would lead to changes at the producers' level, from mixed dairy farming to organized commercial dairy farming

“The system approach to problem solving included description, problem identification problem analysis, design, testing and decision making. For the above reasons, the systems approach to the development of livestock production programs in Asia was best applied through some form of farming systems Research / Extension Approach (FSR/E)” (Sastry and Thomas, 2015).

2.3 SOCIO-PERSONAL AND ECONOMIC CHARACTERISTICS OF FARMERS

George and Nair (1990) found that the average size of land among cattle holdings (1.66 acres) was much larger than the average size among non-cattle holdings (1.23 acres) in Kerala.

Varghese *et al.* (2000) attempted to study the current trends of in rural dairying in Kerala. The study revealed that 6.25 per cent of farmers studied had land holding of 10 cents or less and 4.1% per cent had more than 10 cents but less than 50 cents and 24.11 per cent had more than 50 cents but less than one acre and

27.68 per cent had more than one acre. In all 85.4 per cent of farmers were in dairying for 10 years or more and this showed traditional farmers were more. Cattle rearing was the main occupation for 50.46 per cent of farmers.

Pradeep and Rajkamal (2009) conducted a study in Thrissur district of Kerala to focus on the dairy entrepreneurs to analyse the availability, preference and frequency of utilisation of institutional programmes. The study revealed that the low availability of training programmes, symposium and farm clinics resulted in their low utilization. Seminars, farm visits and vaccination camps were the most preferred institutional programmes.

Vidya *et al.* (2009) carried out a study to understand the situational and psychological characteristics of dairy farmers of Kannur district in Kerala. The study revealed that 41.67% of the farmers studied were old aged, 31.67% young and 26.67% middle aged. Primary, middle or secondary education group comprised 56.67% of the farmers studied and 11.67 per cent possessed higher secondary education. A small share of 8.33 per cent each 'can read and write' and 'graduation and above' group where as one-tenth were illiterate. Regarding the farming experience 56.67 per cent had more than 12 years experience in dairying, 26.67 per cent had 6-12 years and the rest had less than six years. Medium level of exposure to mass media and contact with extension agency was observed for majority of the farmers studied.

Feroze *et al.* (2011) studied the impact of microfinance through Self Help Groups on income from dairying in Haryana. The study revealed that the variable credit were having positive and significant impact on gross dairy income.

Shinde (2011) carried out a study titled "Socio - Economic Profile of Dairy Farmers in Sholapur District of Maharashtra". It was found that across the different categories, there was difference in primary sources of occupation.

Datta and Singh (2013) investigated the communication behaviour of innovative dairy farmers in Haryana and concluded that the innovative farmers were regularly using mass media as the source of communication.

Naik *et al.* (2013) analysed the existing dairy farming systems in Goa and reported that only eight per cent of farmers had dairying as major occupation and 74% had agriculture or horticulture as the primary occupation.

Prasad *et al.* (2013) studied the socio personal traits of farmers of Jind district of Haryana and reported that majority of farmers (49.17%) belonged to middle aged group (36-50 years).it was further reported that majority had (52.50%) medium socio-economic status and 63.33% were agricultural labourers with medium (middle to high school) education, low social participation, medium family education status, small herd size and medium level of annual income, extension contact, exposure to mass media , risk orientation . The cosmopoliteness- localiteness was also at medium level. Most of the large herd sized dairy farmers had high socio-economic status, annual income from animal husbandry and mass media exposure.

Rathod *et al.* (2013) investigated the socio-economic and personal profile of dairy farmers in Western Maharashtra. They reported that 71 per cent of the farmers studied belonged to middle age group, 16 per cent to young and 13 per cent in the old age group. They also found 37.33 per cent possessed high school level education followed by 29.33 per cent with college level whereas 20.67 per cent were illiterate. The study also revealed that agriculture was the main occupation of 83.3 per cent of the farmers followed by 5.3 per cent involved in dairying a major job. The study also revealed that 76.67 per cent were having medium land holding farmers followed by small (12.67%) and larger (10.66%) farmers. The study revealed that 68 per cent of the farmers studied were members of at least one organization, 30.33 per cent with membership in more than one organization and one per cent without any memberships. They also reported that 56.67 per cent of farmers had medium, 23.33 per cent had low and 20 per cent had high information seeking behaviour.

Rani *et al.* (2013) studied the socio economic profile of farmers in Kurukshetra district of Haryana according to knowledge level. They reported a low knowledge level in middle aged farmers, low knowledge level in illiterate group, low knowledge level in respondents who were members of on

organization, low knowledge level in marginal farmers, low knowledge level in farmers with herd size and low knowledge level in farmers with low level of milk production.

Roy *et al.* (2013) reported that majority of farmers in Andaman Islands belonged to small family size followed by medium and large.

Chandran *et al.* (2014) analysed the socio-economic status of farmers rearing Bachaur cattle in selected areas of Bihar. The average family size was 7.1, 6.8, 6.8 and 7.0 respectively for marginal, small, small-medium and medium farmers.

Kadian (2014) opined that socio-economical development was a multi-dimensional construct having three important factors viz. quality of living, occupation and status of economic dependence. Socio-economic status of farmers could play a pivotal role in differentiating the individuals from each other for transfer of technology.

Kad *et al.* (2014) studied the socio-economic status of dairy farmers in Pune district of Maharashtra and found that most of the farmers (70.83) belonged to the middle category of age (39-60 yrs.). The majority of farmers (51.7%) had education up to secondary level. Most of them (70.00%) were having medium level of social participation. Majority of dairy farmers (61.67%) had medium level of mass media exposure.

Vedamurthy *et al.* (2016) conducted a study on credit utilization and repayment in Shimoga Karnataka. It was found that on an average only 36 per cent of the dairy credit was used for the purchase of animals in the study area.

Kumar and Singh (2004) studied the socio-personal economic and communication profile of dairy farmers in Krishnagiri district of Tamil Nadu and reported that majority of the farmers studied (55.56%) belonged to young age group of up to 35 years followed by middle (36-50) and then old age group (more than 50 years). A significant proportion (87.00%) acquired primary and above education and only 8.89 per cent were illiterate. The dairy farmers of the state had low social participation. The majority of farmers (80%) were having medium (2-11.27 years) experience in dairy farming.

Chaurasiya *et al.* (2016) analysed the entrepreneurial behaviour of dairy farmers in Gwalior district of Madhya Pradesh and concluded that majority of the respondents were having moderate level of entrepreneurial behaviour followed by high and low level.

Vedamurthy and Sirohi (2016) reported that per capita food expenditure, proportion of earning adults in the family, per capita income from dairy and share of expenditure to total income were positively and the capital investment was negatively correlated with repayment. The model was found to be effective to predict defaulter more precisely.

2.4 HERD PROFILE OF DAIRY FARMS

This section included the available literature regarding herd size, herd building, type and preference for purchase of farmers, cattle transactions, calf disposal pattern, mortality and insurance pattern of animals in the herd.

George and Nair (1990) in their study titled livestock economy of Kerala estimated the average herd strength of Kerala as 2.18 with a range of 1.64 to 2.98. They also reported that in the case of crossbred animals 60 per cent of the stock was purchased. Their study on the composition of animals indicated a tendency among small holdings to keep relatively higher proportion of young stock. The proportion of animals in milk indicated variations according to regions and according to size of holdings. Among the respondents who preferred crossbred cattle 47.5 per cent had preference for cows with medium yield (5-10 kg), 33.8 per cent preferred cows with high yield (10-15 kg) and the remaining 18.7 per cent had preference for cows with low yield (below 5 kg). They investigated the breed preference of the farmers and found that 70 per cent preferred Jersey cross, Swiss Brown cross was preferred by about 27 per cent and only 3 per cent had indicated preference for Friesian cows. They also reported after studying the pattern of cattle transactions for two years that the share of purchase of animals accounted for the 21.9 per cent of the total stock of animals at the time of survey. The highest number of purchases was accounted for by cows in milk and followed by pregnant dry cows. About 80 per cent of the purchased were accounted by adult cows. The heifers and young stock accounted for only 11.6 per cent. The

investigation on the financing pattern for purchase of animals showed that about 75 per cent of the animals were purchased using the resources with the farmers without any external sources. In the remaining cases some amount of loan was utilized to meet either full cost or part of the cost and also from partial finance from subsidy. In some cases loans and subsidy were augmented with own finance. They analyzed the sale pattern of livestock during two years and reported that 36.5 per cent of the households had sold animals. About 42 per cent of the animals sold were male calves and another 17 per cent were dry cows which were not pregnant. The calf disposal pattern in farm households revealed that the death rate among cross bred male calves was nearly double the rate for female calves. About 14 per cent of calves born to cross bred cows were sold.

Varghese *et al.* (2000) studied the trends of rural dairying in Pathanamthitta district of Kerala and reported that, of the farmers studied, 94.64 per cent were having at least one dairy cow. Cattle exchange rate was very high as showed by 60.71 per cent farmers who had exchanged cattle within five years, 45.59 per cent of farmers who had exchanged animals as dry animal, 16.18% due to diseases and 14.17 per cent due to overage. They also found a low rate of mortality of cattle during a period of last five years as reported by only 18.75 per cent of farmers. Cattle insurance coverage was very low as only 12.5% farmers were having insured animals.

Naik *et al.* (2013) analysed the existing dairy farming in Goa and reported based on the number of milch animals, 51.5, 27.3, 16.7 and 4.5 percent of the farmers were marginal, small, medium and large respectively.

Rathod *et al.* (2013) studied the herd size maintained by farmers of Western Maharashtra and found that 87.4 per cent farmers kept medium livestock units followed by 12.6 per cent with larger units.

Kad *et al.* (2014) reported that majority of farmers (62%) were having small (less than eight) numbers of animals in their farms only 3 per cent were having more than very large (more than 26), Medium (8-15), Large (16-26) were at 33 and 22 per cent respectively in Pune district of Maharashtra.

Gururaj *et al.* (2015) revealed after a study in Raichur district of Karnataka, a positive relationship between cropped area and keeping of animals.

Malhotra and Parmar (2015) classified the reason for culling into seven categories viz. poor milk production; udder affections; reproduction problems; ill health; other diseases, which shared for 22.3, 10.3, 35.1, 19.2, 5.1, 6.6 and 1.4 per cent respectively. It was also revealed that majority of high milk yielding cows failed to contribute towards the replacement due to poor reproduction performance.

2.5 PHYSIOLOGICAL STATUS OF ANIMALS IN DAIRY FARMS

This section included the available literature on physiological status of various categories of cattle in the dairy herd.

Bhaskar, *et al.* (2007) reported that the milk production in cross bred animals tended to increase with progress in the lactation number of first through fourth.

Ghule (2010) reported that most of the cross-bred milch animals on the sampled commercial farms were third and fourth (nearly 24 %) order of lactation followed by second (23%) and fifth (10%) order of lactation. The overall picture revealed around 78 per cent animals was in first to fourth order of lactation. He also described the number and composition of bovine stock in different commercial farms.

2.6 EXISTING MANAGEMENT PRACTICES IN DAIRY FARMS

2.6.1 Housing

Roy *et al.* (2007) conducted a study on effect of dairy cattle housing on milk production in West Bengal. Types of home did not have any impact on milk production though shed with tile roof, brick floor and no wall had better impact on milk production than other types of housing.

Narayan *et al.* (2008) conducted a study to find out effects of difficult heat stress ameliorating measures including water showering sodium bi-carbonate feeding and both together water showered cows showed significant increase in milk yield, per day milk yield and 4 per cent FCM yield. Milk quality traits like

fat and SNF were significantly affected by water showering and sodium bicarbonate showering.

Tiwari *et al.* (2009) analysed the feeding and management practices in commercial dairy farms. The study revealed a very poor picture of calf and heifer management situation. The shed and breeding management was very poor. They indicated the use of animals as a milking machine and selling them as soon as the production started decreasing.

Sabapara *et al.* (2010) conducted a study on housing and feeding management practices of dairy animals in the tribal areas of South Gujarat. The study indicated that adoption of scientific housing and feeding practices was poor in survey area. Majority of animal houses were *kaccha* type. Majority (84.0%) fed the animals with homemade and compounded cattle feed.

Roy *et al.* (2013) reported that in Andaman Islands, entire household reared dairy cows in semi intensive system and hundred per cent of cattle shed were of temporary type mostly made up of locally available wooden materials with *kaccha* floor.

Kochewad *et al.* (2013) surveyed the housing management by the farmers of upper Gangetic plains of India and found that 8.8 per cent animal sheds attached to dwelling only 10 per cent of floor of animal shed were Pucca and majority of sheds' roof were made up of tin/asbestos/tiles. Majority of farmers provided sufficient ventilation for their animals.

Maiti *et al.* (2014) investigated the adaptation strategies followed by the livestock owners of Odisha and West Bengal to cope up with climatic change. To trace the relative importance of 17 adaptation strategies a climate change adaptation index was developed. They reported that change in micro-climate in cattle shed/grazing area/stale was the most preferred strategy which was followed by provision of clean and fresh drinking water and additional washing/sprinkling of cattle.

Das and Singh, (2014) conducted a study on adaptation of dairy cattle towards climate change by modified housing and management. They reported that effect of change of different micro-environmental parameters had significant

effect on daily and monthly milk yield of cows and the influence was more pronounced in cross bred cows. Modification in housing and cooling facilities in cattle shed could reduce heat stress, decrease milk drop due to change of micro climate.

The mechanisation sector had undergone a revolution in terms of many machines which are highly sophisticated designed for cattle houses. There was an urgent need to enhance the awareness and availability of these technologies and equipments through direct farmers' education (Government of Kerala, Kerala Perspective Plan, 2014).

The scope of reducing the cost of production and drudgery of farm operations by mechanisation in dairy farming like utilisation of modern milking machines, chaff cutters, water sprinklers and slurry pumping units etc. Were included as important item in the plan schemes of the state (Government of Kerala, 2014).

“It was observed that the labour saving technologies and implements had positive effect on the productivity level of crops .Mechanisation was one of the critical inputs of production to increase the crop yield” (Hazarika, 2015).

2.6.2 Feeding

George and Nair (1990) studied the feeding pattern followed by cattle keepers in Kerala and reported that feeding of green grass was wide spread but it was mostly collected grass and not cultivated green fodder. Paddy straw was the most important source of roughage. In the case of concentrate oil cake was the most important item. Manufactured compounded feed was another important item. They investigated the fodder cultivation pattern of dairy farmers. Only 31 per cent had cultivated fodder crops for sometime or other. The average area of fodder grown as pure crop was 17cents and the average area of mixed or intercrop was 35 cents. Among 208 households cultivating fodder crops, 158 had cultivated fodder grass and the remaining 50 had been growing grass mixed with legumes. They also reported that dominant practice was a combination of stall feeding and controlled grazing. On an average animals were grazed for about 3-4 hours a day depending on the season. The use of minerals was not popular among the farmers.

Above 50 per cent of the cattle keeping households purchased dry fodder which was seen to be high in the smaller size holdings. They also reported that a very high percentage of households had to depend not only on the purchase of concentrate feeds and compounded feeds but also dry fodder and even in some villages, green fodder. Instead of integrating cattle keeping with the crop production sector it was depending more on the purchased feed stuffs.

Varghese *et al.* (2000) analyzed the feeding pattern followed by the farmers in Pathanamthitta district of Kerala. They reported that only 8.93 per cent of farmers were using compounded cattle feed alone; majority of farmers (59.82 per cent) were using compounded cattle feed and oil cakes and other feeds. About 31.25 per cent farmers were following traditional methods of feeding in which oil seeds and tamarind seed powder and other feeds were used. Only 25 per cent farmers are cultivating green fodder. Through paddy straw was the most important dry fodder, only 39.29 per cent were cultivating it and 21.43 per cent are purchasing straw. In addition to the cultivated straw majority of the farmers were purchasing straw.

Singh *et al.* (2007) conducted a study to analyze the existing breeding and feeding practices in Rajasthan. It was observed that most of the farmers were adopting natural mating than AI and not conducted pregnancy diagnosis and treatment of repeat breeders. Majority of farmers fed homemade ration, followed supplementary feeding during later stage of pregnancy. It was further observed that 61, 91 and 51 per cent families did not follow salt feeding, mineral mixture supplementation and optimum concentrate level in that order.

Sinha *et al.* (2009) investigated the housing and feeding practices of dairy animals in UP and reported that 86 to 98 percent of farmers in rural, semi-urban and urban areas used wheat straw as dry fodder. In urban areas 97.8 per cent farmers were able to feed concentrate throughout the year whereas in rural and semi-urban areas it was 66.7 and 75.6 per cent respectively.

Unnithan *et.al.* (2010, investigated the feeding practices followed by the farmers in Kerala. They reported that all farmers in the study area invariably fed an array of branded and non branded concentrate feed to their cows. Most of the

farmers followed conservative feeding practices by mixing different feed materials like compounded cattle feed, bran, oilcakes, ground grains and others. The natural grass and weeds collected from homestead premises, cultivable waste land, fallow land, areas under tree cultivation, un-protected forest land etc. were the main roughages fed to the dairy cattle in the state. The grass was cut and carried and fed to cows which was attended by family members both men and woman. They also found that majority of the farmers graze cattle (tethered grazing) during and post monsoon days. Very few farmers in the study area cultivated fodder, wherever cultivated; it was hybrid Napier (Co-3) variety. Paddy straw was the main source of dry fodder. A few farmers in Palakkad area used maize (Jowar) straw.

Sreedhar (2011) studied the seasonal feeding pattern of dairy animals in Andhra Pradesh. The study revealed that stall feeding alongwith grazing was the most followed method of feeding. The grazing period averaged 5-6 hrs daily. Paddy straw, hay and stovers were used as dry roughage. The amount of green fodder fed to milking animals was 21.0 and 20.0 kg during winter and rainy seasons respectively. The milking animals were fed respectively 1.4 and 2.0 kg concentrate feed daily in two seasons. A very few farmers resorted to silage feeding during the scarcity period.

Kochewad *et al.* (2013) investigated the cattle management practices adopted by farmers of upper Gangetic plains of India. The survey revealed that farmers generally followed stall feeding. Of the total, 65 per cent farmers provided homemade feed, 20 per cent used concentrate purchased from market.

Roy *et al.* (2013) reported that in Andaman Islands, majority (90.0%) of the farmers practiced semi-stall feeding and allowed grazing of their animals for 8 to 10 hours.

Kad *et al.* (2014) studied the innovativeness in fodder cultivation and utilization pattern in Pune district of Maharashtra and classified majority (48.33%) of the dairy farmers to medium level of innovativeness for adopting hybrid Napier cultivation. The education and area of fodder cultivation were found to be

positive and significantly correlated with innovativeness. They also found that majority of dairy (42.5%) had small (0.39 to 1.43 acre) area under fodder crops.

Kerala produced only 60 per cent of the roughages required for cattle in Kerala, one of the major constraints for increasing milk production in Kerala. Marginal and small farmers who were the major cattle owners of the state had limited space for fodder development (GoK, Dairy Department, 2014).

2.6.3 Breeding/reproduction

George and Nair (1990) reported that Kerala stood first in the country with roughly about one insemination centre for 1000 breedable cows. The state was self sufficient in the production of basic input for A.I namely frozen semen and had a fairly efficient distribution net work. They also reported that, if the distance to AI centre was more than 2 km, bringing the animal to the A.I centre is a tough job. They also reported that the number of inseminations was about 1.90 for cross bred cows in Kerala. They also found that the success rate of first insemination varied from a minimum of 35-40 per cent to a maximum of 55 to 60 per cent. The success rate in the second insemination varied from a minimum of 20 per cent to a maximum of 40-45 per cent.

Saseendran *et al.* (2008) studied the role of government sponsored institutions for breeding support by conducting a survey in Thiruvananthapuram and Ernakulam milk union areas covered by Milma. They found that A.I. per conception rate was least in the group where distance to nearest veterinary service station was highest.

Unnithan *et al.* (2010) investigated the dairy production situation in Kerala and reported that cattle breeding and health care services were not cost effective. The AI services when home delivered were not free. Although the pricing of semen was withdrawn, the farmers continued to pay as before. The on-call service in rural areas was far from satisfactory and was expensive.

2.6.4 Milking

Daisy *et al.* (2007) found that incidence of mastitis was found to be significantly lower in machine milking.

Filipovic and Kokaj (2009) reported a higher average milk yield per milking and a shorter milking time while using milking machine than hand milking. The differences in milk composition while using two methods were not significant.

Kochewad *et al.* (2013) reported that all the farmers performed milking twice daily after studying the existing milking practices of upper Gangetic plains of India.

2.6.5 Health care

George and Nair (1990) investigated the attitude of dairy farmers towards veterinary services and reported following tendencies. In general, vaccination was carried out by both doctors and livestock inspectors. While doctors had performed most of the vaccinations in the hospital, livestock inspectors have performed most of the vaccination at the farmers' home. For treatment purposes farmers have mainly approached the doctors. Treatment was provided both at home and in the hospital. There was more or less the same number of cases treated at home and in the hospital.

Varghese *et al.* (2000) investigated the veterinary service availability of Pathanamthitta district of Kerala and reported that among the farmers 59.82 per cent had a veterinary dispensary or hospital within 2km. of their home and 73.21 per cent had a veterinary institute within 3 km of their home.

Unnithan *et al.* (2010) reported that the problem of high price of Veterinary medicines was unbearable to an average dairy farmer in the state of Kerala.

Kochewad *et al.* (2013) reported that 91 per cent farmers preferred artificial insemination in upper Gangetic plains of India

2.6.6 Labour

George and Nair (1990) investigated the labour use pattern in dairying in Kerala and revealed that it was carried out mostly with the utilization of family labour. About 60 per cent of the labour time spent in cattle keeping was supplied by female labour. All operations pooled together, about 62 per cent of the labour used in cattle keeping was supplied by females. They also reported a clear division of labour in cattle keeping with women undertaking predominantly the tasks of collection of grass and fodder milking and feeding. The intensity of

labour use in operations like collection of green fodder, shed cleaning and grazing was higher in the smaller size of holdings as compared to the other size groups.

Andrews and Poole (2004) reported that the labour in dairy farms was supplied by the farmer and his family except for larger herds. They reported that 63 per cent of herds used family labour only and average labour use of 35 hours/cow per year. Nearly half of this time was spent on milking the cows.

Unnithan *et al.* (2010) reported that all the daily activities related to cattle keeping with the exception of milking in a few households were contributed by family members as of now in Kerala, but the availability of family labour would be a major challenge in the years to come in the wake of rapid urbanization and fast changing living conditions of rural and semi urban Kerala.

Chayal *et al.* (2009) opined that women played a vital note in animal husbandry and allied fields. They conducted a study in Bundi district of Rajasthan. The findings showed that, womens' participation was 100 per cent in feeding of young calves, care of new born calf and cleaning of shed. Their involvement was there in feed preparation weaning, feeding young calves, care of sick animal, disposal of carcass and disposal of infected litter material.

Oberoi and Sharma (2013) reported that collecting and bringing fodder and milking animals were found as the most time consuming and difficult tasks performed by women in dairy farms in Punjab.

Sabu *et al.* (2013) found that women labour participation was maximum in feeding (66.25 per cent) and health care (61.25 per cent). The supporting role was high in marketing and processing (49.68 per cent) and breeding (39.5 per cent).

Bara *et al.* (2013) recorded the average time (minute/labour unit/animal unit/day) for various categories of animal was 40.76 for milch cow, 28.16 for heifer, 48.94 for calf and 43.76 for advance pregnant cows.

Hazarika (2015) opined that because of high economic growth and fast infrastructure development and more wages were pushing farm labourers were migrating to urban areas or searched for alternative job opportunities. The reasons put forward for labour scarcity included higher wages in other jobs, seasonal nature of farm jobs and the stigma of agricultural job as a low esteem-one. The

Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGA) opened up choice of work to labour in rural areas.

2.6.7 Waste management

Devendra (2007) opined that for the crop-animal systems and small farms predominant in Asia, the major issue to be addressed in future indeed would be waste disposal.

Better management of nutrients, waste and water might be one of the practical policy options in the better environmental management in case of livestock farms especially in intensive ones (Government of Kerala, KPP, 2014).

2.7 EXTENT OF ADOPTION OF RECOMMENDED PRACTICES IN DAIRY FARMS

Garg *et al.* (2005) conducted a study in the command and non command areas of Baran district of Rajasthan to find out extent of adoption of management practices. They reported that majority of the farmers adopted low level of housing and milking management where feeding and calf management practices were of a medium level.

Sharma *et al.* (2007) studied knowledge and livestock feeding practices in Jhansi district of Bundelkhand. The majority of farmers were having medium extent of adoption. Large and marginal farmers were having more adoption level. The knowledge was having highly significant correlation with milk production, mass media exposure and information source utilization and significant correlation with herd size and milk consumption.

Singh and Kumar (2007) investigated about adopters' category among dairy farmer in a study conducted in Haryana. They found that majority of the early adopters had high level of innovations in accepting AI where as early majority dairy farmers had only medium level. A large number of dairy farmer belonging to late majority category how timely vaccination. However almost two-third of dairy farmers is late adopters' category had low level of innovativeness for pregnancy diagnosis. A very large number of laggards had low level of innovativeness for pregnancy diagnosis.

Singh and Chawhan (2009) measured the extent of adoption of scientific farming practices through adoption index. Large percentage of the respondents (64%) was in medium followed by low (24 per cent) and high (12%) adoption categories.

Mishra and Bardhan (2009) analyzed the patterns of adoption of vaccination and deworming practices by farmers of Uttarakhand and identified the factors influencing patterns of adoption. The findings pointed out that the adoption rates had been high for vaccination when compared to deworming. It could also be observed that providing farmers easy access to market in terms of better infrastructure might work in favour of early adoption of technologies.

Mishra *et al.* (2009) carried out a study in Uttarakhand to study the factors influencing and house hold level impact of adoption of package of selected dairy practices. The study revealed a positive and significant influence of membership of farmers group, low farm experience high mass media exposure and closeness to market. Adoption of dairy technologies significantly increased milk product income from dairying and increased household consumption, but not in employment generation.

Rathore *et al.* (2009) studied the adoption of recommended management practice in Churu district of Rajasthan. Higher level of adoption was found in milking management (65.36%) followed by breeding (57.12%) housing (55.43%), health care (53.27%) calf rearing (50.47%) and feeding practices (47.73%) and feeding practices (47.73%). The overall adoption of recommended dairy cattle management practices was 54.90 per cent. The level of education showed highly significant effect on adoption of feeding and overall adoption. Herd size had significant effect on adoption of feeding, housing, milking and overall adoption. The family size had highly significant effect on adoption of housing, milking and health care practices. The results depicted that low price of milk and ghee, lack of market, belief of colostrums feeding before placenta shedding decreases milk production, lack of knowledge about deworming, high cost of treatment, distant hospital and non availability of doctors as major constraints.

Parmar *et al.* (2009) conducted a study in Punjab to evaluate the level of adoption of 11 improved farm practices by dairy farmers, who participated in a state level of competition. Out of total scores 71.6, 64.3, 64.2, 61.8, 61.7 and 60.0 were the scores for housing, feeding, breeding, health and calf management, milk production parameters and physical condition of the stock respectively, against the overall score of 53%. Comparatively lower scores, 47.3, 45.0, 38.7, 37.2, and 33.0 were obtained for composition and size of herd, milking management, record keeping, mechanization and general awareness.

The package of practices recommendations gave the farmers the management practices to be followed in dairy farms (KAU, 2010).

Singh *et al.* (2010) assessed the adoption level of scientific dairy farming practices in Haryana. The study pointed out that the lowest level of overall adaption in landless category whereas, all other categories, small, medium and large farmers had higher level of adoption. The maximum percent of adoption were found to be in case of the animal feeding followed by breeding, healthcare and management practices.

Chand *et al.* (2011) presented a conceptual model for enhancing adoption of farm technology. They opined that, before a new farm technology is recommended for adoption, it should be evaluated on the basis of relative advantage, compatibility, simplicity, trialability, observability, communicability and predictability.

Prakash *et al.* (2011) conducted a study to analyse the adoption of improved practices by the tribal farmers of North-eastern hill region of India. The study revealed that most of the farmers had low level of adoption.. Stall feeding, improved breeds and hygienic conditions were the most adopted ones, while recommended feeding and health management practices were missing. High feed cost, poor economic condition and lack of institutional support and credit were the constraints responsible for the deviation from the recommended practices.

Singha *et al.* (2011) conducted a study on adoption of recommended practices by small dairy farmers in Assam. The study revealed that small farmers

had low to medium adoption in selected systems. (84.4%, 82.22% and 82.22% respectively in three systems).

Meena *et al.* (2012) conducted a study on adoption of improved dairy farming practices by the members and non-members of dairy cooperatives in Rajasthan. They found a significant difference in adoption of practices by member and non –members

Quddus (2012) reported that the level of technology adoption by the small dairy farmers was lowest and was highly correlated with farmer's education, farming experiences, financial status and reach of extension.

Singh *et al.* (2013) carried out a study to investigate adoption level of husbandry practices by dairy farmers in Manipur. It was found that majority of the farmers studied were having low level of adoption in breeding (44.17%) and feeding (50.0%). Whereas they had medium adoption level in management (54.17%), healthcare (60.83%) and marketing (40.83%).

Maousam *et al.* (2014) analyzed the adoption level of scientific calf management in two districts of UP and Chhattisgarh States. They reported that 79 per cent had adopted scientific practices only at partial level and 19 per cent at high level. Education , land , herd size, milk production, annual income, social contact and exposure to mass media were having positive correlation with level of adoption.

Manhas (2015) analysed the extent of adoption of improved farming practices in Jammu district and revealed that most of the respondent farmers in the study (62%) were having medium level of adoption. Maximum level of adoption was found in feeding practices, minimum in housing practices.

2.8 PRODUCTION AND REPRODUCTION PERFORMANCE OF DAIRY FARMS

George and Nair (1990) in their study on livestock economy of Kerala found out the economic traits of cross bred cattle of Kerala. The average value in months for length of lactation, dry period, interval between calving and age at first calving were 11.25, 5.64, 16.89 and 33.30 respectively. They also reported that daily milk yield of cross bred cows was 4.35 litres/day. The average yield over the

lactation period was about 1486 kg and milk yield showed an improvement during the first three months and then a gradual decline in the subsequent months.

Iype *et al.* (1994) found that milk fat percentage in the fortnights of 3,6,9,12, and 15 were 3.28,3.73,3.99,4.35,and 4.6 in the morning samples and 3.81,4.3,4.64,4.93 and 5.23 in evening samples for crossbred cows in Kerala.

Radhika and Iype (1999) analysed the Solids-not-Fat (SNF) percentage of milk of crossbred cows both in villages and organized farms of Kerala and found that the average SNF content of morning and evening milk was 8.56 and 8.53 for early lactation, 8.59 and 8.52 for middle and 8.51 and 8.50 for late lactation which exhibited less variation with the progress of lactation. The effect of sire, centre and season on SNF was non-significant. Around 47 per cent of cows, irrespective of time of milking and stage of lactation recorded SNF percentage below the legal standards of 8.5.

Ibraheem kutty C. and Ramachandran, K. (2000) reported that performance of reproduction and breeding of crossbred cattle in Kerala were poorer as indicated by delayed age of first service, and service periods, various aberrations of oestrous signs and lower success rate of AI and poorer performance was attributed to the inferior management both general and technical along with harmful consequences of artificial breeding. The average age of first service (months), service period (days), proportion of animals with mucous discharge during heat (%) and prolonged heat (%) were 26.3, 147.3, 51.9, 70.0 and 14.8 respectively.

Ettemma *et al.* (2004) suggested after studying 1905 heifers in three commercial dairy farms that AFC of Holstein cows must be restricted to 23 and 24.5 months of age, to make it more profitable.

Cain *et al.* (2007) reported that Inter calving interval of 18 to 24 months was reported in Pakistani cows resulting in low profitability.

Roy *et al.* (2007) reported that cows under specialized dairy farming produced significantly higher milk yield than others and also cows under co-operative villages.

Vaidya (2007) stated that since the shape of the lactation curve was almost constant, early milk yield could be used to predict the lactation milk yield.

Stephen *et al.* (2009) reported that location, lactation stage, and time wise differences in fat percentages were at highly significant. It was also observed 53, 32 and 27 per cent of cow were having less than 3.5 per cent fat in the morning milk of 2nd, 5th, 8th month of lactation respectively.

According to Abe *et al.* (2009) days from calving to first service was favourable to genetic selection for reproductive traits because of relatively high heritability and because it can be available earlier than the days open.

Unnithan *et al.* (2010) reported that the milk yield of cows (litres per day) in Kerala was 7.39, 9.2 and 9.46 in Malabar, Ernakulam and Thiruvananthapuram regions.

A study in Kerala Agricultural University based on more than 30,000 samples of milk from crossbred cows had revealed that two third of the cows in the early lactation produce milk with less than 3.5% the minimum fixed as per PFA act. Study on SNF revealed that around 47% percentage of cows irrespective of the stage of lactation and time of milking recorded SNF percentage below the legal standards of 8.5 per cent. From a field study covering the entire state of Kerala, it was found that the average SNF content in the milk of cross bred cattle was only 8.2 per cent. About 82 per cent of the samples collected were showing SNF below the legal level of 8.5. The present average daily milk production of cross bred cows of Kerala was around 7.50 kg. Owners could record the milk production monthly and These records could be utilized to predict the standard lactation milk yield accurately. Daily milk records at 6 weeks interval were also found to be suitable for prediction with accuracy. (KAU, 2010)

Radhika *et al.* (2012) conducted a study in Wayanad district of Kerala, India and reported that lactation milk yield, peak yield, milk fat and SNF percentages were 2118.79, 10.62, 3.51 and 8.35 respectively. The study also revealed that centre had significant effect on peak yield, lactation milk yield, milk fat, SNF and total solids percentages, whereas parity and season of calving were insignificant.

Naik *et al.* (2013) analysed the existing dairy farming in Goa and reported that the wet average and dry average were 7.62 and 5.79 kg /day respectively in the state.

Kumar, *et al.* (2015), reported that mean milk production in Krishnagiri district of Tamilnadu was 12.44 litres/day. The average milk production was quite good as 50 per cent of the respondents fell in large (>17.04 litre/day) and medium (10.46-17.04 litres/day)

Hussain *et al.* (2015) reported that the peak yield was 8.77, 11.02 and 2.5 litres for Jersey cross, HF cross and local animals respectively and days to attain peak yield were 32.6, 35.6 and 28 days for three groups respectively.

2.9 MARKETING OR DISPOSAL PATTERN OF MILK

George and Nair (1990) opined that the degree of commercialization of milk production in Kerala was far higher than the all-India average. In Kerala the percentage of milk sold per day out of the daily production was about 56 per cent as against 26 percent in the country as a whole. Of the total daily milk production, about 37 per cent was consumed at home and 63 per cent was sold. About 2/3 of the milk produced in the morning and 3/4th of the milk produced at noon time were sold. The farmers used four avenues for selling milk, direct to consumers in the village, tea shop, middle men and cooperatives. Direct sale to consumers in the village was the most popular outlet (38 percent), cooperatives (30 percent) tea shops (27 per cent). The share of middle man was about 4 per cent of the total sale.

Varghese *et al.* (2000) studied the status of rural dairying in Kerala and reported that, of the farmers studied in Pathanamthitta district 86.61 per cent were selling milk, but majority (54.29 per cent) were selling milk in unorganized sector.

Vinod *et al.* (2004) observed that medium and large farms sold more milk through cooperative society than the disposal through milk vendors and directly to the consumers. The reason was mainly due to more marketable surplus. The small farms sold 35 percent through milk vendors and directly to the consumers, and the

sale of milk through cooperative society was less as marketable surplus was lower.

Unnithan *et al.* (2010) studied the house hold disposal of milk in Kerala and reported the following findings. Out of the total household production, almost 91 per cent was house hold surplus. About 28 per cent of household surplus was marketed locally and the balance 72 per cent through DCS. The average household consumption was less than 1.5 litres per day. About local disposal considerable inter-regional variations did exist, least in Malabar region where chance for local sale was less. The highest percentage of local sale (41%) was in Trivandrum region. The local sales were to neighbours tea shops (seldom), institutions and cycle vendors.

Khoveio *et al.* (2016) reported from a study in Nagaland that major share of surplus of milk was given to unorganised sector than co-operative societies. The reason being relatively lower price.

2.10 ROLE OF COOPERATIVES IN DAIRYING.

Rajendran and Samarendu (2004) reported that 80 percent of the rural milk production was handled by unorganized sector and 20 percent by organized sector. They also pointed out the vital role of co-operatives in alleviating rural poverty by increasing rural milk production and marketing.

Lopoyetum and Selvamani (2006) studied whether dairy co-operative marketing business organizations are sustainable in the new economic environment and to evolve strategies for the same. They found out that sustainability of dairy co-operative marketing business organizations in the new economic environment demand a lot of marketing efforts and adoption of new strategies.

Sulaiman and Pillai (2006) conducted a study with the objectives of assessing the quality of services provided by the dairy co-operatives to its members, identifying the problems if any, in the marketing of milk through the society by the dairy farmers and suggesting suitable measures for improving their income from dairying. From the study, it was found that even though dairy co-operatives were rendering services to member farmers, the working of the

societies is not up to the expectation. The farmers were facing problems like low procurement price of milk, partial collection of milk, indifferent attitude of the staff, lack of transparency in the quality of inspection and delay in getting sales proceeds.

Khan and Jagatap (2007) examined the working of dairy societies in Karnataka. It was observed that the schemes of the society have enabled the downtrodden and weaker sections of the society to meet their minimum and daily expenditures.

Nishi *et al.* (2011) in her study titled “Dairy Farmer’s Satisfaction with Dairy Societies: A case Study”. The survey revealed that more the farmers are motivated towards economic accomplishment, they utilize the services of the societies to a great extent for their economic benefit. It could also be found that about one –third of the respondents were happy with the functioning of the societies. However the prevailing constraints like impediments for member farmers in getting accrued benefits of several provisions within the co-operatives and the hostile or non co-operative attitude towards societies have negatively contributed towards farmer’s satisfaction with the functioning of DCSs.

Meena *et al.* (2013) reported that breeding practices and feeding practices were highly adopted by the respondents who were members of cooperatives..

Wani *et al.* (2013) reported that the dairy farmers considered non-remunerative price for milk, high cost of inputs, and poor availability of green fodder, lack incentives for supplying milk to society and lack of training as major constraints.

Rathod *et al.* (2013) reported that in western Maharashtra Majority of the farmers were partly satisfied with the feed and fodder services by the cooperative societies.

Kankarne, *et al.* (2014) conducted a study on impact of Warana cooperative on socio-economic status, level of knowledge and extent of adoption of improved management practices. They found highly significant differences in adoption level.

2.11 INSTITUTIONAL ASSISTANCE FOR DAIRYING

George and Nair (1990) in their study on livestock economy of Kerala reported that among the sample households, 88 had received subsidy from the government for purchase of milch animals. When asked whether availability of subsidy had influenced the decision to keep animals, of the 93 respondents, 39 reported that their decision was influenced by the amount of subsidy.

Chauhan and Kundu (2005) conducted a study in Haryana state covering three districts where intensive cattle development project were functioning. They reported that the beneficiary households enjoyed on an average 3.77 times higher level of net income than non beneficiary households. They also found that new technology had extorted a favourable impact on several socio-economic parameters like productivity per animal, employment generation especially for women income generation and also an income distribution.

Dairying was the source of livelihood to the millions of the poor people and was the sole source of livelihood bringing cash to their hands twice daily in some places and weekly once in other places. Small holder livestock is a substitute for land. Governments had realized this fact and implemented various developmental programmes for the benefit of dairy farmers both by Central and State Government to improve the rural economy and also rural employment (Raju, 2007).

Kumar *et al.* (2008) conducted a study at two Institute Village Linkage Programme (IVLP) centres. The overall impact of IVLP on herd size had shown 23-28 per cent increase. There were 15.9, 26.72 and 33.87 per cent increase in milk yield of cross bred cows. The overall increase in average milk production and milk sale was 5.62 and 5.15 litres/day respectively.

Sinha *et al.* (2012) observed a positive response to micro credit from the tribal dairy farmers.

2.12 DAIRY FARM PERFORMANCE INDEX

Yang (1980) measured milk production of animals using livestock production index. It was calculated by dividing the individual cow's milk production by the region average.

Senthilvinayagam (1999) conceptualized the dairy farm performance in the form of Dairy Farm performance Index (DFPI) which was totality of three dimensions viz.capacity utilization of the farm, perceived profitability of the farm and dairy Production Index (DPI).

Performance was a function of ability and motivation of the entrepreneurs and was the explicit behaviour exhibited by the entrepreneur in running the enterprise.(Senthilkumar ,2003)

2.13 CONSTRAINTS IN DAIRY FARMING

Upadhyay (2000) analyzed the constraints and opportunities of small holder dairy farming systems in Indian and reported that agro-climatic conditions, genetic potential of animals, shortage of feeds and fodders, reproductive disorders, lack of adequate health care lack of suitable housing and unscientific management, lack of credit facilities, lack of organized marketing and transfer of technology as major constraints.

Bardhan *et al.* (2005) carried out a study in Uttaranchal to find out major constraint perceived by dairy farmers belonging to landless marginal, small medium, and large farmers according to profitability proportion to size technique. The study revealed that non-remunerative price of milk, pricing based on fat purchase, reproductive problem, distant AI centres and high cost of feeds to be the major constraints.

Kumar *et al.* (2009) conducted a study in rural areas of Jhansi district and concluded that problem regarding poor availability of green dry fodder and its high cost and inadequate knowledge of ration balancing influenced milk production

Khoveio *et al.* (2012) investigated the major constraints in milk production and marketing on Nagaland. The constraints were ranked using Garret's ranking Technique (GRT) and reported that low availability and a high price of concentrate was the major production constraint. Low price of liquid milk was found to be the major constraint in marketing among members of cooperative while delay in payment by unorganized sector was the major constraint in case of non-members.

Paul *et al.* (2013) analyzed the quantity and value loss of milk in crossbred cows in North-Eastern states in India. It was estimated that mineral deficiency, repeat breeding and worms infestation accounted for about 94 per cent economic losses. The foot and mouth disease, mastitis, haemorrhagic septicaemia, black quarter and milk fever were ranked in decreasing order for losses. All the constraints were found to lower the productivity of cows by 0.86 litres per day.

Rani *et al.* (2013) conducted a study to find the constraints in adoption and repayment of loans in Punjab. Most of them perceived shortage of quality animals, many intermediaries, low price of milk, high cost of feed and fodder, high expense on animals, low productivity, high interest rate, problem of guarantee, policy of banks and inadequate loan as the serious problems.

Roy *et al.* (2013) studied the impact of constraints based technological interventions in a selected village of South Andaman. Results of the study revealed that majority (96 per cent) had the constraints of shortage of green fodder followed by anoestrous and repeat breeding. Technological interventions like non hormonal and hormonal treatment for infertility management, use of Ivermectin to reduce menace of tick, periodical training on management and value addition, establishment of dairy cooperative society were undertaken. The constraint and need based technological interventions would serve as a successful model for village based dairy development programme.

Jha (2014) reviewed the challenges and the way forward for the small holder dairy farmers in India. He identified top five challenges as inadequate support infrastructure, lack of trained manpower, inadequate focus on nutrition, lack of knowledge on economics and lack of cost effective technology along with low productivity of animals. All were the need of the hour.

Yadav *et al.* (2014) analyzed the various dimensions of entrepreneurial behaviour of dairy women farmers and their constraints in Mandi district of Himachal Pradesh in India. A large majority of respondents (83.0%) encountered medium to high extent of constraints in dairy farming which included lack of knowledge, lack of credit, high cost improved animal breeds, high cost of feeds,

medicines and non availability of fodder seeds, lack of market, lack of training ,low price of milk and repeat breeding in cows.

Khan *et al.* (2014) conducted a study to explore dairy farmers' perception of constraints in cattle insurance. Results showed that illiteracy distance of agency delay in visit of agent, unawareness of rules and regulation, long formality and delay in payment were the main constraint of dairy farmers.

Singh *et al.* (2015) undertook a study in Ranchi district of Jharkhand to identify the constraints of the tribal farmers and reported non availability of fodder and scarcity of clean drinking water as the most important constraints. The study revealed lack of knowledge of diseases and scientific practices as the next major constraint. The distant location of insemination centre was also a major constraint.

Nagrale *et al.* (2015) analyzed the constraints of dairy farmers in Vidarbha region of Maharashtra using Garret's ranking technique. They found lack of green fodder availability as major feeding constraint, low productivity of animals as breeding constraint, low price of milk as marketing constraint and lack of facilities for AI and veterinary services as health care constraint. Overall, the major constraint was the green fodder availability.

Jha and Singh (2015) conducted a study in Odisha and revealed that the lack of progeny tested bull, mineral deficiency, non availability of green fodder and infertility were the persistent constraints in dairying.

Kant *et al.* (2015) conducted a study in Western dry region of India to find out the problems perceived by the dairy farmers in adapting to climate change. The study revealed that the major constraints were repeat breeding, lack of knowledge about impacts of climate change, high cost of concentrate, lack of government policy on climate change, lack of pasture and lack of information on weather. The suggestions received from the farmers to overcome this situation were campaign about climatic problems, improved and drought resistant grasses, good quality bull and animal health service at nominal rate.

Payasi and Poonia (2015) investigated the management issues of dairy industry in Varanasi district of U.P. under different headings. They were

production issues, education and information issue, and infrastructural issue. Investment and compensation, inadequate government policies and social awareness from the major issues emerged in the study, it was clear those producers and farmers were poor in awareness on the latest state of art of milk production as business. The region suffered the problem of availability of only cow yielding animals. Low price of milk, irregular supply and high cost of cattle feed, high price of cross bred animals distant AI centres and the quality fodder availability.

2.14 ECONOMICS OF MILK PRODUCTION

2.14.1 Investment pattern in dairying

Kumar (2003) in his study observed that the total investment on animals was about 75 to 81 percent of the total investment whereas those on buildings ranged between 16.02 and 20.98 percent. He also made the observation that for both crossbreds and buffaloes the total investment per household was directly proportional to the herd size.

Desai (2005) undertook a study in Bidar District of Karnataka and observed that the average investment per household per milch animal was ₹ 22920. He also opined that the investment on the milch animals was nearly two-thirds of the total investments.

Kumar *et al.* (2006) in their micro level study in Andaman and Nicobar Island observed that the total investment on local cow and crossbred cow for all the farm size categories was respectively, ₹ 9034.45 and ₹22304.13. Out of this the share for milch animals was 77.36 percent (local cows), 75.89 per cent (CB cows), for dairy buildings it was 20.69 per cent (local cows) and 22.49 percent (CB cows), for dairy equipments and machinery it was 1.95 percent (local cows) and 1.61 percent (CB cows). He also analysed a direct relationship between the investment on size of the farm and the investment on the milch animals. He also noticed an inverse relation between the size of the dairy farm and the investment on the dairy buildings.

According to Singh and Aggarwal (2007) Cattle shed, storage shed, dairy equipments and milch cows were considered as dairy assets.

Singh (2008) studied the economics of milk production in Varanasi District of Uttar Pradesh. He observed that the investment was highest for milch animals (53.9 %) followed by dairy building (27.6 %) and dairy equipments (18.9%). He also noticed a large variation in the fixed investment on dairy assets among different land holding groups.

Ghule *et al.* (2012) conducted a study of commercial dairy farms in Maharashtra. The average investment per farm was Rs.12.17 lakhs. The proportion of dairy animals in total investment was 51.28 percent in small farms and 70.12 percent in large farms.

2.14.2 Cost and return of milk production

George *et al.* (2000) analysed the economics of cattle rearing in south Kerala and found that the majority of the farmers used family labour and the enterprise was profitable only at net cost. The major cost was accounted for feed cost especially of concentrates. Due to the high cost of feed the farmers were unable to feed the animals according to the standards.

Singh (2001) analyzed the technical change in milk production in Karnal district of Haryana. He made the observation that variable cost constituted for more than 90 percent of the total cost and the cost of per litre milk production was the lowest for crossbred cattle. He also concluded that crossbred cattle had the highest average milk yield and the average maintenance cost for them was ₹ 7.86

Gandhi (2002) observed that the net cost of milk production per litre for crossbred cows was ₹ 7.18 and for buffalo was ₹ 9.90. They also found out that the maintenance cost per year for crossbred cows was ₹ 10231.01 and for buffalo is ₹ 11340.35. He also made the observation that as a result of higher productivity of crossbred cows, rearing crossbred cows were more profitable than buffaloes. He also analysed that the overall net profit per annum from crossbred cows was ₹ 2222.

Rajadurai (2002) investigated the economics of milk production in the Madurai District of Tamil Nadu. He made the observation that in small, medium as well as large farm categories, the feed cost accounted for more than two-third of the gross cost. The cost of milk production per litre for local and crossbred

cows was analysed as ₹ 9.72 and ₹ 7.44 respectively. He also concluded that as a result of low productivity of animals, there was a negative return in rearing local cow for small as well as medium category households.

Chand *et al.* (2002) undertook a study on the economic analysis of commercial dairy herd in arid region of Rajasthan and observed that the feed cost contributed for more than 70 percent of the overall maintenance cost per animal per day. He also analysed that the net cost per annum per day for small, medium and large herds was ₹ 53, ₹ 51, and ₹ 50 respectively. He also observed that due to higher expenses on feed in winter as well as rainy season, the average cost of maintenance of a cow per day was seen to be highest in winter season when compared to summer season. He also reported that the net return per animal per day was lowest for large herds (₹ 12), followed by medium and small herds respectively at ₹ 13 and ₹ 18. This made him to conclude that the small producers took better care of the cattle and hence were the better managers.

Kumar and Pandian (2003) analysed the cost of milk production in Tamil Nadu. He observed that the total maintenance cost per animal per day was highest for crossbred cows at ₹ 72.80. The same was recorded at ₹ 33.03 and ₹ 33.72 respectively for indigenous cows and buffalo. In his study he reported that the ratio of variable cost to total cost for indigenous cows was 96.18 percent, for buffaloes 95.33 percent and for cross bred it was recorded at 92.31 percent. They also noted a reduction in average cost with increase in farm size.

Hemalatha *et al.* (2003) reported in their study on the economics of milk production in Maharashtra stated that the average daily maintenance cost of Holstein Friesian- Crossbred, Jersey-Crossbred, Non-Descript Cow and Graded Buffalo was respectively ₹ 52.40, ₹ 49.61, ₹ 24.60 and ₹ 48.28. She also made the interpretation that feed cost constituted to 60 percent of the gross cost in all the breeds whereas the labour cost varied from 16.85 percent to 22.25 percent on case of graded buffalo and non descript cow. He also observed that the highest cost of milk production per litre was observed in case of Non descript cows at ₹

8.10 followed by graded buffalo at ₹7.43, Jersey –Crossbred at ₹ 4.51 and Holstein Friesian –Crossbred at ₹ 4.03.

Kumar (2003) studied the economics of milk production in Vellore of Tamil Nadu and he made the observation that the buffaloes had the highest net cost of production (₹ 66.68). The cross bred cows and local cows followed next at ₹ 60.06 and ₹40.82. In his analysis, he concluded that for crossbred cows the cost of production per litre of milk was highest for small farmers (₹8.21) and lowest for medium farmers group (₹ 7.23). In case of buffaloes the cost of production per litre of milk was seen to be highest in case of small farmers group at ₹ 12.99 and lowest for landless farmers group at ₹ 11.20.

Hymajyothi *et al.* (2003) analysed the economics of milk production in Andhra Pradesh. The average per litre cost of milk production was arrived at ₹ 7.95, ₹7.92 and ₹ 7.86 for the small, medium and large herd groups respectively. The average maintenance cost per day was estimated at ₹ 38.20. The same was calculated for small herd size groups at ₹ 28.01 whereas for large herd size groups it was ₹ 48.

Mankar (2003) after a study in Wardha of Maharashtra reported that the feed cost accounted for about 72-77 percent of the total gross cost while the variable cost accounted for about 90-93 percent of the total cost. He also made observation that the average maintenance cost per day per animal was highest for crossbred cows at ₹ 38.58 whereas for buffaloes and local cows it was respectively ₹ 37.63 and ₹29.53.

Rao *et al.* (2004) conducted a study on the economics of milk production in Kanpur of Uttar Pradesh. They reported that there was an increase in total maintenance cost of a milch animal per lactation with increase in farm size. The labour charge was having the highest share followed by fodder and concentrates. The large farmers were having higher gross income because of more utilization of concentrates. The small farmers showed highest Input output ratio. The fodder was having the highest elasticity of production and then for human labour and concentrates for all farms.

Reddy *et al.* (2004) while studying the cost of milk production in different agro climatic regions in AP, Tamil Nadu and Karnataka and noticed that the feed cost accounted for 64 percent, 72 percent and 74 percent respectively in the states Andhra Pradesh, Tamil Nadu and Karnataka. He also observed that the cost of milk production per litre was highest in Tamil Nadu at ₹7.20 where as in Karnataka and Andhra Pradesh it was without much variation at ₹ 5.84 and ₹ 5.48 respectively. According to this study, the average daily maintenance cost of crossbred cows in the states Andhra Pradesh, Tamil Nadu and Karnataka was respectively at ₹ 38.99, ₹ 49.36 and ₹ 48.88.

Shergill (2006) studied the commercial dairy farms of Punjab for the year 2005. He defined the commercial dairy farms as households selling milk on a regular basis. He reported that commercial dairying was not a profitable one in rural Punjab. He estimated the cost of milk production as ₹ 11.13 per litre. He also reported that the average price received by the farmers was ₹ 9.98 per litre and therefore he analysed that the farmers incurred a loss of ₹ 1.15 per litre of milk that he sold.

Singh (2006) analysed the economics of milk production and market surplus in Imphal dist of Manipur. He observed the cost of milk production per litre of milk for crossbred and local cows as ₹ 13.09 and ₹ 16.70 respectively. He also made the conclusion that the net returns from local cows were negative while for crossbred cows it was as low as Re. 1. He concluded that out of the total gross maintenance cost almost 82 percent share was contributed by the total variable cost.

Singh *et al.*, (2006) studied the economics of milk production in Rajasthan and observed that for local cow and buffalo, the feed cost alone was responsible for 55 and 62 percent of the gross cost respectively. For both local cows and buffaloes the variable cost accounted for 90 percent of the total cost. The per litre cost was higher for buffalo at ₹ 15.74 where as for local cow it was ₹ 14.70. He also made the observation that rearing buffalo was more remunerative than cow

milk. He concluded that income of family labour was positive for local cow and buffalo in all categories of households.

Dixit *et al.* (2006) undertook a study on economics of milk production in Karnataka and Kerala. They observed that in Karnataka, in case of non-descript cows the cost of milk production per litre ranged between ₹ 15.23 and ₹ 18.16 whereas for crossbred cows it was between ₹ 8.73 and ₹ 12. The same for buffaloes ranged from ₹ 13.12 to ₹ 15.67 per litre. They also observed that the feed cost contributed more than half of the gross cost in all cases of their study followed by labour cost at about 25 percent. The cost of milk production per litre of milk in Kerala ranged from ₹ 15.46 to ₹ 21.96 in case of non-descript cattle whereas for crossbred cattle and buffalo this ranged from ₹ 9.86 to ₹ 12.22 and ₹ 14.92 to ₹ 17.02 per litre of milk respectively.

Singh and Agarwal (2007) described variable costs are those costs which can be incurred during production and can be altered in the short run. It includes feed, labour, veterinary and miscellaneous cost and they undertook a study in Imphal West district of Manipur to work out costs and returns from milk. The net return from milk production from crossbred cows was positive and highest for large herd size category followed by medium and small.

Singh, *et al* (2007) conducted a study at Imphal West district of Manipur state to assess resource use efficiency in milk production concentrate was used optimally and efficiently while green fodder was not used efficiently in the study area.

Sirohi *et al.* (2007) investigated out cost of milk production and net profit margin for crossbred cows, categorized into various productivity levels, to examine the requirement of minimum productivity potential for economical viability. The results indicated that at the field level, rearing of cross bred cow was an economically sustainable occupation of their average daily production during lactation was ≥ 9 litres.

Sirohi *et al.* (2007) undertook a study on the economics of milk production in Haryana. They observed that across different productivity levels, the gross maintenance cost per day between milch and lactating animals showed variations

between 6 and 7 percent. The reason for such a variation was due to the difference in expenditure on feed inputs. This variation was calculated as 48-52 percent and 33-36 percent respectively for crossbred cows and buffaloes. He also analysed that the returns showed direct variation with the productivity of animals. He concluded that rearing of crossbred cows and buffaloes was considered economically viable only if their production was greater than 9 and 6 litres respectively.

Singh and Agarwal (2007) worked out the economics of milk production in Imphal of Manipur and found that the net returns from milk production per local milch cow were negative except for the large herd size category.

Bhowmik and Sirohi (2008) conducted a study in South Tripura district to work out cost and returns from small holder dairy production in rural areas. The average cost of milk production was 9.40/litre for cross bred cows and net returns from cross bred cows were positive.

Sekhon *et al.* (2009) in his study reported that concentrate and green fodder accounted for respectively 35 and 50 percent of the total cost of production. This was also seen to vary invariably with the size of the farm. For marginal farmers the net return per lactating animal was calculated at ₹ 22400/ year whereas for small and large farmers the net return was estimated at ₹ 22400 and ₹ 25200 respectively.

Unnithan *et al.* (2010) conducted a study in Kerala. As per the results of the study the average gross cost of production of milk was Rs. 26.75. They also reported that the corresponding net cost of production cost was Rs. 26.27. This actual production was higher than the procurement price (Rs. 18.63) fixed for cow milk with 3.5 per cent fat and 8.5 per cent SNF at that time in the state. They also reported that nearly 48 per cent of the overall cost was on feeding 32 per cent on labour, 12 per cent on maintenance of dry cows and loss in value of cows comprised remaining 8 per cent. The study also identified variation in cost among different herd size. The net cost of production was Rs. 29.65 and 18.88 among single cow holder and medium sized farms owning ten or more cows respectively.

They also reported that the three geographical zones of Kerala viz. coastal

mid and high lands were having variations in cost of milk production. The net cost of milk production was Rs. 27.14, 26.09 and 24.84 in coastal mid land and high land zones respectively. They also reported a seasonal variation in net cost of production as Rs. 25.67, 29.71 in flush and lean seasons respectively.

Khoveio *et al* (2012) conducted a study to determine the cost and returns from milk production in the state of Nagaland using tabular analysis. The average cost of milk production for crossbred milch cows was calculated as Rs. 18.52/litre. The net return was found to be positive for cross bred across all categories of households.

Devi *et al.* (2013) conducted a study on the women dairy farmers from Karnataka and studied that about 65-70 percent of the total production cost was due to the feed cost while the contribution from labour expenses ranged between 15-20 percent. They also noticed that the share of fixed cost ranged only between 5- 15 percent of the total cost.

Aswani (2013) studied the cost of unit milk production in Kerala under different feeding regimes and developed models for different feeding regimes and found that using combination of homemade feed and green grass gave highest profit.

Singh *et al.*, (2014) undertook a study on the cost of milk production in crossbred cows in Meghalaya and observed that cost of production was ₹ 17.51/ litre among IDDP beneficiaries whereas it was ₹20.20 per litre among the non beneficiaries. He also noted that the net profit ranged between ₹ 2.08 /litre to ₹ 1/litre. He made the conclusion that the feed cost accounted for 80-82 percent of the total cost.

Vishnoi *et al.* (2014) made an effort to estimate cost and returns from milk production in plain and hill region of Uttarakhand state. The study revealed that in plain region, the cost per litre milk production was RS.19.17, share of feed cost at 64 per cent and share of labour 23 per cent, the net returns were positive for crossbred cows. In case hill region the cost per litre milk production was Rs.19.23, feed cost share at 64 per cent and labour cost share at 24 per cent.

Jaiswal and Khan (2015) conducted a study in Raipur district of Chhattisgarh to study the economics of milk production. The maintenance cost for crossbred cow was, Rs.115, expenditure on feed (84.21%), cost per litre of milk production (Rs, 23.78) and net return from milch animal (Rs.12.96) which were comparatively better than buffaloes and local animals.

Sharif and Dixit (2015) conducted a study on economic analysis of dairy farming under varying ground water regimes in Southern Karnataka. The cost of milk per litre was least in crossbred cows (Rs.22.5), the net returns per day per milch animal (Rs.67.36) were highest from crossbred cows and a net returns /litre was Rs, 5.820. The milk production (litres/day) was 11.57. From functional analysis it was found that concentrates and dry fodder exerted their significant effect on milk production.

Anbukkani (2016) conducted a study on the economic analysis of dairy farming in dry areas of Tamil Nadu. The herds were classified into small, large and medium with average sizes 2.08, 5.19 and 14.38 respectively. Investment on crossbred cattle constituted the major component of investment followed by cattle shed and equipments. The feed cost was the major component in variable cost which accounted for 64 per cent. The average quantities of green, dry fodder and concentrates fed per crossbred per day was 15.8, 9.6 and 7.2 kg respectively. The overall maintenance cost for crossbred cow /day was Rs, 51.29. and income from sale of milk and manure was Rs. 87.7 ,yielding a profit of Rs. 41.37.

Prasad *et al.* (2016) developed an index to measure sustainability of sugar cane based dairy farming with 44 indicators. Index was developed based on a three point relevancy continuum and calculating mean relevancy and overall mean relevancy score. This index could be used to measure the sustainability of dairy farming beyond the study area with suitable modifications and evaluation of reliability and validity.

2.14.3 Cost and Return traits

Baruah and Sarker (1997) in their study about profitability in milk production in operation flood areas of Assam, used various cost and return traits like return over feed cost, feed cost efficiency, return over variable cost, fixed

cost: variable cost, variable cost per litre of milk, price per litre of milk, break even output, percent break even output to total output and input-output ratio.

Raju *et al.* (2005) conducted a study on cost of milk production at different levels of production in Bangalore district, Karnataka. It was apparent that return over cost at below 6 litres milk yield level is an uneconomic position at the current prices offered by the dairy cooperative society.

Prusty and Tripathy (2016) investigated the economics of milk production in organized and un organized sector in Cuttack district of Odisha. the total milk produced per cow per day in the respective sectors were 15.64l and 10.73l respectively which was higher than the break-even level of output i.e. 1.28 and 1.50 litres respectively.

2.14.4 Measures of farm efficiency

Thomas and Sastry (1991) described certain parameters for analyzing the business in a dairy farm. The very soundness of the enterprise can be analyzed by these measures. Some of the measures of farm efficiency were as followed. Net farm income, Net cash income, net income per hectare, net farm income per adult unit, net return per Rs. 100 worth feed fed to livestock, capital per Rs. 100 gross return and rate of turnover. Other methods like NPV, IRR, Benefit cost ratio, repayment capacity pay-back period etc. could be used by loan giving organizations for evaluation of the viability of dairy project submitted by them.

2.14.5 Resource use efficiency of milk production

Kumar and Singh (2004) conducted a study in Tamil Nadu to analyze the input-output relationship, productivity of inputs and resource use efficiency of milk production in crossbred cows in Villupuram district. The estimated Cobb-Douglas function explained about 70 per cent variation in returns from milk yield of crossbred cows. In case of crossbred cows, the expenditure on concentrate and dry fodder had positive and significant impact on returns, but green fodder was non-significant. For crossbred cows, MVPs of dry fodder and concentrates were significantly more than unity indicating their underutilization, but MVPs of green fodder and labour were non significantly different from unity, indicating their optimal use.

Mahajan and Chauhan (2011) made an attempt to study the resource use efficiency of rural and peri-urban farms in Ludhiana Dist of Punjab. He observed that in case of crossbred farms, the green fodder and concentrates showed significant effect on milk production. This led to the conclusion that feeding more green fodder to the crossbred cattle can lead to a marked increase in the milk production in rural dairy farms. The utilisation of concentrates was optimum in both the rural and peri-urban dairy farms. He also observed that both the categories of farm studied underutilized the green fodder. The peri-urban farms were seen to follow the practice of silage making at times of green fodder scarcity.

Kumar *et al.* (2012) analysed the resource use efficiency of milk production in Haryana. Human labour was underutilized in crossbred cows in Karnal. The technology in form of crossbred cows discerned not only scope of additional milk production with appropriate mix of green fodder and concentrates inputs in feed ration but also provided opportunity for enhancing marginal productivity of surplus labour to an extent.

Bardhan and Sharma (2013) carried out a study in Kumaon of Uttarkhand and the findings indicated a chance for re-allocation of existing resources base because some inputs were over utilized and some underutilized.

Sharma *et al.* (2014) conducted a study in two districts of Malwa region of Madhya Pradesh and found that resource use efficiency of green fodder was negative and significant indicating its overutilization.. The concentrates were used optimally in crossbred cows. The Cobb-Douglas production function best fitted with significance regression coefficients and the value of R^2 .

Rangnath *et al.* (2015) undertook a study in Western Maharashtra and reported that concentrates were underutilized for both buffaloes and crossbred cows.

Prusty and Tripathy (2016) investigated the economics of milk production in organized and unorganized sector in Cuttack district of Odisha. They analysed the resource use efficiency and found that green fodder was utilized optimally in organized sector but underutilized in unorganized sector. Concentrate was sub-

optimally used in both sectors. Green fodders and concentrate had positive and significant effect on production in all market structure with total explained variation of 69.3 percentages.

2.14.6 Technical efficiency of milk production

Battese and Coeli (1988) reported that dairy farms in New South Wales were 77 percent technically efficient while those in Victoria showed an efficiency of 63 percent. The variability among the farms in New South Wales was observed between 0.55 and 0.93 which was lesser than in the farms of Victoria which ranged 0.30 to 0.93. The implication was that the farms in New South Wales functioned more closely to their frontier production than the farms in Victoria.

Manohar *et al.* (2004) in his study resorted to Frontier production Function approach to study the Technical Efficiency in Pondicherry. He analysed that the TE of the farms studied were 82.28 percent. He also observed that 18 percent of the technical abilities were not realized. He also analysed that the variation in yield among the dairy farmers was a result of the farm specific variability and this was explained with the help of the variance ratio. He also concluded that the major share of the differences between observed and the maximum frontier output was because of the difference in farmers' level of Technical Efficiency which was as a result of adoption of different management practices by the farmers under study.

Saravanakumar and Jain (2008) studied the technical efficiency of dairy farms in Tamil Nadu using stochastic production function approach. He found out the average TE of the crossbred cow farms as 82.10 percent (ranging between 72.30 and 97.90). The results indicated that there is a scope to increase the milk production on an average by 16.32 percent while for buffaloes it was 14.04 percent and that too without increasing any extra expenditure on these farms.

Singh and Sharma (2011) used the stochastic frontier approach to study the specific technical efficiency of dairy farmers in India. Since the technical efficiency of the farms turned out to be two third of the total, he analysed that the milk production can be increased by one – third of the present value without

increasing the inputs. Economic status, innovativeness and schooling positively affected the TE of the farmers whereas the age of the farmers negatively influenced the TE. Hence he suggested the urge for promoting the young farmers, providing training to the farmers and increasing the educational status for making them more resourceful. He also recommended the need for providing low cost finance for purchasing elite breeds to strengthen the resource base of the farmers.

Pandian *et al.* (2012) had undertaken a study to analyze the technical efficiency in the state of Tamil Nadu. The mean technical efficiency was 85.5 per cent for Kanchipuram, 85.8 for Erode, 82.7 for Nagapattinam and 77.4 per cent for Thoothukudi district.

Kumar (2012) conducted a study to measure farm specific technical efficiency in milk production and shown that at the existing level of technological development India has the potential to augment production by about 25%.

Bhardhan and Sharma (2013) evaluated the TE across different herd sizes in Kumaon Division of Uttarakhand using Stochastic Production function and its determinants. He made the observation that the small holder producers were far more technically efficient in milk production when compared to their larger counterparts. He also opined that the intensity of market participation also had significant and positive impact on TE, apart from the herd size. He also opined that the production efficiency would have been improved by increasing the level of commercialisation of the dairy farms.

Sharafat (2013) studied the TE of dairy farms in Jordan using the Stochastic Production Frontier methodology. He arrived at the conclusion that the TE of milk production of most of the farms in Jordan is as low as 39.5 percent. He concluded that in order to increase the production efficiency of dairy farms the farmers access to extension services must be improved.

Umamageswari *et al.* (2016) measured the technical efficiency in Tamil Nadu. The mean technical efficiency was estimated to be 86.32 per cent for crossbred cows. The education level had the positive impact while age and land holding negatively and significantly influenced TE.

2.15 MILK PRICING

The minimum standard prescribed by the PFA (1976) rules for cow milk were 3.0 to 4.0 per cent fat and 8.5 to 9.0 per cent solids-not-fat throughout the country with a view to encouraging milk production through high yielding indigenous and cross-bred cows, it was necessary to adopt a pricing policy which would provide an adequate incentive for production of cow milk. In that context, the National Dairy Development Board (NDDB) had suggested the two-axis milk pricing policy such a policy ensured payment for milk on its compositional quality evaluated rationally on its fat and solids-not-fat (SNF) components (De, S. 2000). (The PFA act was replaced by Food Safety and Standards Act, 2006 (FSSA), but same standards were maintained.)

Saravanakumar and Jain (2009) attempted to develop a model for milk pricing in Tamil Nadu based on the production cost and price and non-price factors like technology, and projected price of milk in coming years.

Unnithan *et al.* (2010) opined that Kerala paid the highest procurement price in cow milk segment. Considering the various findings of the study they recommended a procurement price for milk recommended a procurement price for milk having 3.5 per cent fat and 8.5 per cent SNF should be fixed as Rs. 26/- per litre of milk during the period of study (2010). They also confirmed that two axis pricing was the best possible method for cow milk and it enabled the DCS and the unions to make genuine payment for milk solids apart from improving the quality. They raised concern over the complaint that milk from crossbreds did not meet the required standards of 8.5 per cent SNF. They also recommended to revise the procurement price every year and to formulate an index which should be derived from increase in the prices of concentrates, the declared agricultural wage, the consumer price index and lending rates of commercial banks.

Bardhan and Sharma (2012) opined that to make dairying more remunerative price was a very important factor to consider as it often acts as an incentive for farmers to scale up their production. Dairy cooperatives followed two-axis policy in regard to fixing price for milk. It is imperative that factors other than fat and SNF to considered for fixing of milk price by the cooperatives. For

this price based the total cost of milk production (including imputed value of family labour charges) rather than only fat and SNF could go a long way in offering remunerative prices to member farmers. However cognizance needed to be taken of quality of milk (as denoted by fat and SNF content) that is produced by the farmers. Thus, a model needs to be developed so as to standardize milk production costs as per the specified quality levels of milk. This would enable linking of milk production cost with quality of milk and hence the producers as well as provided enough incentives to them in producing milk of adequate quality.

3. MATERIALS AND METHODS

Selection of an appropriate methodology is essential to bring out a meaningful result from research. This chapter deals with the research methods and procedures followed in the study. The methods and procedure of selection of the study area and respondents, the operationalization and empirical measurement of variables, data collection and various statistical tools and techniques employed in analyzing the data are described. The methodology is presented under the following headings.

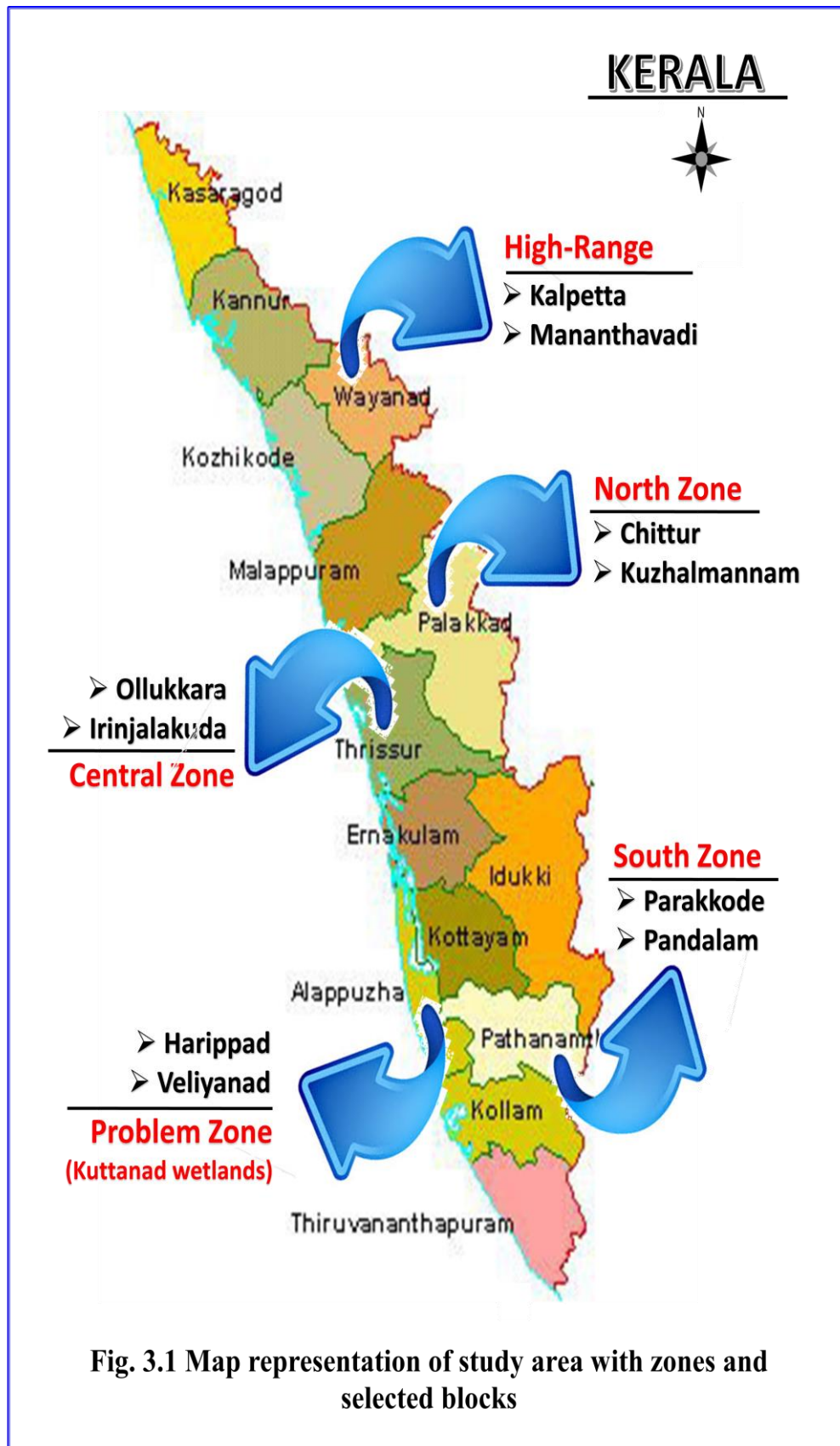
- 3.1 DESCRIPTION OF THE STUDY AREA
- 3.2 SELECTION OF THE AREA AND SAMPLE OF THE STUDY
- 3.3 METHOD OF DATA COLLECTION
- 3.4 IDENTIFICATION OF DAIRY FARMING SYSTEMS
- 3.5 VARIABLES AND THEIR MEASUREMENT
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3.1 DESCRIPTION OF THE STUDY AREA

The present study was undertaken in 10 blocks of the state of Kerala, selected from five districts representing five agro- climatic zones of the state.

3.1.1 Kerala

Kerala state, a southern state of the Indian peninsula is spread over 38,863 sq. km and lies between 80°18' North latitude and between 74°52' and 77°24' East longitude. This state is located on the south western tip of India with the Arabian Sea on the west and Western Ghats towering 500-2700 metres on the east.



It is bordered to the south by Tamil Nadu and the North by Karnataka states. The state is divided into 3 regions - the coastal lowlands, the fertile midlands and the highlands. The lowlands of Kerala are a coastal belt relatively flat and are networked by endless backwaters and the deltas of forty-four rivers. The midland is made up of undulating hills and valleys. This area is rich in cashew, coconut, arecanut, tapioca, banana, rice, ginger, pepper, sugarcane and vegetable plantations. The forested highlands slope down from Western Ghats which rise to an average height of 900 m, with a number of peaks over 1500 m in height. This is an area rich in tea, coffee, rubber and spice plantation and wild life. Kerala, which lies in the tropics, is mostly subject to the type of humid tropical wet climate experienced by most of earth's rainforests. Meanwhile, its extreme eastern fringes experience a drier tropical wet and dry climate. Kerala's rains are mostly the result of seasonal rains due to South East monsoon. Kerala receives an average annual rainfall of 3,107 mm and average 120-140 rainy days per year. In summer most of Kerala is prompt to gale-force winds, storm surges and torrential downpours accompanying dangerous cyclones coming in off the Indian Ocean. The average daily temperature in the state is around 36.7oC; the minimum is 19.8oC.

Agriculture remains one of the most important sectors of Kerala economy. The growth performance of the agriculture and allied sectors has been fluctuating across the plan period. In 2014-15, the sector had recorded a negative growth rate – 4.67 per cent. The share of agriculture and allied sectors in total Gross State Domestic Product (GSDP) of the state had also declined from 14.38 per cent in 2011-12 to 11.6 per cent in 2014-15. But, the switch from 2004-2005 to new series with 2011-12 as base has resulted in higher share of agriculture and allied sectors in the total GSDP of the State from 8.83 per cent to 12.9 per cent for 2013-14 (Economic Review, 2015, Government of Kerala).

Kerala is one of the states in India where land resources are under intensive use, mainly because of the low per capita availability of land in the state. Out of a total geographical area of 38.86 lakh ha, little over one forth was under forest and one tenth of it was put to non-agricultural use. The net sown area which accounts

for 53 per cent of the total geographical area did not record significant changes. Out of the gross cropped area of 26.24 lakh ha in 2014- 2015, food crops comprising rice, pulses, tapioca, occupied 10.5 per cent. In 2014- 15, food crops in general showed an increasing trend in production as the production of pulses and tapioca recorded an increase of 13 and 16 per cent respectively and that of rice recorded a marginal decline. In the case of spices, pepper showed a tremendous increase in production, while production of ginger and turmeric showed an increasing trend in production. In the case of plantation crops, coffee, tea and cardamom had shown increase in production while rubber had shown a drastic decline in production. Fruits, banana and other plantains recorded an increase in production whereas the cashew output largely declined. Rice, the staple food of Kerala occupied only third position in area under cultivation way behind rubber and coconut. (Economic Review, 2015, Government of Kerala).

Livestock sector contributed 27.62% of the Agriculture Gross Domestic Product (AGDP) of the state during 2014-15 (at constant price with base year 20011-12), while in 2013-14; the share was 25.25 per cent recording a growth rate of 4.3 per cent. In Kerala, 96 per cent of the Agricultural holdings fall below one hectare and nearly 94 per cent of the livestock population is concentrated in rural areas. As a consequence, 80 per cent of the livestock farmers are marginal farmers and agricultural labour households. As per the 19th livestock census 2012, Kerala had 12.11 lakh female cattle population and nearly 82% of cattle were crossbreds. Milk production in the state during 2013-14, and 2014-15 was 26.55 lakh and 27.11 lakh MT respectively. During 2014-15, Kerala contributed only 1.85% to the annual milk production of the country (Economic Review, 2015, Government of Kerala).

3.1.2 Pathanamthitta District

Pathanamthitta district was selected from the south zone of the five agro-climatic zones identified for the present study. The district consists of 3 natural divisions viz. the low land, the middle land, and the highland. The district has more or less the same climate conditions as prevalent elsewhere in the state. The climate is generally moderate, the temperature rising from 22 to 39°C. Paddy,

rubber, tapioca, vegetables, banana, pepper, tuber crops etc. are extensively cultivated. Within the district, the two blocks selected for the present study were Parakkode and Panthalam which are classified under agro-climatic zone of southern central laterite where rubber occupied major share of cultivation followed by coconut, fruit crops and tapioca. Pathanamthitta district ranks 12th position with 5.32% of cattle population of state. (SREP, 2013, ATMA).

3.1.3 Thrissur District

Thrissur is referred to as the cultural capital of Kerala. On the agricultural front, this is the place of 'Kole lands' which are real potential producers of paddy in the region. Other important crops of the district are coconut, banana, vegetables, pepper, nutmeg and tapioca. The district has a tropical humid climate with an oppressive hot season and plentiful and seasonal rainfall. Thrissur district was selected from central zone of five agro-climatic zones selected for the present study. The two blocks selected from the district for the present study were Irinjalakuda and Ollukkara. Irinjalakuda belonged to sub humid laterite and agro-climatic zone (ACZ) with Agro Ecological Situation (AES) with special reference to kole land paddy cultivation as major cropping system followed by coconut and banana. The Ollukkara block belonged to sub humid laterite ACZ and AES, highland with coconut, paddy and rubber as major crops. Thrissur district ranks sixth with respect to cattle population with 8.1 per cent of the cattle of the state (SREP, 2013, ATMA).

3.1.4 Palakkad district

Palakkad district was selected from the north agro -climatic region for the present study. Kuzhalmannam and Chittur were the two blocks selected for the study from the district. Sprawling over the midland-plains and mountains highlands, the district does not have a coastal line. The climate in the district is hot and humid during most part of the year. Palakkad is one of the hottest places in Kerala with two diverse types of climates one part with a climate similar to that of other districts of Kerala. The other part shows a climate similar to Tamil Nadu. However, the average annual rainfall is sufficient for cultivation. Palakkad is branded as the rice-bowl of Kerala. Coconut, banana, vegetables, arecanut, mango

and pepper are other major crops of cultivation in Palakkad. Kuzhalmannam belonged to AES, where major crops are paddy, coconut, arecanut, banana, tapioca and vegetables. Chittur block belongs to AES, where major crops are paddy, coconut, arecanut, banana, tapioca and vegetables. With regard to cattle population this district, ranks first with 11.6 per cent of the cattle population of the state. (SREP, 2013, ATMA)

3.1.5 Alappuzha district

Alappuzha district represented the problem zone (Kuttanad – wet land) of the five agro-climatic zones of the present study. Harippad and Veliyanad were the two blocks selected for the study from this district. The district is a sandy strip of land intercepted by lagoons, rivers and canals. There are no mountains or hills or forest area in this district. Owing to the proximity to the sea, the climate of Alappuzha is humid and hot during summer, although the place remains fairly cool and pleasant during the months of October and November. The average monthly temperature is 27°C. One of the major features of this land is the region called, Kuttanad the granary of Kerala. Kuttanad is also known as the rice bowl of Kerala and is one of the few places in the world where farming is done below sea level. The paddy fields lie about 0.6 to 2 m below mean sea level. In both selected blocks paddy was the major crop. The district ranks last with respect to cattle population, with 4.7 per cent of cattle of state. (SREP, 2013, ATMA)

3.1.6 Wayanad district

Wayanad district was selected from the high land zone of five agro-climatic zones for the present study. Kalpetta and Mananthavadi were the selected blocks. Wayanad is the northern hill district of Kerala with undulating terrains with altitude ranging from 700-2100 m. The distance from the mean sea level and the amount of forest cover creates a pleasant climate in the region. The greater temperature variation in the last 5-6 years was in the range of 18°C to 28°C. The average rainfall is 2500 mm per year. Agriculture is the mainstay of economy. Wayanad is 3.9% urbanized. Coffee, pepper, rice, banana, tea and cocoa are the main crops. The Mananthavadi and Kalpetta blocks belonged to the high range

zone with AES named as valley paddy area. Wayanad is having a cattle population of 103694 which is 4.8% of cattle of the state. (SREP, 2013, ATMA)

3.2 SELECTION OF THE AREA AND SAMPLE OF THE STUDY (SAMPLING DESIGN)

A stratified multistage random sampling procedure was used to select the area of study and respondents. In the first stage, the state of Kerala was stratified into five agro-climatic zones (NARP, 1989). In the second stage one district from each zone (Strata) was randomly selected. In the third stage, from each district two blocks were randomly selected.

For the present study the respondents selected were dairy farmers who are members of the dairy co-operatives and enrolled in the Direct Benefit Transfer (DBT) scheme of the Government of Kerala. As the total population of milk pourers and DBT members were nearly two lakhs, a total sample size of 350 farmers was selected for the present study. The farmers/farm households were categorized into small or subsistence farms (1-2 cows), medium (3-10 cows) and large farms (more than 10 cows). Out of 350 farmers selected for the study the numbers of small, medium and large farms were fixed as 175, 100 and 75 respectively. The sample size for each category of farms in each block was determined in proportion to the number of farmers belonging to each category (Probability proportion to size technique). For this all the farmers in the selected blocks were enumerated and classified into small, medium and large farms based on number of cows. The respondents in each group were selected randomly in each block proportional to their number in each block. The Table 3.1, Figure 1 and Figure 2 showed the details of sampling design. In the course of the study, the three farm size groups were classified into different dairy farming systems based on different criteria like major crop/cropping pattern, income from the farm and dry matter availability to cows in the farm from own crop cultivation.

Table 3.1 Number of farmers selected for study under different farm size in each block (Sampling design)

Sl no	Agro-Climatic Zone	District	Name of block	Small	Medium	Large	Total
1	South	Pathanamthitta	Parakode	12	5	2	19
2			Pandalam	6	3	1	10
3	Central	Thrissur	Ollukkara	12	6	3	21
4			Irinjalakuda	3	2	3	8
5	North	Palakkad	Kuzhalmannam	20	5	6	31
6			Chittur	30	44	32	106
7	Problem Zone	Alappuzha	Haripad	6	5	3	14
8			Veliyanad	2	2	3	7
9	High Range	Wayanad	Mananthavady	51	17	16	84
10			Kalpetta	33	11	6	50
			TOTAL	175	100	75	350

3.3 METHOD OF DATA COLLECTION

The objectives of the study were accomplished through the collection, processing and analysis of primary and secondary data. For collection of primary data, triangulation- a multi method in which qualitative and quantitative research methods were combined to provide a more complete set of findings that could be arrived at through the administration of one of the methods alone – was used. Further, triangulation was used both as a technique for validation as well as a means to enrich the data and to ensure a comprehensive and deeper understanding of the present situation under investigation. (Klein and Olbrecht, 2011).

Five methods of data collection were used. These included observations, focus group discussions, measurements, in-depth interviews and questionnaires. Designed, structured and pre-tested interview schedule was used (Appendix I). The secondary data was collected from literatures, reports, journals; internet and personal communications the data pertained to the year 2015-16. The season of the study period included those months excluding rain and summer (August-January).

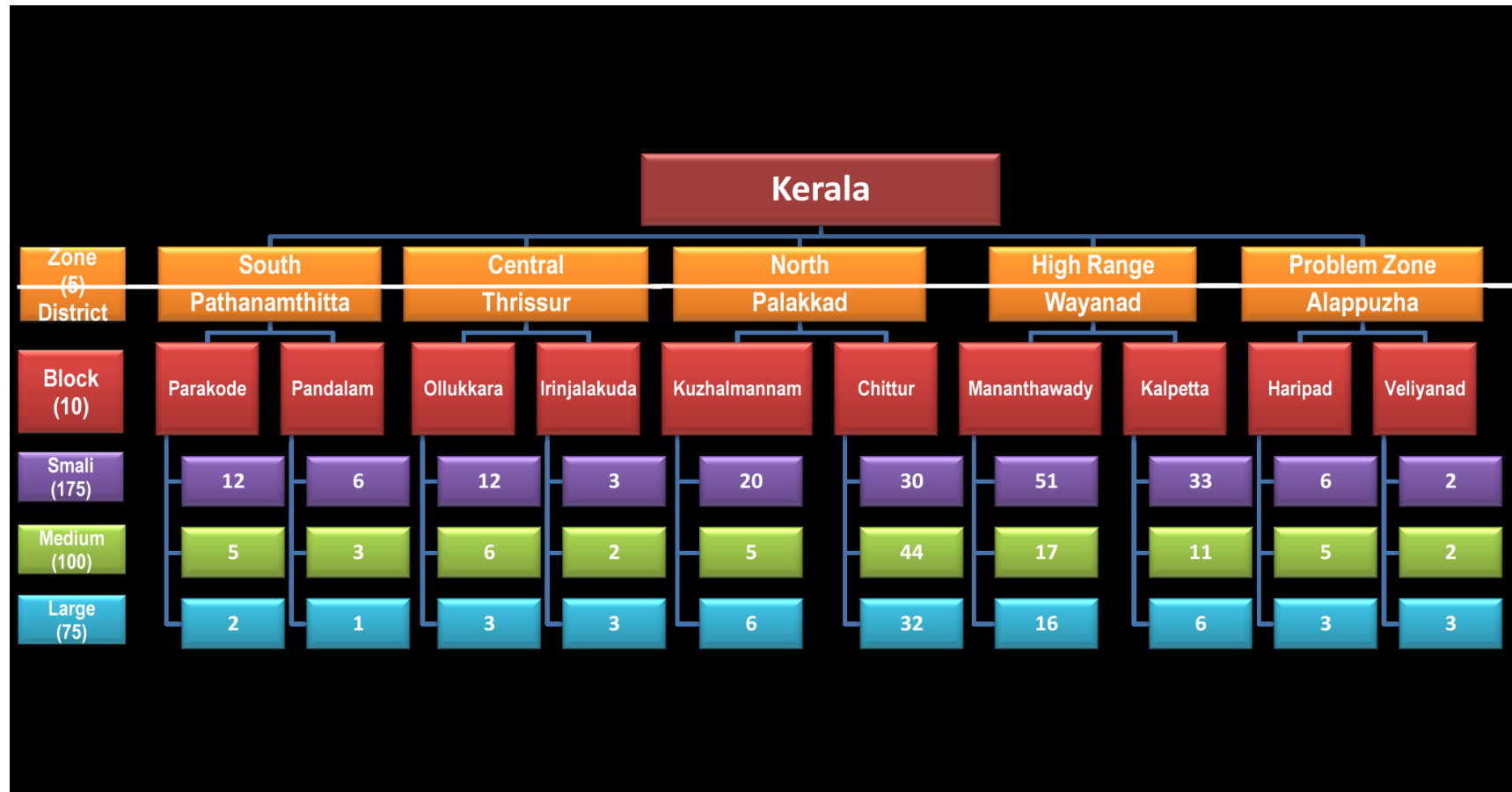


Figure 3. 2. Survey methodology with selected zones, districts, blocks and type of farms and number of respondents

3.4 IDENTIFICATION OF DAIRY FARMING SYSTEMS

The farms/farm households selected for the study were classified into four different farming/ production systems based on criteria described below.

3.4.1 Production/farming systems based on number of cows

The selected farms were divided into three production system, as per the method followed by Package of Practices Recommendations Kerala Agricultural University (2010) with slight modification. This was the classification of the farms used throughout study. The complete enumeration of all the households was done for classification.

Sl. No.	Name of the system
1	Small farms (1-2 cows)
2	Medium farms (3-10 cows)
3	Large farms (More than 10 cows)

3.4.2 Classification of dairy farming systems based on major crop/cropping pattern

In the selected farms based on farm size, the dairy farming systems were classified into eight groups based on the major crop/cropping pattern followed by the farmer in their house hold land

Sl. No.	Name of the system
1	Paddy monoculture
2	Coconut monoculture
3	Rubber monoculture
4	Spices
5	Banana monoculture
6	Mixed cropping
7	Homestead farming
8	Vegetables

3.4.3 Farming systems based on Income from farming activities

The dairy farming systems were classified into specialized and crop-livestock mixed farming system as per the definition given by Thomas and Sastry (1991).

Sl. No.	Name of the system	Criteria
1.	Specialized dairy farming	50% or more income from dairying
2.	Mixed farming	Minimum 10-15% income from dairying

3.4.4 Classification of dairy production systems based on dry matter availability

The dairy production system were classified into two groups viz. Solely Livestock Production System (SLPS) and Crop-Livestock Mixed Farming System (CLS) based on the availability of feed dry matter to animals from the crops cultivated in the farmers' own field as per the slightly modified definition of Ghosh, B. (2007). In SLPS, more than 90 per cent of dry matter came from outside source and in CLS, more than 10 per cent dry matter came from crop by products from the farmers' own cultivation.

3.5 VARIABLES AND THEIR MEASUREMENT

3.5.1 Socio- Personal and economic data of the farmers

Keeping in view of the objectives of the study, past literature and the discussion with the scientists certain important variables were selected for the study. The variables and their techniques of measurement were given below. In the present study the respondent/farmer meant the person who led the activities of the farm. Grouping of the respondent into different categories was based on the mean and standard deviation of the particular character as measure of check.

3.5.1.1 Age

The number of years completed by the respondent at the time of interview was reckoned as the age and respondents were classified as following using the mean and standard deviation as measures of check.

Sl. No.	Class	Age
1	Young	39 or below
2	Middle aged	40 - 60
3	Old	61 or above

3.5.1.2 Gender

Gender meant whether the respondent was male or female. Based on this two categories were drawn and scores of one and two were given respectively to male and female

Sl. No.	Category	Scores
1	Male	1
2	Female	2

3.5.1.3 Educational Status

Educational Status of the respondent was operationalized as his/her highest level of formal education at the time of interview and were classified into eight categories and were given scores as shown below for the purpose of analysis.

Sl. No.	Education	Score
1	Illiterate	0
2	Primary (1-5)	1
3	Middle (6-8)	2
4	Secondary (9-10)	3
5	Senior Secondary (11-12)	4
6	Graduate	5
7	Post Graduate	6
8	Professional	7

Based on the score obtained the respondents were classified into three categories based on their educational level.

Sl. No.	Category	Score
1.	Low	1 or less
2.	Medium	2 - 4
3.	High	5 and more

3.5.1.4 Family education index

The family education index of respondents' family was calculated by taking the total score for adult members and number of adult members using the formula (Khan, 2006).

$$\text{Family education index} = \frac{\text{Total score of adult members}}{\text{Number of adult members}}$$

The family education index was categorized into three groups on described below.

Sl. No.	Category	Score
1	Low	2 or less
2	Medium	2 - 4
3	High	4 and more

3.5.1.5 Family size

The size of family referred to the number of individuals of both the sexes including their children living together in a house hold. The families were categorized into the following three categories as described below.

Sl. No.	Category	Number of members
1	Small	2 or less
2	Medium	3 - 5
3	Large	6 or above

3.5.1.6 Family participation

The family participation referred to the number of adult members participating in the activities of the dairy farm, which is given by the formula.

$$\text{Family participation (\%)} = \frac{\text{Number of adult members participating}}{\text{Number of adult members}} \times 100$$

Based upon these the farm households were classified into three categories as given below.

Sl. No.	Category	Score (%)
1.	Low	36 or below
2.	Medium	36 - 90
3.	High	More than 90

3.5.1.7 Special Training

The number of respondents who received special training on dairying conducted by an agency for particular duration was considered. Based on this two categories were drawn and scores of 1 and 0 were given to recipients and non recipients.

3.5.1.7.1 Agency of training

The agency was classified as Government or Non-Government Organization (NGO).

3.5.1.7.2 Duration of training

Average Duration of training received in days was noted.

3.5.1.8 Participation in extension programmes

The number of extension programmes in which the respondents participated in the previous year was considered and attendance in one programme was given one point. Respondents were classified on the basis of total points obtained by them into seven categories (0-7).

3.5.1.9 Dairying as major occupation

The respondents were classified into two categories based on the criteria whether their major occupation was dairying or not. Based on this two categories were drawn and scores of zero and one were given to minor and major.

3.5.1.10 Major occupation /sources of income of farm household

The major occupations/sources of income of the farm family were categorized based on the structured schedule.

3.5.1.11 Land holding

The respondents were classified into five categories based on their land holding in cents as having less than 30 cent, 30-100 cents, 101-500 cents and more than 500 cents.

3.5.1.12 Experience in dairying

Years of experience in dairying referred to the number of years that the respondents had been rearing cattle. The respondents were classified and scores were given as below

Sl. No.	Years & Experience	Score
1	No experience	0
2	Less than 5 years	1
3	5 - 10 years	2
4	10 - 20	3
5	20 - 30	4
6	Above 30	5

Based on the score obtained, the respondents were classified into three categories as given below

Sl. No.	Category	Score
1	Low	1 or less
2	Medium	2 - 4
3	High	5 and more

3.5.1.13 Family Experience Index

The score of each adult member were added to get the family experience score (Khan, 2006).

$$\text{Family experience index} = \frac{\text{Family experience score}}{\text{No of adult members}}$$

Based on these score the households were classified into three categories as described below

Sl. No.	Category	Score
1.	Low	1 or less
2.	Medium	1 - 3
3.	High	3 or more

3.5.1.14 Purpose of cattle rearing

The purposes for which the respondent was engaged in dairying were ranked as per the structured schedule.

3.5.1.15 Motivation for dairying

Ten factors which had been generally found to influence farmers to adopt dairying were considered for the study (Raju, 1981). If a factor was recorded as having influenced a respondent that factor was given a score of one and otherwise zero. The total score for each respondent was formed by the aggregate of the 10 factors. Based on the total score obtained by each respondent they were grouped into following categories.

Sl. No.	Category	Score
1	Low Motivation	2 or less
2	Medium Motivation	3 and 4
3	High Motivation	5 or more

3.5.1.16 Previous job before start of dairying

The job in which the respondent was occupied before entering the dairy sector was grouped based on structured schedule.

3.5.1.17 Shift in Sector

The number of farmers who had shifted from other sectors (secondary/tertiary) to dairying (primary sector) was expressed as shift in sector. Based on this two categories were drawn and scores of zero and one were given respectively to traditional farmers and for shifted farmers.

3.5.1.18 Extent of information utilization

It was operationalised as the utilization of number of sources providing information regarding dairy farming and frequency of exposure of sources. It was measured by assigning scores of 5,4,3,2 and 1 to daily, weekly, fortnightly, monthly and occasional contact respectively with various sources of information as per the procedure adopted by Senthil Kumar (2003). The final score was arrived at by summing up the scores for each source. Based on this respondents were classified into 3 categories as given below.

Sl. No.	Extent of information utilization	Score
1	Low	6 or more
2	Medium	7 - 17
3	High	18 or more

3.5.1.19 Social Participation

Social participation in this study referred to the degree of involvement of the respondent in the formal organizations whether as a member or as an office bearer. Scoring system followed by Pareek and Trivedi (1994) was used to quantify the social participation of the respondents as follows.

Sl. No.	Social Participants	Score
1.	Social Participants	0
2.	Member of one organization	1
3.	Member of more than one organization	2
4.	Office bearer of any organization	3

Based on this the respondents were classified into three categories as described below

Sl. No.	Category	Score
1.	Low	1 or less
2.	Medium	2
3.	High	3

3.5.1.20 Credit orientation

Credit orientation was operationalised as the respondents' orientation to avail and utilize the loan/credit facilities of different organizations for running and expanding her dairy enterprise. It was measured with the help of a scale adopted by Sethy (1982) as shown.

Response by the respondents	Score
Borrowing money and re-borrowing money from a public credit institution after making timely repayment	5
Only borrowing money and not re-borrowing the same though making timely repayment	4
Borrowing money delaying payment but not borrowing again	2
Borrowing money from a public credit institution and remaining defaulter in repaying the same for a long time	1
Borrowing money from more than one institution and repaying the loan in time	5
Borrowing money from a credit institution, repaying it after borrowing money from some other institution and continuing the claim involving several credit institutions	1
Willing to borrow money but could not borrow due to ignorance or some other reasons	3
Making efforts to borrow loan but could not due to various reasons	3
Not willing to borrow money from any public institution due to various reasons	3
Borrowing money only from village money lenders and not from any public credit institution	2

Based on their scores, the respondents were classified into three categories as described below

Sl. No.	Category	Score
1	Low	2 or less
2	Medium	3
3	High	4 or more

3.5.2 Herd profile

3.5.2.1 Number of animals of different classes present in the farm

The details regarding number of milch cows, animals in milk, dry animals, heifers and calves (male and female) were collected using structured interview schedule.

3.5.2.2 Herd size

Herd size was measured in terms of the number of various categories of cattle kept on the homestead. The actual number were converted into standard animals units as per Kumbhare, *et al.* (1983) as follows

Sl. No.	Animal	Number	Standard Animals Unit Conversation coefficient
1.	Calf less than 1 year	1	0.33
2.	Heifer	1	0.75
3.	Cross breed cow	1	1.40

3.5.2.3 Herd building

The details of mode of replacement, number of different categories of animals purchased and sold, mode of purchase, (based on the details of last animal purchased in the farm) and in addition, farmer's preferences for purchase were also collected using interview schedule.

3.5.3 Physiological state of animals

The details of lactation number, stage of lactation and number of pregnant animals were collected. The age and reproductive status of heifers and age structure of male and female calves were also collected as per interview schedule.

3.5.4 Cattle transaction

The details of livestock transaction during the previous year of study were collected. The number and value of various classes of animals were collected as per structured schedule.

3.5.5 Calf disposal pattern

The details regarding the disposal of male and female calves were collected as per structured schedule.

3.5.6 Animal mortality

The details of number of animals lost because of death during the previous year of study were collected as per structured schedule.

3.5.7 Insurance

The details of number of animals insured and reasons for not insuring were collected. The cost of insurance of milk animals were imputed to all the cows at premium rate of 3.0 per cent per year assuming that all the all animals were insured under subsidy linked insurance scheme.

3.5.8 Farm Inventory

3.5.8.1 Land

The details of land for farm buildings and fodder cultivation were collected. The area of cattle shed were measured and recorded in each house hold. The details of type of land (own/lease) for buildings and fodder was collected as per the interview schedule. The cost incurred by the farmer for building cattle sheds was recorded.

3.5.8.2 Animals

The cost of animals maintained in the farm was calculated using two criteria. For the purchased cows the initial purchase cost was used and for the farm reared animals, the cost was fixed at rupees forty thousand for all the animals in the present study.

3.5.8.3 Equipments

The details of different equipments and their cost were recorded as per the interview schedule.

3.5.8.4 Mechanisation

To assess the level of mechanization, the schedule had enumerated 10 equipments which could be used in dairy farms and use of one equipment in the farm was given one point. So the total points obtained were calculated and was expressed as mechanization level. Based upon the points obtained, the farms were categorized into three classes as described below.

Sl. No.	Category	Score
1	Low Level	1 or less
2	Medium	2, 3
3	Large	4 or more

3.5.9 Existing management profile of the farms

3.5.9.1 Housing

The details of housing followed by different farmers like location, type, floor, roof, etc. were collected by observation and farm area details by actual measurement as per the interview schedule. Based on this the housing patterns were categorized.

3.5.9.1.2 Heat alleviation measures

To calculate the level of heat alleviation measures adopted by the farmers, eight recommended heat alleviation measures were enumerated. Farmers' score was calculated by the number of measures adopted by them. Based on this score the farms were classified into three categories as described.

Sl. No.	Category	Score
1	Low	1 or less
2	Medium	2
3	High	3 or more

3.5.9.2 Feeding

3.5.9.2.1 General feeding practices

The details of system of feeding, feed type, grazing area, type of concentrate, source of fodder and details of fodder cultivation, reason for non cultivation of fodder and source of fodder and source of paddy straw were collected as per the schedule.

3.5.9.2.2 Feeding Schedule

The amount and cost of green fodder, dry fodder, other crop residues and concentrate feed were recorded. The amount of green fodder, dry fodder, crop residues and concentrate feed fed on the previous day of interview were

measured using electronic weighing machine at the farm. The price of concentrate and paddy straw were recorded as incurred by the farmer at market price. The price of green fodder was calculated as following.

Cultivated green grass- Rs. 1.4/kg ; Purchased green grass Rs. 3.5/kg.

The cost for collection of local grass was calculated on the basis of value of labour required for collection of grass. The labour cost was taken as the value of collected local grass. The family labour cost was calculated on the basis of minimum wages in Kerala prescribed by the Government.

3.5.9.3 Breeding/Reproduction

The details of reproduction/breeding management like source of Artificial insemination (AI) service, distance to AI centre, availability of service, Service provider and cost of AI were collected as per the schedule.

3.5.9 Milking

The details of method of milking, interval of milking, milker etc. was collected as per the schedule.

3.5.9.5 Labour

The type and cost of labour were recorded as per the schedule. The paid labour was recorded as per the actual cost incurred by the farmer. The cost of family labour was imputed as per the Minimum Wages Act (Government of Kerala, 2011) for each district.

3.5.9.6 Waste management

The details of waste management were collected like presence of storage facilities, use of dung and liquid-waste and presence of biogas, vermi-compost etc. Considering these factors, score of one point was given for each measure taken. The system of waste management in the farm was categorized as described below.

Sl. No.	Category	Score
1.	Poor	1 or less
2.	Satisfactory	2,3
3.	Good	4 or more

3.5.9.7 Health care

The details of health care services were collected as per the schedule.

3.5.10 Extent of adoption of recommended dairy farming practices

3.5.10.1 Adoption index

The package of practices formulated and recommended to the farmers by the Kerala Agricultural University (KAU, 2010) and review of standard literature formed the basis for selection of recommended dairy farming practices for the study. Out of 52 practices selected six, five, nine, six, eight and ten practices were classified under selection, housing, feeding, breeding, milking, calf care and health respectively. The extent of adoption was measured using the adoption index. Continued adoption of a practice by a respondent was weighted with a score of one, discontinued adoption by a score of two and non-adoption by a score of one. The total score obtained by adding the individual scores of each practice was taken as the adoption score and adoption index of the farm calculated as follows.

$$\text{Adoption Index} = \frac{\text{Respondent score}}{\text{Total Score}} \times 100$$

On the basis of the adoption index, the respondents were classified as follows considering the mean and standard deviation as measures of check.

Sl. No.	Category	Score
1.	Low	78 or below
2.	Medium	78 - 96
3.	High	96 or more

3.5.10.2 Reason for deviation from recommended practices

The reasons cited by the farmers for deviation from the recommended practices were ranked by taking weighted average and preference index. Lowest index was given the first rank and then ranks were given from lowest to highest index.

3.5.11 Reproduction and Production parameters

3.5.11.1 Reproduction performance

The details of reproduction performance of animals were collected from those farms in which individual animal records were maintained. The service period, number of AI per conception, age of heifers at first successful service, number AI per conception were also collected from farms where written records were available.

3.5.11.2 Production performance

3.5.11.2.1 Peak yield and lactation yield

The details of peak yield, the yield at the day of recording and the fortnight of recording was collected from farms where records were maintained and was used for prediction of lactation yields. A single day milk record at any stage of lactation was used for predicting lactation milk yield using the regression equation developed by the Kerala Agricultural University (Table 3.2). Multiplication of Peak yield with a ratio factor 215.5 will predict the standard lactation.

Table 3.2 Regression of test day milk-yield at fortnightly intervals on 305 day lactation interval

Fort-night	Regression Formula	Accuracy
1	$665.01+160.61X1$	0.729
2	$459.09+182.30X2$	0.802
3	$417.01+181.91X3$	0.813
4	$311.51+195.00X4$	0.867
5	$326.20+191.06X5$	0.859
6	$262.76+201.51X6$	0.875
7	$254.22+229.87X7$	0.915
8	$272.41+227.12X8$	0.911
9	$326.94+225.88X9$	0.892
10	$321.13+233.29+X10$	0.899
11	$327.41+242.60X11$	0.914
12	$376.65+241.10X12$	0.905
13	$343.81+225.63X13$	0.904
14	$361.20+257.57X14$	0.883
15	$393.65+258.04X15$	0.893
16	$411.01+266.10X16$	0.882
17	$429.88+269.25X17$	0.884
18	$479.14+267.24X18$	0.862

19	532.41+264.91X19	0.846
20	604.35+262.08X20	0.810
21	669.34+258.21X21	0.773
22	693.52+265.91X22	0.763

Where, X1 to X22 are daily milk yield at fortnightly intervals.

3.5.11.2.2 Details of milk production

The details of milk produced in the farms were collected as per the schedule. The details of quantity and quality of milk sold to Dairy Cooperative Society (DCS) and the price realized were collected from respective DCS.

$$\text{Wet average} = \frac{\text{Total milk produced in the farm}}{\text{Number of animals in milk}}$$

$$\text{Dry average} = \frac{\text{Total milk produced}}{\text{Number of milch animals}}$$

3.5.12 Marketing and Disposal pattern

The details regarding marketing and disposal pattern of milk were collected using structured schedule.

3.5.13 Role of cooperatives in dairying

The benefits and complaints regarding the participation in Dairy Cooperative Society (DCS) as perceived by the farmers were ranked. The response to each benefit obtained on a three point continuum viz. Very important, Important and Not important with weights 3, 2 and 1 respectively. The problems were also obtained on a three point continuum viz. Very serious, Serious and Not serious with weights 3, 2 and 1 respectively. For each benefit and problem, the frequency of the response under each category was multiplied with its respective weightage and added up to get the total score of that particular constraint. The obtained score was divided by the total number respondents and the number of items in a particular benefit/problem to arrive at the mean score of the benefit/problem. The benefits/problems were then ranked based on the mean scores so obtained.

3.5.14 Institutional Assistance

The various assistance obtained by the respondents from different Government departments were classified as capital assistance and recurring assistance. The details of capital assistance from the starting of farm and recurring assistance in the previous financial year were collected. Each assistance received was given one point. The total assistance score was obtained by adding up the points. Based on this score the farmers were classified into three categories as followed.

Sl. No.	Category	Score
1	Low assistance	3 or less
2	Medium assistance	4 - 6
3	High assistance	7 or more

3.5.14.1 Farmers perception regarding institutional assistance

The farmers' perception was classified as Not at all satisfied, some satisfaction, satisfied and very much satisfied giving scores 1,2,3 and 4 respectively. Based on this score farmers were classified into three categories as described below.

Sl. No.	Category	Score
1	Low satisfaction	Less than 1.5
2	Medium satisfaction	1.5 - 2
3	High satisfaction	More than 2

3.5.14.2 Farmers participation of areas where government can help

The areas pointed out by the farmers where government could help were ranked by taking weighted average and preference index and the lowest index was given the first rank and the areas were ranked from lowest to highest index.

3.5.15 Dairy farm performance

3.5.15.1 Operationalisation and measurement of identified indicators of dairy farm performance

3.5.15.1.1 Capacity Utilization Index (CUI)

Capacity utilization was a critical factor which had a direct bearing on the efficiency of the dairy enterprise. Capacity utilization was operationalised as the extent to which the dairy farmer utilizes their dairy farm in relation to its capacity. It was a measure using the Capacity Utilization Index developed by Senthilkumar (2003) with appropriate modifications for the present study.

$$CUI = (D_H/D_C) \times 100,$$

where, CUI is the Capacity Utilization Index,

D_H is the number of adult dairy cattle housed,

D_C is the number of adult dairy cattle that can be housed .

The value of the index ranged from zero to 100. The scoring procedure used by Kumar (1995) was used in the study.

Index value	Score
0-25 per cent	1
26-50 per cent	2
51-75 per cent	3
75-100 per cent	4

3.5.15.1.2 Perceived profitability of the enterprise

Perceived profitability of the enterprise referred to the degree to which an enterprise was perceived to be relatively advantageous in terms of the dairy farmer's perception regarding the profit from running the dairy farm. The procedure adopted by Singh (1992) with slight modifications was followed in this study to measure the perceived profitability. The responses were obtained on a five point continuum as given below.

Response	Score
Very High loss	1
High loss	2
Somewhat profitable	3
More profitable	4
Most profitable	5

3.5.15.1.3 Dairy Production Index of milch animals

This was conceptualized as a manifestation of obtaining total fluid milk from per unit of dairy animal through the interplay of entrepreneurial behaviour and available resources. Milk production of dairy animals was measured by the Livestock Production Index which was measured as recommended by Yang (1980). For the purpose of the study, the milk production in three stages of lactation, of an animal on the farm, as recalled by the respondent was taken. The average milk yield of each animal for the total lactation was then calculated. The average milk yield of a particular zone was taken as the average milk yield of the milch animals for that zone. The Dairy Production Index for each respondent's animal was calculated by dividing the individual cow's milk production by the zone average.

3.5.15.1.4 Operationalisation and measurement of dairy farm performance

Dairy farm performance was a function of ability and motivation of the entrepreneurs (Senthilkumar, 2003). It is the explicit behaviour exhibited by the entrepreneur in running the enterprise. Based on review of literature, discussion with experts and observation three important indications of performance were identified. These were capacity utilization, perceived profitability of the dairy and dairy production Index.

Dairy farm performance was conceptualized as the totality of all three dimensions. An index was developed to measure the dairy farm performance on the lines proposed by Senthilvinayagam (1999) with appropriate modifications.

$$DFPI = \sum_{i=k} (A_i/P_i)$$

Where, DFPI = Dairy Farm Performance Index

Where i = i^{th} dimension

A_i = Actual score of the i^{th} dimension

P_i = Potential score of the i^{th} dimension

k = Number of dimensions

The DFPI values ranged from zero to three. Based on these index values, respondents were categorized into high, medium and low using mean and standard deviation.

3.5.16 Constraints expressed by the dairy farmers

Based on review of previous work done and discussion with Veterinary Surgeons, Dairy Extension Officers, DCS personnel and dairy farmers, five groups of important constraints (feeding, breeding, health, policy related and marketing) along with the nature of problems (total 46 constraints) were identified. The procedure adopted by Jayalekshmi *et.al.* (1997) was used to ascertain the importance of the constraints as perceived by farmers as follows.

The response to each constraint along with its nature of problems was obtained on a three point continuum viz. very serious, serious and not serious with weights of 3, 2, and 1 respectively. For each constraint, the frequency of the response under each category was multiplied with its respective weightage and added up to get the total score of that particular constraint. The obtained score was divided by the total number of respondents and the number of items in a particular constraint to arrive at the mean score of the constraint. The constraints were then ranked based on the mean score so obtained. The mean score of each problem under a constraint was arrived at by arriving at the total score for it and then dividing it by the number of respondents.

3.5.17 Milk pricing policy of Kerala

The price charts of Kerala Cooperative Milk Marketing Federation (KCMMF) were analyzed in detail for the price values for milk fat and Solids-not-Fat (SNF) combination. The hike in milk prices and changes in the charts over the last five years were analyzed. To suggest modifications, data regarding price of

fat, SNF, price of compounded cattle feed, labour cost, consumer price Index (CPI) and repo rate of Reserve Bank in the last five years were collected. The details of milk production in the state, details of DCS and their procurement and milk chart were given in the appendix II- V.

3.6 ANALYTICAL FRAMEWORK FOR ECONOMICS OF MILK PRODUCTION

The data collected during the period of investigation were scrutinized, tabulated and analyzed as per methods described by Snedecor and Cochran (1994) and using the software Statistical Product and Service Solutions (SPSS) version 21.0 and FRONT41 for Stochastic Frontier Analysis. The tabular analysis and functional analysis were used for systematic analysis commensurate with the objectives of the study. The different analytical tools used for economic analysis of milk production in different dairy production systems were illustrated below

3.6.1 Tabular analysis

The data were subjected to tabular analysis for estimation of fixed capital investment, to analyze the investment pattern, cost and returns from milk production in different farm sizes.

3.6.1.1 *Investment pattern*

The income generating capacity of a dairy owner was reflected through investment pattern. The fixed investment in the farm was considered for this study which included,

- 1 Investment on milch animals
- 2 Investment on farm buildings
- 3 Investment on machinery and equipments

The proportionate investment on the above items was worked out separately for various categories of farm.

3.6.1.2 *Costs and returns concepts*

The maintenance cost of animals was calculated separately for per milk animal and per milch animal per day basis. The returns were also calculated separately for per milk, and per milch animal per day basis. The cost of production per litre of milk was also estimated per milk animal and and per milch

animal basis. The returns were also selected on same way. The cost, cost/litre and return were calculated for different farm sizes, different agro- climatic zones and also for different dairy farming systems.

3.6.1.2.1 *Fixed cost*

Fixed cost is the expenditure which is incurred whether or not the production is carried out. It includes interest on fixed capital and depreciation. The fixed cost was apportioned on the basis of standard animal units.

The components of fixed cost

i. Interest on fixed capital investment

The interest on fixed capital was worked out at the prevailing rate i.e. at 12.0 per cent per annum.

ii. Depreciation on fixed capital

It is the loss in the value of an asset as a result of its use, wear and tear, accidental damage and time obsolescence. It was worked out separately for milch animals, cattle shed and equipments keeping in view the present value and useful economic life.

iii. Depreciation on milch animals

The depreciation on milch animals was calculated using the straight line method considering the initial value of the animal, economic life and culling value. In this study depreciation on milch animal was taken as 12.5 per cent taking productive life as 8 years.

iv. Depreciation on cattle shed and equipments

The depreciation on cattle shed and equipments were calculated by diminishing balance method. Depreciation on cattle shed was calculated by the type of building taking into consideration their foundation, superstructure and roof. Based on this, the value and productive life the buildings were estimated for calculation of depreciation the buildings were classified into five types with depreciation 3, 5, 10, 20 and 30 per cent respectively. The depreciation on equipments was estimated at 10 per cent level.

3.6.1.2.2 Variable cost

Variable costs are those costs which are incurred on the variable factors of production and can be altered in short run. It includes feed cost, labour cost, veterinary cost and insurance cost.

i. Feed and fodder cost

Cost on green fodder, dry fodder and concentrate were worked out by multiplying quantities of feeds and fodders consumed by animals with their respective price as described earlier.

ii. Labour cost

It included family as well as paid labour. The hired labour was calculated on the basis of actual cost incurred. In case of family labour, the imputed value obtained depended upon the time spend in dairying and wage rates as fixed by minimum wages fixed by Government of Kerala. The labour cost was apportioned on standard animal unit basis.

iii. Veterinary cost

It included the cost incurred on artificial insemination, pregnancy diagnosis, vaccination, medicines feed supplements and fees of veterinary doctor.

iv. Insurance cost

The cost of insurance was imputed for all milch animals at premium rate of 3 per cent per annum.

3.6.1.2.3 Gross cost

It was obtained by adding all the cost components including fixed and variable costs, i.e.

$$\text{Gross cost} = \text{Total variable cost} + \text{Total fixed cost}$$

3.6.1.2.4 Net cost

The net cost was reckoned by deducting the imputed value of dung, (rupees 0.9/kg) from the gross cost, i.e.

$$\text{Net cost} = \text{Gross cost} - \text{Imputed value of dung}$$

3.6.1.2.5 Gross returns

Gross returns were obtained by multiplying wet average with average price obtained from the society. i.e.

$$\text{Gross returns} = \text{Quantity of milk} \times \text{Average price from society}$$

3.6.1.2.6 Net returns

Net return was calculated by subtracting net cost from gross return i.e.

$$\text{Net returns} = \text{Gross returns} - \text{Net cost}$$

3.6.1.2.7

In order to estimate the cost per litre of milk, the average gross maintenance cost per day was divided by average milk production per day i.e.

Cost per litre of milk (Rs) on milk animal basis =

$$\frac{\text{Gross maintenance cost per milk animal/day}}{\text{Wet average on the day}}$$

Cost per litre of milk (Rs) on milch animal basis =

$$\frac{\text{Gross maintenance cost per milk animal per day}}{\text{Dry average on the day}}$$

Two types of cost concept were used in this study

COST A=Cost without imputing family labour

COST B= Cost with value of imputed family labour

3.6.2 Cost – Return traits

Various cost return traits were calculated as follows (Baruah and Sarker, 1997)

- i. Return over feed cost (ROFC) = Total returns - feed cost
- ii. Feed cost efficiency (%) = $\frac{\text{ROFC}}{\text{Total feed cost}} \times 100$
- iii. Return over variable cost (ROVC) = Total return – Variable cost

- iv. Fixed cost (FC): Variable cost (VC) = $\frac{FC}{VC}$
- v. Variable cost/litre of milk = $\frac{\text{Variable cost per animal}}{\text{Average yield}}$
- vi. Break even output (litre) = $\frac{\text{Total fixed cost per animal}}{\text{Price per litre-Variable cost per Litre}}$
- vii. Per cent of break even output to total output

$$= \frac{\text{Break even output}}{\text{Total milk yield}} \times 100$$
- viii. Input- output ratio = $\frac{\text{Total return}}{\text{Total cost}}$

3.6.3 Measures of farm efficiency (Thomas and Sastry, 1991)

- i. Net farm income = Total returns – Total costs
- ii. Net cash income = Cash purchase – cash sales
- iii. Net income per hectare = $\frac{\text{Net farm income}}{\text{No of hectares of farm}}$
- iv. Net farm income per adult unit = $\frac{\text{Net farm income}}{\text{No.of Adult units on farm}}$
- v. Net return per Rs. 100 worth feed fed to livestock

$$= \frac{\text{Estimated value of concentrate and roughage}}{\text{Estimated receipts from sale}}$$
- vi. Capital per Rs. 100 gross return = $\frac{\text{Gross income}}{\text{Capital invested on farm}} \times 100$
- vii. Rate of Turn over = $\frac{\text{Net farm income}}{\text{Total expenses}} \times 100$

3.6.4 Functional analysis

Milk production is a complex biological process influenced by several genetic, non genetic and environmental factors. Though it is not possible either to identify all the factors affecting milk production or to take into account all of them in a single production frame work, the relationship between such inputs and milk production had been explored through production function approach.

3.6.4.1 Specification of milk production function

Production function approach was used to study the effect of different factors on milk production. The factors influencing milk production depend on the character of the milking animal, quality and quantity of feeds fed, labour, management etc. and several other intangible magnitudes that cannot be quantified (e.g. climatic factors, place etc.).

The specification of milk production is as follows

$$Y = f(X_1, X_2, X_3, X_4, X_5, \dots, X_n)$$

Where Y = Value of milk produced per animal per day in Rs.

X_1	=	Expenditure on concentrate fed per animal per day in Rs.
X_2	=	Expenditure on dry fodder fed per animal per day in Rs.
X_3	=	Expenditure on green fodder fed per animal per day in Rs.
X_4	=	Expenditure on labour (paid+ family) employed per animal per day in Rs.
X_5	=	adoption index in percentage

3.6.4.2 Milk Production Function

Conceptually any input – output relationship could be expressed as follows

$$Y_i = f(X_1, X_2, X_3, \dots, X_n)$$

Where Y_i was the dependent variable or regressed and X_i 's were the explanatory variables or referred to as regressors. In the present study double log (Cobb-Douglas) production function (Cobb and Douglas, 1928) was fitted whose mathematical form was given below.

$$\text{Cobb Douglas} = Y = a \prod_{i=1}^n x_i^{b_i}$$

Where Y was the dependent variable, 'a' was the intercept, X_i 's were the exogenous variables and b_i 's are the partial regression coefficient of the respective X_i 's.

3.6.4.3 Resource use efficiency

Resource use efficiency was essentially a comparison between the Marginal Value Product (MVP) of an input with its price that gave direction on the use of that particular input in order to maximize profit. MVP was the absolute output response per unit of input and it helped to compare the relative efficiency of resources use among various categories of households. Since inputs and outputs were taken in monetary terms, MVPs of all the factors in Cobb-Douglas production function were calculated at respective geometric mean level which was as follows.

$$MVP_{Xi} = b_i \frac{\bar{Y}}{\bar{X}_i}$$

Where $\bar{Y}$ = Geometric mean of Y

$\bar{X}_i$ = Geometric mean if ith input

b_i = partial regression co efficient of X_i s

The MVPs were compared with the acquisition cost or unit price of the corresponding resources. Use of the concerned resource was recommended to increase if $MVP_{xi} - P_{xi} > 0$ while its use was advised to decrease if $MVP_{xi} - P_{xi} < 0$ the significance of the difference between MVP and unit price of the resource was tested using 't' test which was computed as follows,

Calculated t = $\frac{MVP_{xi} - P_{xi}}{SE(MVP_{xi})}$

$$SE(MVP_{xi}) = SE(b_i) \frac{\bar{Y}}{\bar{X}_i}$$

where SE = Standard Error.

If the difference between MVP and unit price was statistically not significant it indicated optimal use of that particular resource.

3.6.4.4 Technical Efficiency

Technical efficiency was measured through the ratio of observed output to potential output. Stochastic frontier regression model analysis was used to assess the technical efficiency of farms.

Model specification

The stochastic frontier production function (Aigner *et al.* (1977) of the Cobb-Douglas type was specified for this study and the method specified was as follows.

The model used was

$$Y_i = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + V_i - U_i$$

$$i = 1, 2, \dots, n.$$

$$Y = \text{Value of milk production per animal/day}$$

$$X_1 = \text{Concentrate cost per animal per day}$$

$$X_2 = \text{Total roughage cost per animal per day}$$

$$X_3 = \text{Total veterinary cost per animal per day}$$

$$X_4 = \text{Total labour cost per animal per day}$$

$$\beta_0 = \text{The constant Term}$$

$$\beta_0 - \beta_5 = \text{Parameter to be estimated}$$

$$V_i = \text{A random noise variable and}$$

$$U_i = \text{Half-normal error term}$$

Following Battese and Coelli (1988), when output was measured in logarithms, the farm specific technical efficiency can be estimated as:

$$TE_i = \exp(-U_i)$$

$$i = 1, 2, 3, \dots, n, 0 < TE_i < 1$$

The variance ratio γ explaining the total variations in output from the frontier level of output attributed to technical efficiencies can be computed as

$$\gamma = \sigma_u^2 / \sigma^2$$

3.6.4.5 Determinants of technical efficiency of milk production

Since various solid economic and managerial traits of the farmer have either direct or indirect bearing on the performance of the farm, in the present study an attempt was made to identify different factors to assess their impact on technical efficiency of the farm households. Functional analysis has been undertaken to accomplish the above taking technical efficiency index as regressed and while the determinants as regression.

$$Y = F(X_1, X_2, X_3, X_4, X_5, X_6)$$

Where Y= Technical efficiency index expressed in percentage

$$X_1 = \text{Education index of the family}$$

$$X_2 = \text{Farming experience index of the family}$$

$$X_3 = \text{Adoption index}$$

X_4 = Herd size

Cobb Douglas was fitted for estimation of parameters to assess the influence of different factors affecting technical efficiency in the study area.

3.7 STATISTICAL TOOLS USED IN THE STUDY

The statistical techniques used in the present study included

- 1 Frequencies
- 2 Percentages
- 3 Chi-square test
- 4 Spearman correlation coefficient
- 5 Cobb-Douglas production function
- 6 Economic efficiency using cost return traits and farm efficiency measures
- 7 Resource use efficiency using marginal value product(MVP)
- 8 Technical efficiency using Stochastic frontier production function.

4. RESULTS

The salient findings of the present study have been presented in this chapter.

4.1. AGRO-CLIMATIC ZONES

For the present study the state of Kerala was identified into five agro-climatic zones which are described in Table 4.1. Each zone was having specific agro-ecological situation which formed the basis for development of distinct agriculture and dairy production systems in that zone.

Table 4.1 Agro-Climatic Zones of Kerala selected for the study.

Sl No.	Agro-Climatic zone
1	South
2	Central
3	North
4	Problem Zone (Kuttanad wet lands)
5	High Range

4.2. IDENTIFICATION OF DAIRY FARMING / PRODUCTION SYSTEMS

After identifying the five agro-climatic zones, districts and blocks for the study purpose were selected by proper sampling procedure .The farming system based on number of milch cows was identified and this classification based on farm size was mainly used throughout the present study. After identifying the farming system based on farm size it was attempted to identify different farming systems within these farm sizes as described below.

4.2.1 Production/Farming systems based on number of milch cows (Farm size)

The details of distribution of small, medium and large farms are presented in Table 4.2.1. The results indicated that of the 10266 dairy households enumerated in 10 blocks, small sized farms were predominant with a share of 78.80 per cent, followed by medium (20.40 per cent) and large farms were having mere 0.70 per cent share to total. The same pattern of distribution of farms was observed in all the blocks selected for the present study.

4.2.2 Production / Farming systems based on major crop / cropping pattern

The details of distribution dairy farming systems based on the major crop or cropping pattern of the household is presented in Table 4.2.2. The results indicated, out of the eight farming systems identified the overall picture showed that mixed farming was dominant type (50.0 per cent) followed by homestead farming (20.6 per cent) , paddy monoculture (16.6 per cent) ,coconut monoculture (6.9 per cent) and rubber monoculture (3.7 per cent). In small, medium and large sized farms, the mixed and homestead farming system was dominant.

Table 4.2.1 Dairy farming systems identified based on number of milch animals (farm size) in selected blocks

Sl no	Agro-climatic zone	District	Name of block	Small	%	Medium	%	Large	%	Total
1	South	Pathanamthitta	Parakode	1305	86.80%	194	12.90%	4	0.30%	1503
2			Pandalam	672	85%	117	14.80%	2	0.30%	791
3	Central	Thrissur	Ollukkara	1308	86.10%	206	13.60%	5	0.30%	1519
4			Irinjalakuda	391	82.10%	80	16.80%	5	1.10%	476
5	North	Palakkad	Kuzhalmannam	2297	92.20%	183	7.30%	11	0.40%	2491
6			Chittur	3402	67%	1620	31.90%	58	1.10%	5080
7	Problem Zone (Kuttanad wet lands)	Alappuzha	Haripad	715	78.70%	188	20.70%	6	0.70%	909
8			Veliyanad	176	69.30%	72	28.30%	6	2.40%	254
9	High Range	Wayanad	Mananthavady	5767	90%	612	9.60%	29	0.50%	6408
10			Kalpetta	3756	89.80%	417	10%	10	0.20%	4183
TOTAL				10266	78.80%	2660	20.40%	97	0.70%	13023

Table 4.2.2 Dairy farming systems identified based on the major crop/cropping pattern

Farm type	Number / Per cent	Major crop/Cropping pattern							
		Paddy - Mono	Coconut - Mono	Rubber - Mono	Coffee & Pepper	Banana	Mixed	Homestead	Vegetables
Small	Number	35	1	8	0	1	90	39	1
	Per cent	20.0%	0.6%	4.6%	0.0%	0.6%	51.4%	22.3%	0.6%
Medium	Number	21	4	3	1	4	47	20	0
	Per cent	21.0%	4.0%	3.0%	1.0%	4.0%	47.0%	20.0%	0.0%
Large	Number	2	19	2	0	0	38	13	1
	Per cent	2.7%	25.3%	2.7%	0.0%	0.0%	50.7%	17.3%	1.3%
Overall	Number	58	24	13	1	5	175	72	2
	Per cent	16.6%	6.9%	3.7%	0.3%	1.4%	50.0%	20.6%	0.6%

4.2.3 Farming systems based on income from farming activities.

Table 4.2.3 showed the distribution of farming systems bases on the share of income from different farming activities. The majority of the farms under small (68.6 per cent) medium (64.0 per cent) and large (58.7 per cent) were following mixed type of farming system. The proportion of specialized farms were comparatively highest in large farms (41.3 per cent) and lowest (31.4 per cent) in small farms. The overall picture also showed that mixed farming was dominant (64.86 per cent) than specialized dairy farming system (34.86 per cent).

Table 4.2.3 Dairy farming systems identified based on the income from the farm under different farm sizes

Farm type	Number / Per cent	Income	
		Specialized	Mixed
Small	Number	55	120
	Per cent	31.4%	68.6%
Medium	Number	36	64
	Per cent	36.0%	64.0%
Large	Number	31	44
	Per cent	41.3%	58.7%
Overall	Number	122	227
	Per cent	34.86	64.86

4.2.4 Farming systems based on dry matter availability

The classification of dairy farming system based on the availability of the source of dry matter to livestock is presented in the Table 4.2.4. The presence of SLP (Sole Livestock Production) farmers was 56.0 per cent, 51.0 per cent and 70.7 per cent in small, medium and large farms respectively. The overall picture also showed that 57.7 per cent of farming system was SLP type and 42.3 per cent was C-L type (Crop-Livestock mixed).

Table 4.2.4 Dairy farming systems identified based on the dry matter source under different farm sizes

Farm type	Number / Per cent	Dry matter source	
		SLP	C-L Mixed
Small	Number	98	77
	Per cent	56.0%	44.0%
Medium	Number	51	49
	Per cent	51.0%	49.0%
Large	Number	53	22
	Per cent	70.7%	29.3%
Overall	Number	202	148
	Per cent	57.7%	42.3%

4.3. SOCIO –PERSONAL AND ECONOMIC DATA OF FARMERS

The socio-personal and economic data of farmers under different farm sizes are described below.

4.3.1 Age

Table 4.3.1 reveals the age of the farmers (the person who leads the dairy activities) under different farm sizes. The results showed that, in small farms (65.7 per cent), medium (69.0 per cent) and in large farms (50.7 per cent) fell in the age group of 40-60 years. In large farms the proportion of farmers within age group of 39 or below was comparatively higher (36.0 per cent). In small farms the proportion of farmers in the age group of 61 or above was higher (20.0 per cent) compared to other farm sizes. The overall picture also showed that majority of the farmers (63.4 per cent) fell under the age group of 40-60 years.

Table 4.3.1 Distribution of farmers according to their age under different farm sizes

Farm Type	Number / Per cent	Age class (in years)		
		39 or below	40-60	61 or above
Small	Number	25	115	35
	Per cent	14.3%	65.7%	20.0%
Medium	Number	12	69	19
	Per cent	12.0%	69.0%	19.0%
Large	Number	27	38	10
	Per cent	36.0%	50.7%	13.3%
Overall	Number	64	222	64
	Per cent	18.3%	63.4%	18.3%

Mean: 50.16 SD: 10.96

4.3.2 Gender/Sex

Table 4.3.2 shows the sex/gender of the person who leads the dairy activities in the household. The results revealed that, at overall level ,male (70.9 per cent) had lead role in dairy activities and female had leadership in 29.1 (per cent) per cent dairy farms.

In small, medium and large groups 58.9 , 73.0 and 96.0 per cent farms were having a male leader. In only 4.0 per cent of large farms, the female was having a leading role.

Table 4.3.2 Distribution of farmers according to the gender/sex

Farm Type	Number / Per cent	Sex	
		Male	Female
Small	Number	103	72
	Per cent	58.9%	41.1%
Medium	Number	73	27
	Per cent	73.0%	27.0%
Large	Number	72	3
	Per cent	96.0%	4.0%
Overall	Number	248	102
	Per cent	70.9%	29.1%

4.3.3 Educational Status and Level

Table 4.3 and 4.3.3.1 shows the educational status and level of education of farm heads. The results revealed that in small farms, majority of the farmers (44.0 per cent) had completed secondary education followed by middle school education (27.4 per cent). The proportion of people with graduate level was 6 per cent and farmers with post graduate and professional education was nil. In small farmers 6.9 per cent people were illiterate. The medium farms also almost followed the pattern of small farms. But in large farms the per cent of illiterate, primary school, middle secondary, senior secondary, graduate, postgraduate and professional were 0, 0, 9.3, 25.3, 32.0, 30.7, 1.3 and 1.3 respectively. Overall picture showed the predominance of secondary school education (38.0 per cent).

Table 4.3.3.1 showed that irrespective of farm size, majority of farmers had medium level of education. Very few farmers in the small and medium farms had high level of education. Where as in large farms, 33.3 per cent had higher education level. The share of low education level was 28.0, 19.0, zero per cent in small, medium and large farms respectively. The overall picture showed that the proportion of farm heads with low medium and high level of education was 13.4, 76.6, and 10 per cent respectively.

Table 4.3.3 Distribution of farmers according to their education status

Farm Type	Number / Per cent	Education							
		Illiterate	Primary	Middle	Secondary	Senior Secondary	Graduate	PG	Professional
Small	Number	12	16	48	77	16	6	0	0
	Per cent	6.9%	9.1%	27.4%	44.0%	9.1%	3.4%	0.0%	0.0%
Medium	Number	10	9	20	37	20	4	0	0
	Per cent	10.0%	9.0%	20.0%	37.0%	20.0%	4.0%	0.0%	0.0%
Large	Number	0	0	7	19	24	23	1	1
	Per cent	0.0%	0.0%	9.3%	25.3%	32.0%	30.7%	1.3%	1.3%
Overall	Number	22	25	75	133	60	33	1	1
	Per cent	6.3%	7.1%	21.4%	38.0%	17.1%	9.4%	0.3%	0.3%

Table 4.3.3.1 Distribution of farmers according to their level of education

Farm Type	Number/ Per cent	Education Class		
		Low	Medium	High
Small	Number	28	141	6
	Per cent	16.0%	80.6%	3.4%
Medium	Number	19	77	4
	Per cent	19.0%	77.0%	4.0%
Large	Number	0	50	25
	Per cent	0.0%	66.7%	33.3%
Overall	Number	47	268	35
	Per cent	13.4%	76.6%	10.0%

Mean: 2.83

SD: 1.2

4.3.4 Family Education Index

Table 4.3.4 shows the family education index of dairy households. The results indicated that the majority of the dairy families had medium level of education index, irrespective of farm size. The proportion of families with low level of education index was 22.9, 20.0 and 8.0 per cent in small, medium and large farms respectively. The share of families with high level of education index was 14.0, 15.0, and 34.7 per cent in small, medium and large farms respectively. Overall picture showed that majority of farm families had medium level (65.4 per cent) of education index followed by low (18.9 per cent) and high (15.7 per cent) level of education index.

4.3.5 Family size

The size of family of the dairy farmers under different farm sizes is presented in Table 4.3.5. The results showed that medium sized families were in majority in all farm size groups. Corresponding values were 66.9, 56.0 and 64.0 in small, medium and large farms. In medium sized farms, the proportion of large sized families were comparatively more. The overall picture showed that the per cent of small, medium and large sized families were 18.0, 63.1 and 18.9 in dairy households

Table 4.3.4 Distribution of farm households according to the family education index

Farm Type	Number / Per cent	Education Index of Family		
		Low	Medium	High
Small	Number	40	121	14
	Per cent	22.9%	69.1%	8.0%
Medium	Number	20	65	15
	Per cent	20.0%	65.0%	15.0%
Large	Number	6	43	26
	Per cent	8.0%	57.3%	34.7%
Overall	Number	66	229	55
	Per cent	18.9%	65.4%	15.7%

Mean: 3.071 SD: 1.09

Table 4.3.5 Distribution of farm households according to the family size

Farm Size	Number / Per cent	Family Size		
		Small	Medium	Large
Small	Number	26	117	32
	Per cent	14.9%	66.9%	18.3%
Medium	Number	19	56	25
	Per cent	19.0%	56.0%	25.0%
Large	Number	18	48	9
	Per cent	24.0%	64.0%	12.0%
Overall	Number	63	221	66
	Per cent	18.0%	63.1%	18.9%

4.3.6 Family participation in dairying

The level of participation of family members in dairy activities is depicted in Table 4.3.6. It revealed that irrespective of the farm size, majority of the farms had medium level of family participation. In small, medium and large farms 13.7, 15.0 and 32.0 per cent of the farms had low level of family participation and 40.0, 36.0 and 17.0 per cent had high level of family participation respectively. The proportion of family participation was highest in medium farms (36.0 per cent)

and was lowest (22.7 per cent) in large farms. Overall picture showed a proportion of 18.0, 55.4, and 26.6 per cent of low, medium and high participation.

Table 4.3.6 Distribution of farm households according to the level of participation of members in dairying

Farm Type	Number / Per cent	Family Participation		
		Low	Medium	High
Small	Number	24	111	40
	Per cent	13.7%	63.4%	22.9%
Medium	Number	15	49	36
	Per cent	15.0%	49.0%	36.0%
Large	Number	24	34	17
	Per cent	32.0%	45.3%	22.7%
Overall	Number	63	194	93
	Per cent	18.0%	55.4%	26.6%

Mean: 63.31 SD: 27.27

4.3.7 Special Training

Table 4.3.7 shows whether a special training in dairying was received by the farmers. The results clearly indicated that in all farm sizes 70-80 per cent of the farmers had not received and special training in dairying. In small, medium and large farms only 15.4, 17.0, 29.3 per cent received a special training respectively.

Table 4.3.7 Distribution of farmers according to the special Training received in dairying

Farm Size	Number / Per cent	Special Training	
		Yes	No
Small	Number	27	148
	Per cent	15.4%	84.6%
Medium	Number	17	83
	Per cent	17.0%	83.0%
Large	Number	22	53
	Per cent	29.3%	70.7%
Overall	Number	66	284
	Per cent	18.9%	81.1%

4.3.7.1 Agency of training

Table 4.3.7.1 shows the agency which conducted the training. The results revealed that Government departments played an upper role in imparting training to dairy farmers. In overall 92.3 per cent of the training were organized by Government and only 8.3 per cent by Non-Government Organizations.

Table 4.3.7.1 Classification according to the agency provided the special training

Agency	Number / Per cent	Farm type			
		Small	Medium	Large	Total
GOVT.	Number	24	17	19	60
	Per cent	82.8%	100.0%	100.0%	92.3%
NGO	Number	5	0	0	5
	Per cent	17.2%	0.0%	0.0%	8.3%

4.3.7.2 Duration of training

Table 4.3.7.2 reveals the overall picture regarding the duration of training. This showed that 1.05 ± 0.13 days was the average duration of training received by farmers.

Table 4.3.7.2 Average duration of the special training received

Farm Size	Av. Duration(days)
Small	0.99 ± 0.19
Medium	0.89 ± 0.22
Large	1.40 ± 0.29
Overall	1.05 ± 0.13

4.3.8 Participation in extension programmes

Table 4.3.8 shows the details of farmers' participation in extension programmes. The results showed that 41.1, 67.0 68.0 per cent did not participate in any extension programmes during the previous year of study. In small sized farms only 0.6 per cent of the farmers attended six extension programmes in the particular year. In medium and large farms the corresponding values were zero

and 0.3 per cent. Overall picture showed that 54.3 and 30.9 per cent of farmers attended one and two extension programmes respectively in the previous year.

Table 4.3.8 Distribution according to the number of extension programmes attended in the previous year,

Farm Size	Number / Per cent	No. of Extension programmes						
		0	1.0	2.0	3.0	4.0	5.0	6.0
Small	Number	72	68	22	7	3	2	1
	Per cent	41.1%	38.9%	12.6%	4.0%	1.7%	1.1%	.6%
Medium	Number	67	23	6	2	1	1	0
	Per cent	67.0%	23.0%	6.0%	2.0%	1.0%	1.0%	0.0%
Large	Number	51	17	3	2	2	0	0
	Per cent	68.0%	22.7%	4.0%	2.7%	2.7%	0.0%	0.0%
Overall	Number	190	108	31	11	6	3	1
	Per cent	54.3%	30.9%	8.9%	3.1%	1.7%	0.9%	0.3%

Mean: 0.70 SD: 1.01

4.3.9 Dairying as major occupation

Figure 4.1 shows the distribution of farmers according to the criteria whether dairying is their major occupation. The results showed that the proportion of farmers who considered dairying as their major occupation was 20.6, 41.0 and 49.3 per cent respectively in small, medium and large size farms . Overall picture showed that 32.6 per cent of farmers considered dairying as their major occupation.

4.3.10 Major occupation / sources of income of farm households

Figure 4.2 shows the major occupation or sources of income of farm households. The results revealed that majority of the farmers irrespective of farm size had dairying, agriculture or allied fields as their major sources of income. In small farms 20.6, 29.1, 20.0 per cent farmers were dependent on dairying, agriculture and agriculture plus private job as their major source of income. In medium farms 40, 28.0 and 11.0 per cent involved in dairying agriculture and agriculture plus private job as their major source of income. In large famers 53.3, 28.0, 10.7 per cent took dairying, agriculture and business as their major source of

income. Overall picture showed that the major sources of income in dairy households were dairying (33.2 per cent), Agriculture (30.9 per cent) Government job (1.7 per cent), private job (5.4 per cent), business (2.9 per cent), agricultural labour (2.3 per cent), industrial labour (1.1 per cent) labour (3.1 per cent), Agriculture + Govt. job (3.4 per cent), agriculture + government + private job (1.1 per cent) and agriculture + industrial labour (1.7 per cent).

4.3.11 Land holding

Table 4.3.11 shows the distribution of farm house holds according to their land holding. In small farms the proportion of families having different land holdings were less than 30 cent (20.6 per cent), 30-100 cents (60 per cent), 101-500 (73 per cent), and more than 500 cents (6.0 per cent). In medium farms the corresponding proportions were 18.0, 19.0, 50.0 and 13.0 per cent respectively. In large farms the proportion was 6.7, 12.0, 49.3 and 32.0 per cent respectively. Irrespective of farm size, majority of farmers were having a land holding between 101- 500 cents. The overall picture showed the distribution of land holding as 16.9 per cent (less than 30 cents) , 25.1 (30-100) 45.7 (101-500) and 12.3 per cent (500 cents).

Table 4.3.11 Distribution of farm households according to the land holding

Farm Type	Number/ Per cent	Land Holding in cents			
		<30	30-100	101-500	>500
Small	Number	36	60	73	6
	Per cent	20.6%	34.3%	41.7%	3.4%
Medium	Number	18	19	50	13
	Per cent	18.0%	19.0%	50.0%	13.0%
Large	Number	5	9	37	24
	Per cent	6.7%	12.0%	49.3%	32.0%
Overall	Number	59	88	160	43
	Per cent	16.9%	25.1%	45.7%	12.3%

Mean: 264.60 SD: 319.28

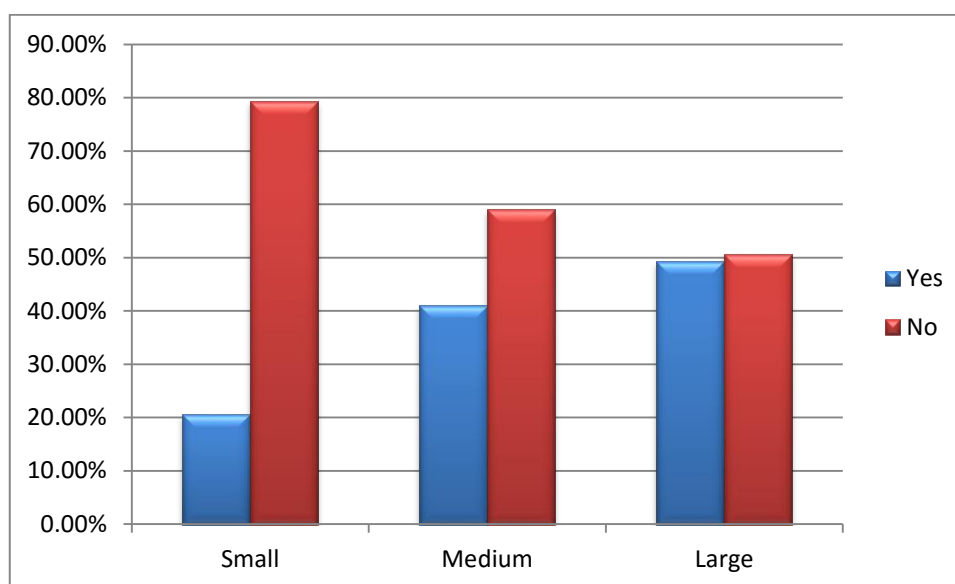


Figure 4.1 Distribution of farmers according to the criteria of dairying as the major occupation

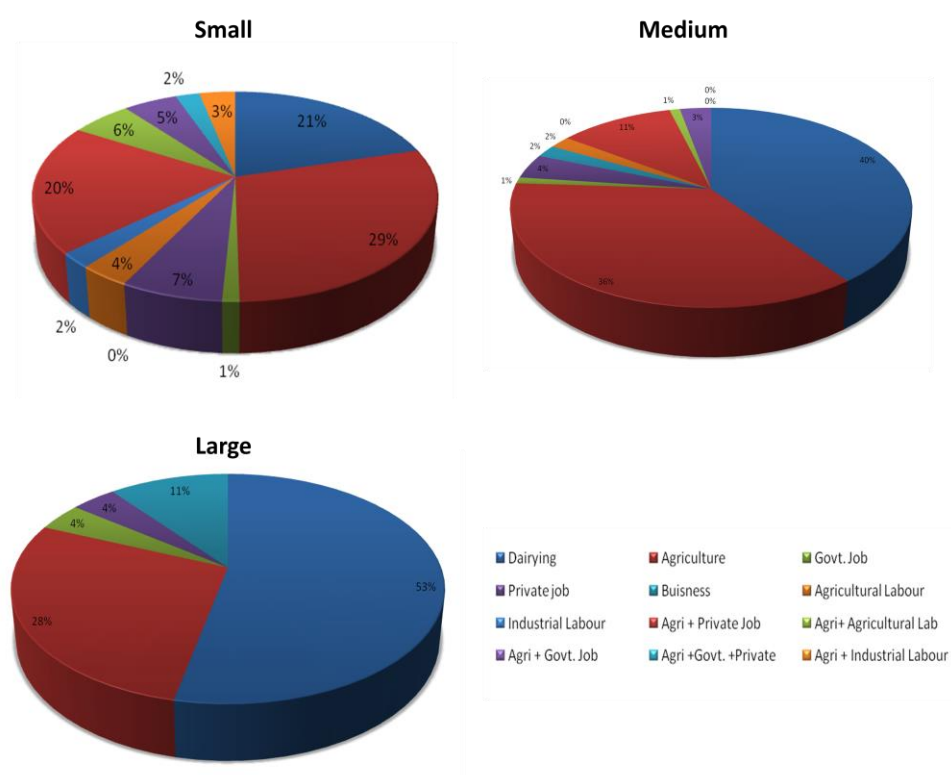


Figure 4.2 Distribution of farm households according to the major sources of income

4.3.12 Experience in dairying

The table 4.3.12 shows the experience of farmers in dairying. The results indicated that in all farm sizes majority of the farmers were having medium level of experience in dairying. In small, medium and large farms the farmers with medium level of experience was 69.7, 72.0 and 40.0 per cent respectively. In large farms 42 per cent of the farmers were having low level of experience and in small farms 22.3 per cent were having high level of experience ,which were comparatively higher in respective groups. The overall picture showed that 20, 64.0 and 16.0 per cent of farmers were having low medium and high experience in dairying.

Table 4.3.12 Distribution of farmers according to the experience in dairying

Farm Type	Number / Per cent	Experience		
		Low	Medium	High
Small	Number	14	122	39
	Per cent	8.0%	69.7%	22.3%
Medium	Number	14	72	14
	Per cent	14.0%	72.0%	14.0%
Large	Number	42	30	3
	Per cent	56.0%	40.0%	4.0%
Overall	Number	70	224	56
	Per cent	20.0%	64.0%	16.0%

Mean: 2.88 SD: 1.35

4.3.13 Family Experience Index

Table 4.3.13 shows the family experience index of the dairy households under different farm sizes. Irrespective of farm sizes medium level of experience was dominant with 69.1, 68.0 and 34.7 per cent in small, medium and large farms respectively. Low family experience index was observed in 10.9, 16.0 and 57.3 per cent of small, medium and large farms respectively. The overall picture showed that 22.3, 61.4 and 16.3 per cent of farm families were having low, medium and high experience in dairying.

4.3.13 Distribution of farm households according to the family experience index

Farm Type	Number / Per cent	Family Experience		
		Low	Medium	High
Small	Number	19	121	35
	Per cent	10.9%	69.1%	20.0%
Medium	Number	16	68	16
	Per cent	16.0%	68.0%	16.0%
Large	Number	43	26	6
	Per cent	57.3%	34.7%	8.0%
Overall	Number	78	215	57
	Per cent	22.3%	61.4%	16.3%

Mean: 2.13

SD: 1.11

4.3.14 Purpose of cattle rearing

Table 4.3.14 shows the purposes for which cattle rearing was under taken and preference were given ranks. In all farm types and overall, the major reason for rearing cattle was in the order of rank- self employment, source of additional income, manure, use of crop by products, availability of quality milk, inheritance and interest in cattle rearing.

Table 4.3.14 The purposes of cattle rearing as ranked by the farmers

Purpose	Mean/ Rank	Farm Type			Overall
		Small	Medium	Large	
Self employment	Mean	1.00	1.02	1.00	1.00
	Rank	I	I	I	I
Additional Income	Mean	1.25	1.31	1.18	1.26
	Rank	II	II	II	II
Manure	Mean	2.02	2.37	2.02	2.12
	Rank	III	III	III	III
Use of Crop By-products	Mean	3.12	3.48	3.03	3.19
	Rank	IV	IV	IV	IV
Quality Milk	Mean	3.35	3.92	3.89	3.66
	Rank	V	V	V	V
Inheritance	Mean	3.96	4.77	4.87	4.41
	Rank	VI	VI	VI	VI
Interest	Mean	5.16	5.70	5.75	5.47
	Rank	VII	VII	VII	VII

4.3.15 Motivation for dairying

Table 4.3.15 shows the distribution of farmers according to the level of motivation in dairying. In small farms 26.9, 60.0 and 13.1 per cent farmers were having low, medium and high level of motivation in dairying. In medium farms 22.0, 59.0 and 19.0 per cent were having low, medium and high level of motivation. In large farms 5.3, 62.7, 32.0 per cent were having corresponding motivation level. In overall 20.9, 60.3 and 18.9 per cent were having low, medium and high motivation level. Comparatively the motivation level was lowest in small farms and highest in large farms.

Table 4.3.15 Distribution of farmers according to the motivation level in dairying

Farm Size	Number/ Per cent	Motivation for dairying		
		Low	Medium	High
Small	Number	47	105	23
	Per cent	26.9%	60.0%	13.1%
Medium	Number	22	59	19
	Per cent	22.0%	59.0%	19.0%
Large	Number	4	47	24
	Per cent	5.3%	62.7%	32.0%
Overall	Number	73	211	66
	Per cent	20.9%	60.3%	18.9%

Mean: 3.48 SD: 1.13

4.3.16 Previous job before start of dairying

The previous jobs ,the farmers were engaged before starting dairying was shown in Figure 4.3. The result showed that majority of the farmers were engaged in agriculture, animal husbandry and allied works as traditional farmers. The per cent of farmers in these groups were 82.9, 85 and 76 per cent in small, medium and large groups respectively. In large farms 9.3, 2.7, and 12.0 per cent were working abroad, Government employees and in private job respectively.

4.3.17 Shift in sector

Figure 4.4 shows the shift of farmers from other sectors to dairy sector

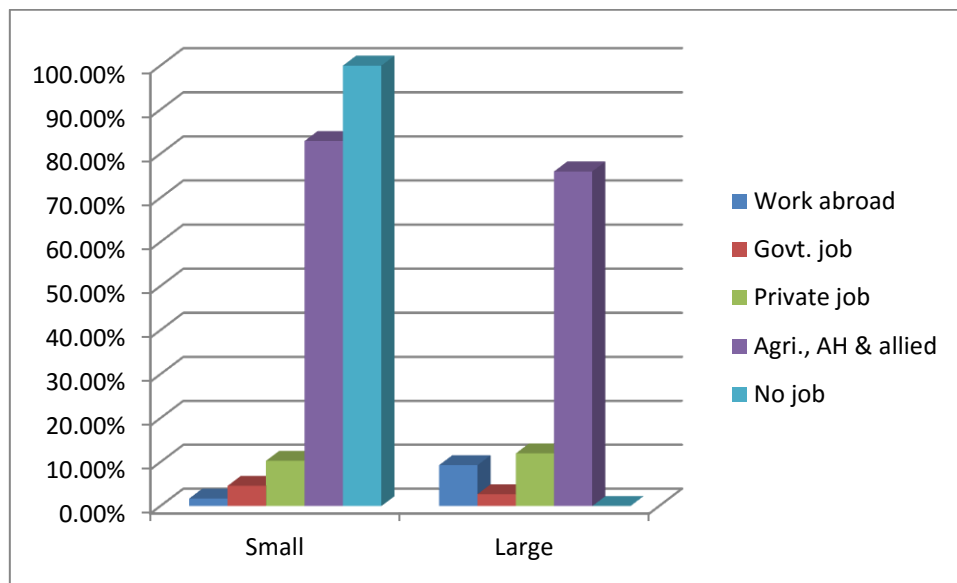


Figure 4.3 Distribution of farmers according to their previous job

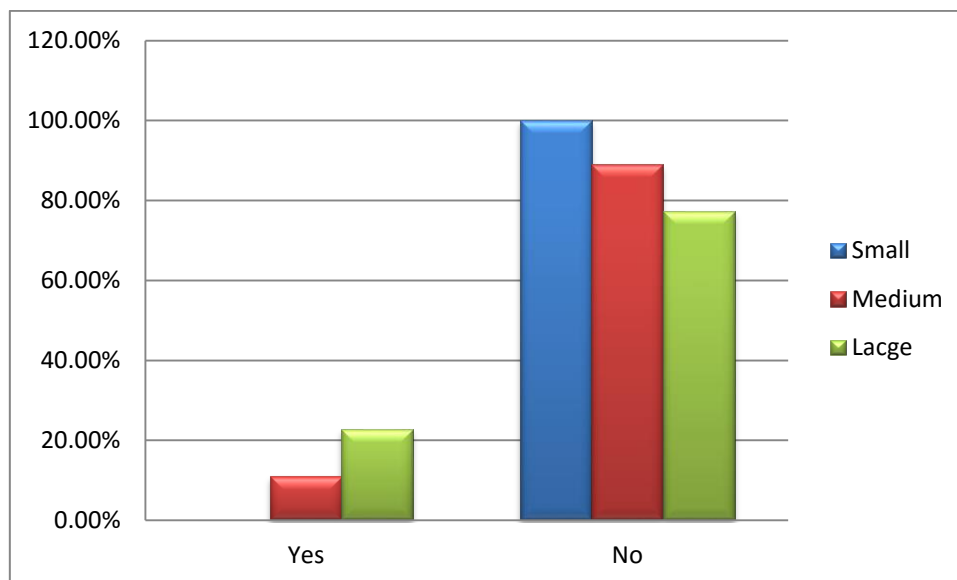


Figure 4.4 Distribution of farmers according to the shift in sector

The results revealed that, there were no shifted farmers in small farms whereas in medium and large farms 11 and 22.7 per cent shift was seen

4.3.18 Extent of information utilisation

Table 4.3.18 shows the extent of information utilisation by the farmers from different communication or mass media sources. Medium level of information utilisation was observed in all types of farms. The respective values were 62.3, 63.0 and 76.0 per cent. In large farms only 6.7 per cent farmers were having low level of information utilisation overall picture showed that 17.1, 65.4 and 17.4 per cent farmers were having low, medium and high level of information utilisation.

Table 4.3.18 Distribution of farmers according to their extent of information utilization

Farm Type	Number / Per cent	Information utilization		
		Low	Medium	High
Small	Number	35	109	31
	Per cent	20.0%	62.3%	17.7%
Medium	Number	20	63	17
	Per cent	20.0%	63.0%	17.0%
Large	Number	5	57	13
	Per cent	6.7%	76.0%	17.3%
Overall	Number	60	229	61
	Per cent	17.1%	65.4%	17.4%

Mean: 12.14 SD: 5.27

4.3.19 Social participation

Table 4.3.19 shows the extent of social participation of dairy farmers. In small farmers were having low, medium and high level of social participation. In medium farms the corresponding values were 79.0, 16.0 and 5.0 per cent respectively. In large farms it was 88.0, 5.3 and 6.7 per cent respectively. The overall picture showed that 70.3, 23.4 and 6.3 per cent of farmers were having low, medium and high level of social participation.

Table 4.3.19 Distribution of farmers according to their social participation

Farm Type	Number / Per cent	Social participation		
		Low	Medium	High
Small	Number	101	62	12
	Per cent	57.7%	35.4%	6.9%
Medium	Number	79	16	5
	Per cent	79.0%	16.0%	5.0%
Large	Number	66	4	5
	Per cent	88.0%	5.3%	6.7%
Overall	Number	246	82	22
	Per cent	70.3%	23.4%	6.3%

Mean: 1.36

SD: 0.59

4.3.20 Credit orientation

Table 4.3.20 shows the distribution of farmers according to their credit orientation. In all farm types and in overall, majority of the farmers were having medium level of credit orientation. The corresponding values were 32.6, 37.0 and 26.7 per cent respectively. The credit orientation was comparatively lower in medium farms and higher in large farms. The overall picture showed that 26.3, 32.6 and 41.1 per cent of farmers were having low, medium and high level of credit orientation.

Table 4.3.20. Distribution of farmers according to their credit Orientation

Farm Type	Number / Per cent	Credit Orientation		
		Low	Medium	High
Small	Number	45	57	73
	Per cent	25.7%	32.6%	41.7%
Medium	Number	31	37	32
	Per cent	31.0%	37.0%	32.0%
Large	Number	16	20	39
	Per cent	21.3%	26.7%	52.0%
Overall	Number	92	114	144
	Per cent	26.3%	32.6%	41.1%

Mean: 3.49

SD: 1.31

4.4 HERD PROFILE

This section presents the details of composition of the herd, herd size, herd building, physiological state of animals, cattle transactions, calf disposal pattern, mortality and insurance of animals in the farm.

4.4.1 Composition of the herd

The details of composition of the herd in different farms are given in Table 4.4.1. In small farms the composition of the herd were as milk animals (24.14 per cent), dry animals (3.15 per cent), Milch animals (27.29 per cent), heifers (11.26 per cent), female calves (10.40 per cent), male calves (6.68 per cent), and total calves (17.08 per cent). In medium farms the respective values were 25.33, 5.24, 30.56, 8.48, 8.31, 6.89 and 15.20 per cent. In large farms it was 26.54, 8.20, 34.74, 6.10, 9.21, 3.0 and 12.2 per cent respectively. In all farms, milch animals proportion was dominant. All the farms showed almost same pattern of distribution of different categories of cattle. The overall picture showed a composition of, in milk animals (25.92 per cent), dry (6.81 per cent), milch (32.74 per cent), heifer (7.37 per cent), female calf (9.17 per cent) male calf (4.41 per cent) and total calves (13.58 per cent).

Table 4.4.1 Composition of the herd under different farm sizes

Farm size	In Milk	Dry	Milch	Heifer	Calf - Female	Calf - Male	Total Calves	Total
Small	253.0 (24.14)	33.0 (3.15)	286.0 (27.29)	118.0 (11.26)	109.0 (10.40)	70.0 (6.68)	179.0 (17.08)	1048
Medium	445.0 (25.33)	92.0 (5.24)	537.0 (30.56)	149.0 (8.48)	146.0 (8.31)	121.0 (6.89)	267.0 (15.20)	1757
Large	1265.0 (26.54)	391.0 (8.20)	1656.0 (34.74)	291.0 (6.10)	439.0 (9.21)	143.0 (3.00)	582.0 (12.21)	4767
Overall	1963.0 (25.92)	516.0 (6.81)	2479.0 (32.74)	558.0 (7.37)	694.0 (9.17)	334.0 (4.41)	1028.0 (13.58)	7572

Figures in parenthesis indicate per cent to total

4.4.2 Average herd size based on Standard Animal Unit (SAU)

Figure 4.5 showed the average herd size of the farms under different farm sizes based on Standard Animals Unit (SAU). In small, medium and large farms, the herd size was 3.13 ± 0.08 , 9.52 ± 0.3 and 36.38 ± 3.65 respectively. The overall herd size was 12.08 ± 1.05 .

4.4.3 Herd building

4.4.3.1 Mode of replacement of animals in farms

The mode of replacement of animals in the farm is presented in the Figure 4.6. Irrespective of farm size the preferred mode of replacement was purchase. In small, medium and large farms 59.4, 69.0 and 88.0 per cent of farmers preferred purchase as the mode of replacement or herd building. The overall picture showed that 68.3 per cent of farmers preferred purchase and 31.7 per cent preferred farm rearing. The preference for purchase was highest in large farms and lowest in small farms.

4.4.3.2 Composition of purchased animals in the farms

Table 4.4.3.2 shows the composition of purchased animals in the farms. It was revealed that in small, medium and large farms, 52.45, 62.57 and 83.57 per cent were adult animals respectively. Heifers constituted 15.25, 7.38 and 5.50 per cent in small, medium and large farms respectively. The calves were 3.35, 1.12 and 5.50 in small, medium and large respectively in purchased animals.

Table 4.4.3.2 Composition of purchased animals in the farms

Farm size	Adult	Heifer	Calf	Total
Small	150.0 (52.45)	18.0 (15.25)	6.0 (3.35)	174.0
Medium	336.0 (62.57)	11.0 (7.38)	3.0 (1.12)	350.0
Large	1383.0 (83.51)	16.0 (5.50)	32.0 (5.50)	1431.0
Overall	1869.0	45.0	41.0	1955.0

Figures in parenthesis indicate per cent to total

4.4.3.3 Composition of animals reared in the farms

Table 4.4.3.3 shows the composition of animals reared in the farm. The proportion of adult animals in total reared animals was 46.50, 37.99 and 15.28 in

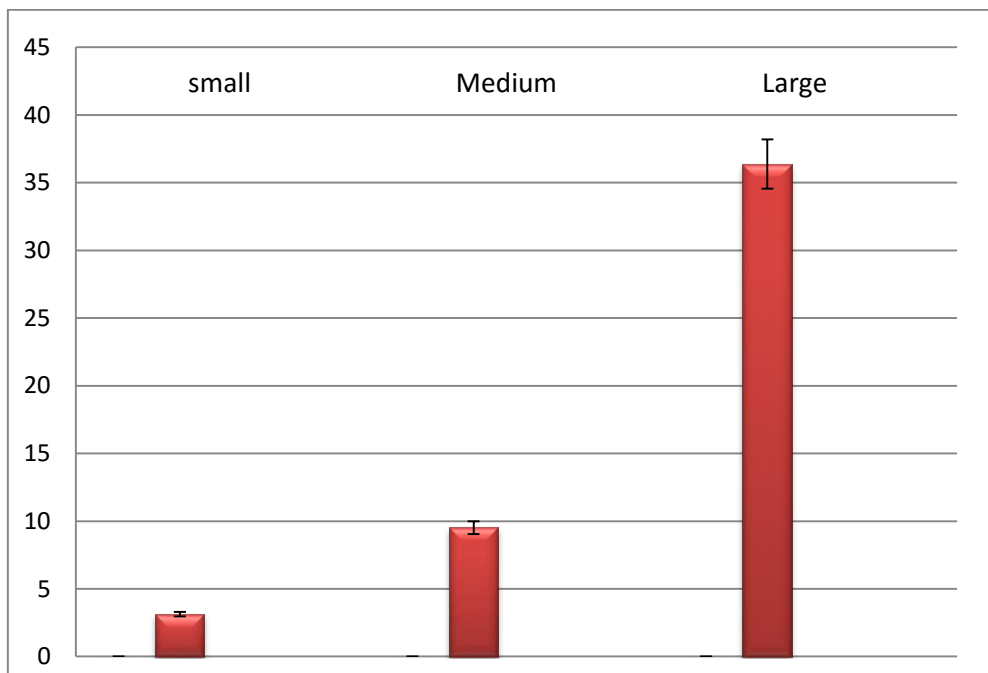


Figure 4.5 Average herd size under different farm sizes

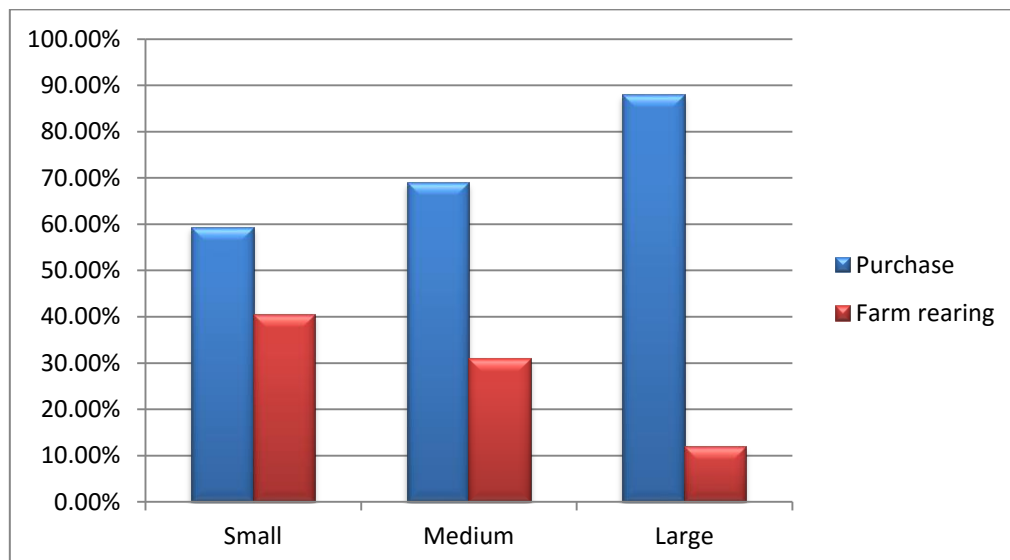


Figure 4.6 Preferred mode of replacement of animals in farms

small, medium and large farms respectively. The respective values for heifers were 66.1, 94.63 and 94.50. The calves reared were 93.6, 95.88 and 96.37 per cent in small, medium and large farms respectively.

Table 4.4.3.3 Composition of animals reared in the farms

Farm size	Adult	Heifer	Calves	Total
Small	133.0 (46.50)	78.0 (66.10)	167.0 (93.30)	378.0
Medium	204.0 (37.99)	141.0 (94.63)	256.0 (95.88)	601.0
Large	253.0 (15.28)	275.0 (94.50)	561.0 (96.39)	1089.0
Overall	590.0	494.0	984.0	2068.0

Figures in parenthesis indicate per cent to total

4.4.3.4 Details of purchase in farms (Based on the last purchased animal)

4.4.3.4.1 Type of purchase

Table 4.4.3.4.1 shows the details of type of purchase in the farms. The result indicated that irrespective of the size, direct purchase was the dominant type. The government scheme linked purchase was only 21.1, 25.0 and 10.7 per cent in small, medium and large farms respectively. The proportion of direct purchase was 78.9, 75.0 and 89.3 per cent respectively. The overall picture showed 80.0 and 20.0 per cent was direct and scheme purchase respectively.

Table 4.4.3.4.1 Details of type of purchase of animals.

Type of Purchase	Number & per cent	Small	Medium	Large	Total
Direct	Number	138	75	67	280
	Per cent	78.90%	75.00%	89.30%	80.00%
Scheme	Number	37	25	8	70
	Per cent	21.10%	25.00%	10.70%	20.00%
Overall	Number	175	100	75	350

4.4.3.4.2 Source of purchase

Table 4.4.3.4.2 shows the source of purchase of animals. In small farms 66.3, 3.4, 30.3 per cent of animals were purchased from within district, within state and outside state. In medium farms 56.0, 4.0 and 40.0 per cent were the

respective figures. In case of large farms 30.3, 40.0 and 76.0 per cent were the proportion of within district, within state and outside state purchase respectively. The overall picture showed 54.3, 2.9 and 42.9 per cent respectively in different sources of purchase.

Table 4.4.3.4.2 Details of source of purchase

Source of Purchase	Number & per cent	Small	Medium	Large	Total
Within District	Number	116	56	18	190
	Per cent	66.3%	56.0%	24.0%	54.3%
Within State	Number	6	4	0	10
	Per cent	3.4%	4.0%	0.0%	2.9%
Outside State	Number	53	40	57	150
	Per cent	30.3%	40.0%	76.0%	42.9%
Overall	Number	175	100	75	350

4.4.3.4.3 Finance for purchase

The source of finance for purchase of animals in the farms is described in Table 4.4.3.4.3 .Using own finance was the dominant source of finance in all types of farms. The respective values were 60.0, 63.0 and 78.7 in small, medium and large farms. The subsidy linked purchase was 20.6, 20.0 and 9.3 per cent in small, medium and large farms respectively. The overall picture showed that own finance , loan, own finance plus loan and subsidy linked purchases were 64.9, 11.1, 6.0 and 18.0 per cent respectively.

4.4.3.4.4 Breed purchased

Table 4.4.3.4.4 shows the details of the breed purchased in the farms. In small farms ,37.7 and 62.3 per cent were Crossbred Jersey and Crossbred Holstein Friesian respectively. In medium farms the respective figures were 35.0 and 65.0 per cent. The large farms showed a high proportion of CBHF (86.7 per cent) and CBJ with only 13.3 per cent proportion of the purchase. The overall picture showed that 31.7 and 68.3 per cent of purchased animals were CBJ and CBHF respectively.

Table 4.4.3.4.3 Details of finance for purchase

Finance for Purchase	Number & per cent	Small	Medium	Large	Total
Own finance	Number	105	63	59	227
	Per cent	60.0%	63.0%	78.7%	64.9%
Loan	Number	21	12	6	39
	Per cent	12.0%	12.0%	8.0%	11.1%
Own finance + Loan	Number	13	5	3	21
	Per cent	7.4%	5.0%	4.0%	6.0%
Subsidy Linked	Number	36	20	7	63
	Per cent	20.6%	20.0%	9.3%	18.0%

Table 4.4.3.4.4 Details of breed purchased

Breed Purchased	Number & Per cent	Small	Medium	Large	Total
CBJ	Number	66	35	10	111
	Per cent	37.7%	35.0%	13.3%	31.7%
CBHF	Number	108	64	65	237
	Per cent	62.3%	65.0%	86.7%	68.3%

4.4.3.4.5 Production level of animal purchased

The detail of production level of animals is presented in Table 4.4.3.4.5. In small and medium farms majority of the animals belonged to the production level of 10-15 litres/day. In large farms, the majority of the animals purchased were having a production level of 15-20 litres/day (64.0 per cent). The overall picture showed that out of total animals purchased 0.6, 16.9, 34.3, 32.6 and 15.7 per cent belonged to per day production level of 1-5, 5-10, 10-15, 15-20 and more than 20 respectively.

Table 4.4.3.4.5 Details of production level of animal purchased

Production level of purchased animal	Number & Per cent	Small	Medium	Large	Total
1-5 l	Number	2	0	0	2
	Per cent	1.1%	0.0%	0.0%	.6%
5-10 l	Number	33	26	0	59
	Per cent	18.9%	26.0%	0.0%	16.9%
10-15 l	Number	63	37	20	120
	Per cent	36.0%	37.0%	26.7%	34.3%
15-20 l	Number	48	18	48	114
	Per cent	27.4%	18.0%	64.0%	32.6%
> 20 l	Number	29	19	7	55
	Per cent	16.6%	19.0%	9.3%	15.7%

4.4.3.4.6 Stage of purchase

Table 4.4.3.4.6 shows the details of stage of purchase of animals in the farms. Majority of animals purchased in small (65.1 per cent), medium (63.0 per cent) and large (78.7 per cent) were lactating animals, while that of pregnant animals was 29.1, 36.0 and 20.0 per cent in respective farms. The purchase of heifers and calves were very few in all types of farms. The overall picture revealed that 67.4, 29.1, 3.1 and 0.3 per cent of the purchased animals were lactating, pregnant, heifer and calves respectively.

Table 4.4.3.4.6 Details of stage of the purchased animal

Stage of Purchase	Number & per cent	Small	Medium	Large	Total
Lactating	Number	114	63	59	236
	Per cent	65.1%	63.0%	78.7%	67.4%
Pregnant	Number	51	36	15	102
	Per cent	29.1%	36.0%	20.0%	29.1%
Heifer	Number	9	1	1	11
	Per cent	5.1%	1.0%	1.3%	3.1%
Calf	Number	1	0	0	1
	Per cent	.6%	0.0%	0.0%	.3%

4.4.3.4.7 Lactation number of the animal purchased

Details of the lactation number of the purchased animals are given in the Table 4.4.3.4.7. In small, medium and large farms, the majority of the animals purchased, were belonging to first order lactation followed by second and third. The share of second order lactation was 41.7, 54.0 and 50.7 per cent in small, medium and large farms respectively. The overall picture showed that the proportion of animals belonging to first, second, third, fourth and fifth lactation was 36.6, 47.1, 14.9, 0.9 and 0.3 per cent respectively.

Table 4.4.3.4.7 Details of lactation number of the purchased animal

Lactation number of purchased animal	Number & Per cent	Small	Medium	Large	Total
1.0	Number	62	33	33	128
	Per cent	35.4%	33.0%	44.0%	36.6%
2.0	Number	73	54	38	165
	Per cent	41.7%	54.0%	50.7%	47.1%
3.0	Number	37	11	4	52
	Per cent	21.1%	11.0%	5.3%	14.9%
4.0	Number	2	1	0	3
	Per cent	1.1%	1.0%	0.0%	.9%
5.0	Number	1	0	0	1
	Per cent	.6%	0.0%	0.0%	.3%

4.4.3.5 Preference in purchase of animals in the farms

4.4.3.5.1 Preferred type of purchase

The details of farmers preference in type of purchase of animals is presented in table 4.4.3.5.1. The preference for direct purchase was 52.0, 25.0 and 60.0 per cent in small, medium and large sized farms respectively. The preference for scheme linked purchase was 47.4, 67.0 and 40.0 per cent in respective farms. The preference for combination of both was 0.6, 8.0 and zero

per cent in small, medium and large farms. The overall values were 46.0, 51.4 and 2.6 per cent for direct, scheme linked and combination purchases.

Table 4.4.3.5.1 Details of preference for the type of purchase of animals

Farm Type	Number / Per cent	Preferred type of animal purchase			Total
		Direct	Scheme	Combination	
Small	Number	91	83	1	175
	Per cent	52.0%	47.4%	.6%	100.0%
Medium	Number	25	67	8	100
	Per cent	25.0%	67.0%	8.0%	100.0%
Large	Number	45	30	0	75
	Per cent	60.0%	40.0%	0.0%	100.0%
Overall	Number	161	180	9	350
	Per cent	46.0%	51.4%	2.6%	100.0%

4.4.3.5.2 Preferred source of purchase

Table 4.4.3.5.2 shows the details of preferred source of purchase of animals in the farms. The preference for within district purchase was 77.7, 69.0 and 16.0 per cent in small, medium and large farms respectively. In large farms 66.7 per cent of farmers preferred outside state purchase. The overall result showed that the preference for within district, within state, outside state and combination purchase was 62.0, 6.6, 29.7 and 1.7 per cent respectively.

4.4.3.5.3 Preference for finance

Table 4.4.3.5.3 shows the details of preference of farmers for finance for purchase of animals. The subsidy based purchase was 52.0, 69.0 and 29.3 per cent in small, medium and large farms respectively. In case of large farms majority of the farmers (52.0 per cent) preferred own source of finance. The overall picture showed that 41.4, 4.0, 0.3, 52.0 and 2.6 per cent preferred own finance, loan own + loan, own + subsidy and loan + own + subsidy as source of finance of purchase of animals.

Table 4.4.3.5.2 Details of preferred source of purchase of animals

Farm Type	Number / Per cent	Preferred source of purchase			
		Within District	Within state	Outside state	Combinations
Small	Number	136	8	30	1
	Per cent	77.7%	4.6%	17.1%	.6%
Medium	Number	69	2	24	5
	Per cent	69.0%	2.0%	24.0%	5.0%
Large	Number	12	13	50	0
	Per cent	16.0%	17.3%	66.7%	0.0%
Total	Number	217	23	104	6
	Per cent	62.0%	6.6%	29.7%	1.7%

Table 4.4.3.5.3 Details of preference of finance for purchase of animals

Farm Type	Number / Per cent	Finance source preferred for animal purchase				
		Own	Loan	Own + Loan	Own + Subsidy	Loan + Own + Subsidy
Small	Number	76	0	0	91	8
	Per cent	43.4%	0.0%	0.0%	52.0%	4.6%
Medium	Number	29	1	0	69	1
	Per cent	29.0%	1.0%	0.0%	69.0%	1.0%
Large	Number	39	13	1	22	0
	Per cent	52.0%	17.3%	1.3%	29.3%	0.0%
Total	Number	144	14	1	182	9
	Per cent	41.1%	4.0%	.3%	52.0%	2.6%

4.4.3.5.4 Preference for breed

The details of preference for a particular breed by farmers during purchase are given in Table 4.4.3.5.4. The preference for CBJ animals was 56.0, 28.0 and 8.0 per cent in small, medium and large farms. The preference for CBHF was 40.6, 56.0 and 57.3 per cent in respective farms. The preference for local animals was negligible. In small, medium and large farms 2.9, 16.0 and 34.7 per cent preferred combination of both breeds. The overall picture showed that 37.7, 48.6,

0.3 and 13.4 per cent of farmers preferred CBJ, CBHF, local and combination of CBJ and CBHF respectively.

Table 4.4.3.5.4 Details of breed preference by farmers for purchase

Farm Type	Number / Per cent	Breed Preferred			
		CBJ	CBHF	Others	Mixed
Small	Number	98	71	1	5
	Per cent	56.0%	40.6%	0.6%	2.9%
Medium	Number	28	56	0	16
	Per cent	28.0%	56.0%	0.0%	16.0%
Large	Number	6	43	0	26
	Per cent	8.0%	57.3%	0.0%	34.7%
Overall	Number	132	170	1	47
	Per cent	37.7%	48.6%	0.3%	13.4%

4.4.3.5.5 Preference for production level

Table 4.4.3.5.5 shows the preference for production level of animals purchased. Majority of small (31.4 per cent) and medium farms (38.0 per cent) and 15-20 litres/day production level. In large farms majority (40.0 per cent) preferred more than 20 l production per day. The overall results showed that 9.7, 26.9, 33.7, and 29.7 preferred production level of 5-10, 11-15, 15-20 and more than 20 litres/day respectively.

Table 4.4.3.5.5 Details of preferred production level of animals

Farm Type	Number / Per cent	Preferred production level(Litres)				Total
		5 to 10	11 to 15	15 to 20	> 20	
Small	Number	30	42	55	48	175
	Per cent	17.1%	24.0%	31.4%	27.4%	100.0%
Medium	Number	4	32	38	26	100
	Per cent	4.0%	32.0%	38.0%	26.0%	100.0%
Large	Number	0	20	25	30	75
	Per cent	0.0%	26.7%	33.3%	40.0%	100.0%
Overall	Number	34	94	118	104	350
	Per cent	9.7%	26.9%	33.7%	29.7%	100.0%

4.4.3.5.6 Preference of stage of purchase

The details of stage of lactation of animals preferred by farmers for purchase are described in table 4.4.3.5.6. Irrespective of farm size, the farmers preferred lactating animals for purchase. In small, medium and large farms 88.0, 60.0 and 66.7 per cent preferred lactating animals respectively. The preference of lactating ones was followed by pregnant animals. The preference for heifers and calf purchase was negligible. The overall results showed that 75.4, 20.6, 1.7 and 2.3 per cent of farmers preferred lactating pregnant, heifer and calf respectively.

Table 4.4.3.5.6 Details of Stage of lactation of animals preferred by farmers

Farm Type	Number / Per cent	Preferred stage of lactation (days)			
		Lactating	Pregnant	Heifer	Calf
Small	Number	154	18	3	0
	Per cent	88.0%	10.3%	1.7%	0.0%
Medium	Number	60	36	3	1
	Per cent	60.0%	36.0%	3.0%	1.0%
Large	Number	50	18	0	7
	Per cent	66.7%	24.0%	0.0%	9.3%
Overall	Number	264	72	6	8
	Per cent	75.4%	20.6%	1.7%	2.3%

4.4.3.5.7 Preference for lactation number

Table 4.4.3.5.7 shows the details of the preferred lactation number for purchase by farmers. The results revealed that majority of farmers in small farms preferred a combination of first and second lactation order (64.6 per cent) followed by combination of first, second and third lactation (10.3 per cent). In medium farms 45 per cent preferred combination of first and second lactation followed by first, second and third combination (34.0 per cent). In large farms 56.0 per cent preferred combination of first and second lactation followed by 17.3 per cent preferring a combination of first, second and third lactation. The overall result showed that 4, 16.0, 0.6, 0.9, 57.1, 18.6 and 2.9 per cent preferred first,

second, third, fourth, combination of first and second, combination of first, second and third and other combinations respectively.

Table 4.4.3.5.7 Details of preferred lactation number for purchase

Farm Type	Number / Per cent	Preferred lactation no						
		I	II	III	IV	Combination of I & II	Combination of I, II and III	Combination
Small	Number	7	30	2	3	113	18	2
	Per cent	4.0%	17.1%	1.1%	1.7%	64.6%	10.3%	1.1%
Medium	Number	0	13	0	0	45	34	8
	Per cent	0.0%	13.0%	0.0%	0.0%	45.0%	34.0%	8.0%
Large	Number	7	13	0	0	42	13	0
	Per cent	9.3%	17.3%	0.0%	0.0%	56.0%	17.3%	0.0%
Overall	Number	14	56	2	3	200	65	10
	Per cent	4.0%	16.0%	.6%	.9%	57.1%	18.6%	2.9%

4.4.4 Physiological state of animals in the farm

4.4.4.1 Status of animals based on lactation number

Table 4.4.4.1 shows the lactation number or order of lactation of animals present in the farms. The results showed that irrespective of farm size, almost 90 per cent of animals were in the first five lactation orders. In small farms majority (94 per cent) belonged to second order, followed by first (28.3 per cent) and third (21.1 per cent). In medium size the proportion of second, first and third lactation order were 32.3, 25.7 and 25.5 respectively. In large farms, respective order was 30.0, 26.6 and 27.3 per cent respectively. The overall analysis showed the presence of 1st to 8th lactation number as 26.6, 30.6, 26.2, 9.6, 4.3, 1.6, 0.6 and 0.2 per cent respectively.

Table 4.4.4.1 Distribution of animals based on lactation number in the farms

Farm size	1	2	3	4	5	6	7	8	Total
Small	86 28.4 %	94 31. %	64 21.1%	44 14.5%	8 2.6%	2 0.7%	1 0.3%	4 1.3%	303
Medium	127 25.7%	160 32.4%	126 25.5%	55 11.1%	11 2.2%	7 1.4%	6 1.2%	2 0.4%	494
Large	439 26.6%	496 30.1%	452 27.44%	136 8.2%	87 5.3%	31 1.9%	8 0.5%	1 0.06%	1650
Overall	652 26.6%	750 30.7%	642 26.2%	235 9.6%	106 4.3%	40 1.6%	15 0.6%	7 0.3%	2447

4.4.4.2 Status of animals based on stage of lactation and pregnancy

The distribution of animals based on stage of lactation and pregnancy are detailed in Table 4.4.4.2. The results indicated that, irrespective of farm size majority of animals in small (23.33 per cent), medium (23.57 per cent) and large farms (20.15 per cent) were in the first 100 days of lactation. The proportion of dry animals were 7.9, 12.2 and 16.8 per cent in small, medium and large farms respectively. The proportion of pregnant animals was 27.44, 24.43 and 24.6 respectively in small, medium and large farms. Overall result showed that the animals upto 100 days of lactation, between 100 and 200 days, 200 to 300 day more than 300 days, dry and pregnant were 21.26, 15.46, 16.49, 7.11, 14.79 and 24.9 respectively.

Table 4.4.4.2 Distribution of animals based on stage of lactation and pregnancy status

Farm size	upto 100 days	100-200 days	200-300 days	more than 300	Dry	Preg nant	Total
Small	91 23.33 %	58 14.9 %	59 15.1 %	44 11.3 %	31 8.0 %	107 27.4 %	390
Medium	165 23.6 %	73 10.4 %	175 25%	30 4.3 %	86 12.3 %	171 24.4 %	700
Large	444 20.2%	378 17.2 %	309 14%	160 7.3 %	370 16.8 %	542 24.6 %	2203
Overall	700 21.3%	509 15.5%	543 16.5 %	234 7.1 %	487 14.8 %	820 24.9 %	3293

4.4.4.3 Distribution of animals based on their physiological status and peak states of production

Table 4.4.4.3 gives details of per cent of animals in milk, dry, pregnant, in first three lactations and in first 100 days of lactation. In small farms 90.57, 9.43, 35.43, 84.57 and 36.57 were under respective groups. In medium farms, the respective proportion was 84.81, 15.19, 31.66, 76.43 and 35.40. In large farms the proportion of above categories were 79.63, 20.37, 30.86, 84.47 and 38.15 respectively. The overall picture showed that 86.58 per cent of animals were in milk out of total milch animals, 13.42 per cent were dry, 33.37 per cent were pregnant, 82.22 per cent were in first three lactation order and 36.58 per cent in first 100 days of lactation.

Table 4.4.4.3 Details of distribution of animals based on their physiological status and peak production state.

Farm Size	% of animals in milk of total milch animals	% of dry animals of total milch animals	% of pregnant animals of total milch animals	% of animals in Ist three lactation no. of total milch animals	% of animals in Ist 100 days of lactation of total milch animals
Small	90.57	9.43	35.43	84.57	36.57
Medium	84.81	15.19	31.66	76.43	35.40
Large	79.63	20.37	30.86	84.47	38.15
Overall	86.58	13.42	33.37	82.22	36.58

4.4.4.4 Age and pregnancy status of heifers

Table 4.4.4.4 shows the average age, per cent of pregnant heifers in the farms. In small farms, average age of heifers was 20.11 months and 33.05 per cent were pregnant. In medium farms age and per cent of pregnancy was 21.65 and 31.54. In large farms, the respective figures were 19.73 and 31.2. The overall results showed that the average age of heifers were 20.49 months and 32.09 per cent heifers were pregnant.

Table 4.4.4.4 Details of age and pregnancy status of heifers in the farms.

Farm size	Average age of heifer	No of pregnant heifer	Total heifer	% of pregnant heifers
Small	20.11	39	118	33.05
Medium	21.65	47	149	31.54
Large	19.73	93	291	31.2
Overall	20.49	179	558	32.07

4.4.4.5 Age wise distribution of male calves

The age-wise distribution of male calves is given in the Table 4.4.4.5. In small farms 37.14, 35.71, 25.71 and 1.43 per cent were below three months, 3-6 months, 6-12 months and above 12 months respectively. In medium farms the corresponding values were 53.72, 19.85, 23.14 and 3.31 per cent. In large farms the respective figures were 55.2, 25.1, 19.5 and zero per cent. The overall results showed that 50.89, 25.45, 22.16 and 1.5 per cent of male calves were below three months, between three and six months, between six and twelve months and above twelve months respectively. Irrespective of farm size majority of male calves were below three months of age.

Table 4.4.4.5 Details of Age wise distribution of male calves

Farm size	Male calves	Age of male calves (months)							
		below 3	%	3 to 6	%	6 to 12	%	above 12	%
Small	70	26	37.14	25	35.71	18	25.71	1	1.43
Medium	121	65	53.72	24	19.85	28	23.14	4	3.31
Large	143	79	55.24	36	25.17	28	19.58	0	0
Overall	334	170	50.89	85	25.45	74	22.16	5	1.5

4.4.4.6 Age wise distribution of female calves

The age-wise distribution of female calves in different farms is given in Table 4.4.4.6. The results indicated that majority of the female calves were below

three months of age irrespective of farm size. In small farms the female calves below three months, between three and six months and between six and twelve months were 43.12, 35.72 and 21.1 per cent respectively. In medium farms, the respective figures were 35.62, 38.36 and 26.03. In large farms ,it was 46.01, 30.75 and 23.23 per cent. The overall results showed that 43.37 per cent of female calves were below three months of age, 33.14 per cent of female calves between three and six months and 23.49 per cent between six and twelve months of age.

Table 4.4.4.6 Details of Age wise distribution of female calves

Farm size	Age of female calves (months)						
	Female calves	Below 3	%	3 to 6	%	6 to 12	%
Small	109	47	43.12	39	35.78	23	21.1
Medium	146	52	35.62	56	38.36	38	26.03
Large	439	202	46.01	135	30.75	102	23.23
Overall	694	301	43.37	230	33.14	163	23.49

4.4.5 Cattle transactions

4.4.5.1 Cattle purchase (previous year)

Table 4.4.5.1 shows the details of purchase of animals and value of purchase. The results revealed that irrespective of farm size, the majority of animals purchased were milch cows and purchase of heifers and calves was in negligible numbers. In small, medium and large farms the average purchase value of milch animals was Rs. 41,523, Rs.42,441 and Rs.48,827 respectively. Overall level it was Rs. 46,816. The average value of heifer and calf was Rs. 7,000 and 501 in small farms. In medium farms it was Rs. 22,243 for heifers. In medium and large farms no purchase of heifers and calves were recorded in the previous year of study.

Table 4.4.5.1 Details of animal purchase in the farm during the previous year

Farm size	Purchase details								
	Milch animal	value (lakh Rs)	Av. value/ milch animal (lakh Rs)	Heifer	value (lakh Rs)	Av. value/ heifer (lakh Rs)	calf	value (lakh Rs)	Av. value/ calf (lakh Rs)
Small	65.0	26.99	0.415	4.0	0.28	0.07	2.0	0.01	0.005
Medium	102.0	43.29	0.412	7.0	1.55	0.224	0.0	0.0	0.0
Large	393.0	191.89	0.488	0.0	0.0	0.0	0.0	0.0	0.0
Overall	560.0	262.17	0.468	11.0	1.84	.167	2.0	0.01	0.005

4.4.5.2 Sale of animals (previous year)

The details of sale of animals in the farm in the preceding year of present study are described in Table 4.4.5.2. The results showed that majority of the sale were of milch animals and male calves. The number of heifers and female calves were comparatively lower. In small, medium and large farms the average sale value of milch animals were Rs. 22, 493, Rs. 20,985 and Rs. 23,947 respectively. The overall value was Rs. 23,051. In large farms the sale of both male and female calves was comparatively more.

4.4.6 Calf disposal pattern

Table 4.4.6.1 and Table 4.4.6.2 shows the disposal pattern of female and male calves in different farms. Irrespective of farms size, majority of female calves were retained in the farm. While majority of male calves were sold out. But in large farms the proportion of females retained was comparatively low. In small, medium and large farms the proportion of females retained were 86.3, 90.0 and 84.0 per cent respectively. The overall retaining rate was 86.9 per cent. In small, medium and large farms 99.4, 100 and 100 per cent of males were sold out. The overall picture was 99.7 per cent selling and 0.3 per cent retention.

Table 4.4.5.2 Details of sale of animals in the farm during the previous year

Farm size	Sale Details											
	Milch animal	Value (in lakh Rs)	Av. Value (Rs)	Heifer	Value (in lakh Rs)	Av. Value (Rs)	Male calf	Value	Av. Value (Rs)	female calf	Value (in lakh Rs)	Av. Value (Rs)
Small	63	14.17	22,493	9	1.18	13,111	49	2.58	5,255	12	0.82	6,854
Medium	65	13.64	20,985	10	0.94	9,400	77	2.51	3,255	26	1.79	6,885
Large	189	45.26	23,947	17	3.4	20,000	128	2.71	2,116	19	0.59	3,105
Overall	317	73.07	23,051	36	5.52	15,333	254	7.79	3,067	57	3.20	5,618

Table 4.4.6.1 Disposal pattern of female calves

Farm Type	Number / Per cent	Total		
		Selling out	Rearing	Total
Small	Number	24	151	175
	Per cent	13.7%	86.3%	100.0%
Medium	Number	10	90	100
	Per cent	10%	90.0%	100.0%
Large	Number	12	63	75
	Per cent	16b%	84.0%	100.0%
Overall	Number	46	304	350
	Per cent	13.1%	86.9%	100.0%

Table 4.4.6.2 Disposal pattern of male calves

Farm Type	Number / Per cent	Disposal pattern of male calves		
		Selling out	Rearing	Total
Small	Number	174	1	175
	Per cent	99.4%	.6%	100.0%
Medium	Number	100	0	100
	Per cent	100%	0.0%	100.0%
Large	Number	75	0	75
	Per cent	100%	0.0%	100.0%
Overall	Number	349	1	350
	Per cent	99.7%	.3%	100.0%

4.4.7 Mortality pattern in farms in the previous year

The details of mortality pattern of animals in the farms in the previous year of the present study is presented as Figure 4.7. The results revealed that irrespective of farm size the higher rate of mortality was observed in male calves.

4.4.8 Insurance of animals

Figure 4.8 and Table 4.4.8.2 shows the number of animals insured in different farms and the reasons perceived by the farmers for not insuring their animals. The results showed that only 43.3, 45.8 and 54.0 per cent of animals were insured in small, medium and large farms respectively. The overall value it

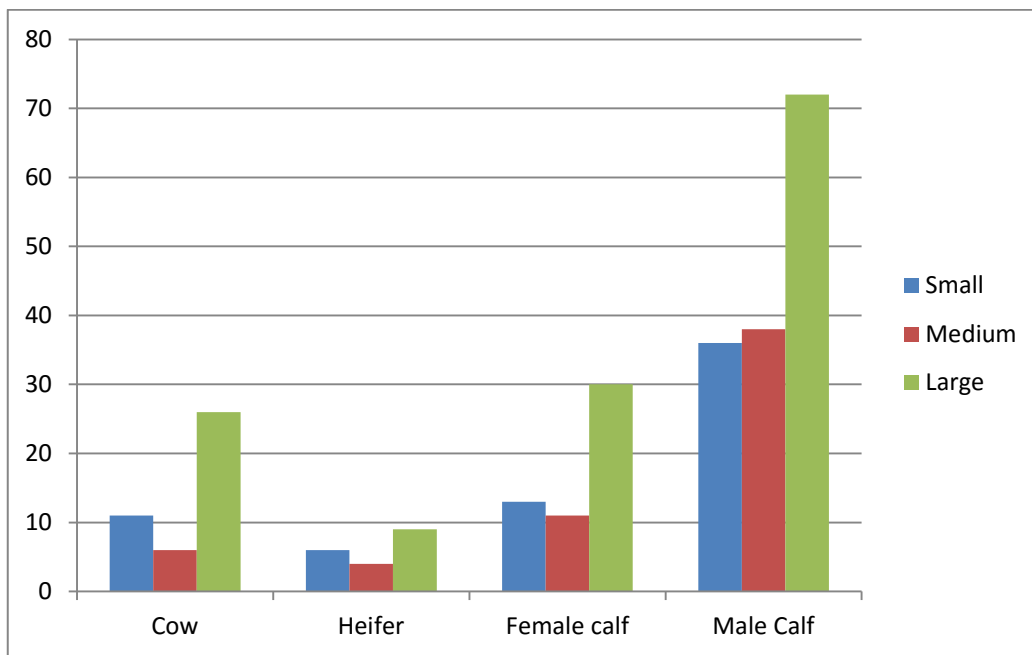


Figure 4.7 Mortality pattern of animals in the previous year (in numbers)

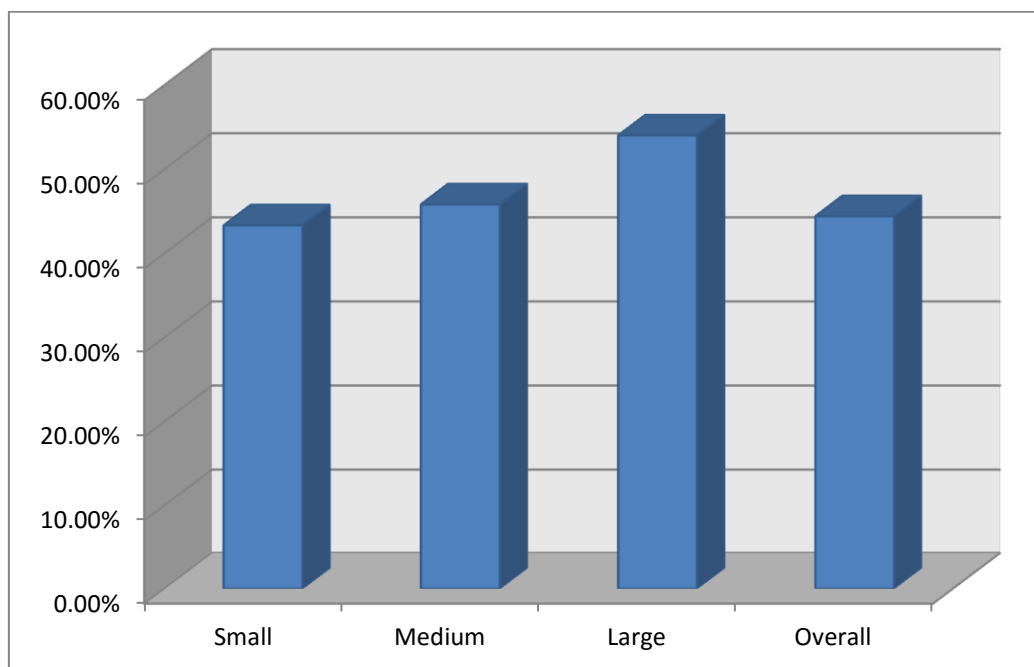


Figure 4.8 Per cent of animals insured in the farms

was 44.4 per cent. The major reasons cited by the farmers for not insuring their animals were high premium and delay in claim receipt.

Table 4.4.8.2 Reason for not insuring the animals in the farms

Reasons	Number /Per cent	Farm size		
		Small	Medium	Large
No insurance(0)	Number	86	62	51
High premium(1)	Number	23	1	0
Not aware of schemes and importance(2)	Number	4	0	0
(0), (1), and (2)	Number	5	24	11
Not interested (3)	Number	2	1	0
Difficulty in claim (4)	Number	1	0	0
(3) and 4	Number	53	12	13

4.5 FARM INVENTORY

4.5.1 Land for building

Table 4.5.1 shows the type of land used by the farmers for constructing animal sheds. It showed that 100 per cent of farmers irrespective of farm size used own land for building/cattle shed construction.

Table 4.5.1 Type of land for building

Parameter	Number/ per cent	Farm type		
		Small	Medium	Large
Own	Number	175	100	75
	Per cent	%	100.0%	100.0%
Lease	Number	0	0	0
	Per cent	0%	0.0%	0.0%

4.5.2 Land for fodder cultivation

The details of type of land used for fodder cultivation is given in the Table 4.5.2. In small, medium and large farms 48.0, 22.0 and 8.0 per cent had not cultivated fodder. Overall 32.0 per cent were not having fodder cultivation. In

small, medium and large farms majority of the farmers (46.9, 69.0, and 78.7 per cent respectively) used own land for fodder cultivation. In small, medium and large farms, 3.4, 7.0 and 8.0 per cent had leased land for fodder cultivation. The proportion of farmers who used both own and leased land farmers were 1.7, 2.0 and 5.3 per cent in small, medium and large farms respectively. The overall picture indicated that 32.0, 60.0, 5.4 and 2.6 per cent of farmers were having no fodder cultivation, own, lease and both for fodder cultivation respectively.

Table 4.5.2 .Type of land for fodder cultivation

Parameter	Number/ Per cent	Farm type			Total
		Small	Medium	Large	
No fodder	Number	84	22	6	112
	Per cent	48.0%	22.0%	8.0%	32.0%
Own	Number	82	69	59	210
	Per cent	46.9%	69.0%	78.7%	60.0%
Lease	Number	6	7	6	19
	Per cent	3.4%	7.0%	8.0%	5.4%
Both	Number	3	2	4	9
	Per cent	1.7%	2.0%	5.3%	2.6%

4.5.3 Area for sheds and fodder cultivation

Table 4.5.3 showed the details of area used for cattle shed and fodder cultivation. The average area for cattle sheds in small, medium and large farms was 199.07 sq.ft. (0.5 cents), 518.35 sq.ft. (1.3 cents) and 2024.8 sq.ft. (5.06 cents) respectively. The overall value was 681.52 sq.ft. (1.7 cents). In small farms used 20.33, 2.43, 10.92 and 11.44 cents of own land, lease land, pure cropping and intercropping for fodder cultivation. In medium farms the respective values were 64.23, 12.85, 35.07 and 35.07 cents. In large farms 217.53, 58, 165.06, 110.46 cents were the area respectively. The overall picture showed that 75.16 (own land), 17.31 (lease land), 52.65 (pure crop) and 63.08 (inter cropping) cents were the area used for fodder cultivation. In total small

(22.76), medium (76.44), large (273.53) and 91.83 (overall) cents was the average area under cultivation of fodder in different farms and in overall.

Table 4.5.3 Details of area for sheds and fodder cultivation

Farm type	Mean	Area of building		Fodder cultivation (cents)				
		(Sq.ft)	(cents)	Own land	Lease land	Pure	Inter cropping	Total fodder
Small	Mean	199.07	0.5	20.33	2.43	10.92	11.44	22.76
Medium	Mean	518.35	1.3	64.23	12.85	35.07	35.07	76.44
Large	Mean	2024.8	5.06	217.53	58	165.06	110.46	273.53
Total	Mean	681.52	1.7	75.16	17.31	52.65	6308	91.83

4.5.4 Investment on capital

Table 4.5.4 shows the pattern of investment on capital assets in different farms. The results revealed that the major share of capital expenditure was on milch animals followed by buildings. The investment on equipments was comparatively small. The share on milch animals was 56.19, 59.81 and 56.14 per cent of total capital expenditure in small, medium and large farms respectively. Overall picture showed 56.79 per cent share of milch animals on total capital assets. In case of buildings 41.7, 33.44, 37.65 and 37.28 per cent was the investment on buildings in small, medium and large and overall farms. The share of cost of equipments was 2.12, 6.75, 6.21 and 5.93 per cent in small, medium, large and for overall farms.

Table 4.5.4 Details of mean values of investment on capital assets

Farm type	Cost on capital assets						
	Milch animal (in lakh Rs)	% Of total	Building (in lakh Rs)	% of total	Equipments (in lakh Rs)	% of total	Total
Small	0.65	56.19	0.48	41.7	0.024	2.12	1.15
Medium	2.29	59.81	1.28	33.44	0.26	6.75	3.83
Large	11.97	56.14	8.02	37.65	1.32	6.21	21.31
Overall	3.54	56.79	2.33	37.28	0.37	5.93	6.24

4.5.5 Mechanisation

The level of mechanisation in different farms is presented as Figure 4.9. Irrespective of farm size, low level of mechanisation was observed. In small farms 83.4, 16.0 and 0.6 per cent of farms had low, medium and high level of mechanisation. In medium farms ,53.0, 23.0 and 24.0 per cent of farms had low, medium and high level of mechanisation. In large farms 10.7, 25.3 and 64.0 per cent were the respective values. The overall picture showed that 59.1, 20.0 and 20.9 per cent farms had low, medium and high level of mechanisation.

4.6 EXISTING MANAGEMENT PROFILE OF THE FARM

4.6.1 Housing

4.6.1.1 Type of Housing

Figure 4.10 shows the details of type of housing followed in different farms. In small farms , 88.0 and 12.0 per cent of houses were permanent and temporary respectively. In medium farms the respective figures were 94.0 and 6.0 per cent. In large farms 100 per cent of cattle sheds were permanent type. The overall picture revealed that 92.2 per cent cattle houses were permanent and 7.7 per cent of temporary type. (Temporary house - a house without a concrete floor with stone, mud or palm, stem floor without proper roof).

4.6.1.2 Type of building

Classification of cattle houses based on building pattern is presented in Table 4.6.1.2. Eleven types of building pattern were observed, based on the position of cattle shed (related to human house) floor and roof. In small, medium and large farms a separate house with metal sheet roof and concrete floor was the predominant type of building with a share of 37.1, 56 and 86.70 per cent respectively in different farms.

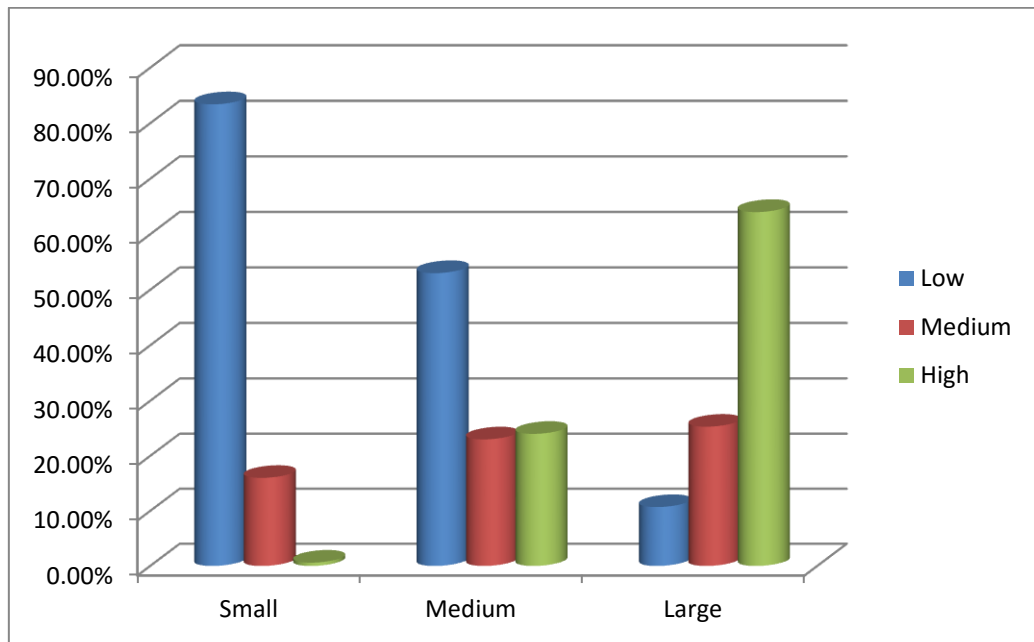


Figure 4.9 Level of mechanization in farms

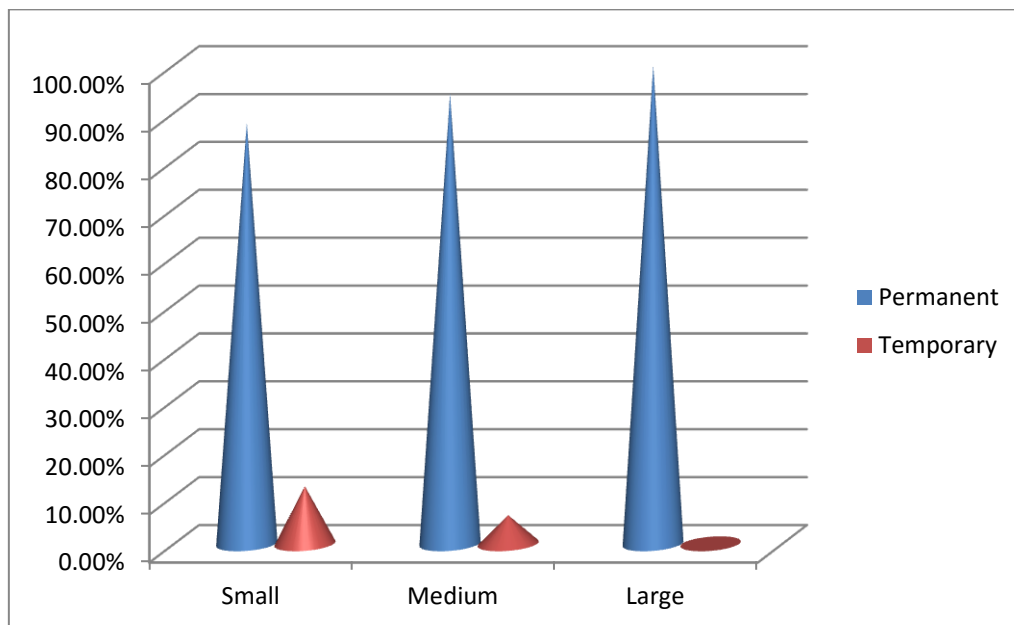


Figure 4.10 Details of type of Housing

Table 4.6.1.2 Classification of cattle houses based on building pattern

Farm type	House Type										
	1	2	3	4	5	6	7	8	9	10	11
Small	14	52	65	5	6	5	6	12	3	2	5
	8%	29.70%	37.10%	2.90%	3.40%	2.9%	3.40%	6.90%	1.70%	1.10%	2.90%
Medium	4	14	56	0	14	2	6	2	1	1	0
	4%	14%	56%	0%	14%	2%	6%	2%	1%	1.10%	0%
Large	0	2	65	0	8	0	0	0	0	0	0
	0%	2.70%	86.70%	0%	10.70%	0%	0%	0%	0%	0%	0%
Overall	18	68	186	5	28	7	12	14	4	3	5
	5.10%	19.40%	53.10%	1.40%	8%	2%	3.40%	4%	1.10%	0.90%	1.40%

1. Temporary(Floor without concrete ,with stone, mud or palm stem floor paneling

2. Separate (position) +Tiled (roof)+Concrete(floor)

3. Separate+Metal Sheet (roof)+Concrete(floor)

4. Separate + Concrete + Concrete

5. Separate +Thatched + Concrete

6. Separate +Silpaulin sheet +Concrete

7. Attached+Metal sheet+ concrete

8. Attached +Tiled + Concrete

9. Attached +Concrete+ Concrete

10. Attached+ Thatched +Concrete

11. Attached + Silpaulin+ Concrete

4.6.1.3 Heat alleviation measures

The level of heat stress alleviation measures followed in the farms are presented in the table 4.6.1.3. In small farms 60.0, 39.4 and 0.6 per cent of farmers followed low, medium and high level of heat alleviation measures. In medium farms 53.0, 38.0 and 9.0 per cent followed low, medium and high level of heat stress alleviation measures. In large farms the respective figures were 1.3, 64.0 and 34.7 per cent respectively. Overall picture showed 45.4, 44.3 and 10.3 per cent farmers following low, medium and high level of heat stress alleviation steps. In small and medium farms majority of the farmers were at low level and in large farms 64.0 per cent were at medium level.

Table 4.6.1.3 Level of heat stress alleviation measures

Farm Type	Number / Per cent	Heat alleviating measures		
		Low	Medium	High
Small	Number	105	69	1
	Per cent	60.0%	39.4%	.6%
Medium	Number	53	38	9
	Per cent	53.0%	38.0%	9.0%
Large	Number	1	48	26
	Per cent	1.3%	64.0%	34.7%
Overall	Number	159	155	36
	Per cent	45.4%	44.3%	10.3%

4.6.2 Feeding

4.6.2.1 System of feeding

Figure 4.11 presents the system of feeding followed by farmers under different farm size. In small and medium farms, majority were following stall feeding along with grazing (54.3 and 57.0 per cent) respectively. In large systems the major system was stall feeding (90.7 per cent). The overall results showed that 54.3 per cent of farms followed only stall feeding 0.3 per cent dependent only on grazing and 45.4 per cent on a combination of stall feeding and grazing.

4.6.2.2 Type of Feed

The type of feeds fed to animals in the farms is given in Table 4.6.2.2. Irrespective of farm size, majority of the farmers fed a combination of green fodder , dry fodder and concentrate. The respective proportion in small, medium and large farms was 80.6, 91.0 and 92.0 respectively. The feeding system without concentrate was almost negligible. The overall results showed that 86.0, 11.1, 2.3, 0.3 and 0.3 per cent of farms depended on green + dry fodder + concentrate, green fodder + concentrate dry fodder + concentrate green fodder + dry fodder and others.

Table 4.6.2.2 Details of type of feed fed to animals in different farms

Farm Type	Number / Per cent	Type of feeding				
		GF+DF+ Conc	GF + Conc	DF + Con	GF + DF	Others
Small	Number	141	27	6	0	1
	Per cent	80.6%	15.4%	3.4%	0.0%	.6%
Medium	Number	91	8	0	1	0
	Per cent	91.0%	8.0%	0.0%	1.0%	0.0%
Large	Number	69	4	2	0	0
	Per cent	92.0%	5.3%	2.7%	0.0%	0.0%
Overall	Number	301	39	8	1	1
	Per cent	86.0%	11.1%	2.3%	.3%	.3%

4.6.2.3 Type of grazing area

Table 4.6.2.3 shows the nature of grazing area used by the farmers. Many farmers were not allowing/not having land for grazing (42.3, 32.0, and 90.7 per cent respectively in small, medium and large farms). In small, medium and large farms 38.3, 50.0 and 2.7 per cent of the farmers depended on common land for grazing. In small, medium and large farms 17.7, 12.0 and 6.7 per cent used homestead land respectively for grazing. The overall picture revealed that 49.7, 13.7, 34.0 and 2.6 per cent of farms were classified as no grazing, homestead, common land and homestead or common land respectively.

Table 4.6.2.3 Type of grazing area

Farm Type	Number / Per cent	Grazing area			
		No grazing (0)	Homestead (1)	Common Land (2)	Both (1)&(2)
Small	Number	74	31	67	3
	Per cent	42.3%	17.7%	38.3%	1.7%
Medium	Number	32	12	50	6
	Per cent	32.0%	12.0%	50.0%	6.0%
Large	Number	68	5	2	0
	Per cent	90.7%	6.7%	2.7%	0.0%
Overall	Number	174	48	119	9
	Per cent	49.7%	13.7%	34.0%	2.6%

4.6.2.4 Type of concentrate

Table 4.6.2.4 shows the type of concentrate fed to animals in different farms. Irrespective of farm size, vast majority of farmers used a combination of branded compounded cattle feed and other concentrate feed ingredients. The respective values in small, medium and large farms were 85.1, 86.0 and 93.0 per cent respectively. In small, medium and large farms 13.7, 13.0 and 5.3 per cent of farmers used only branded feed. The overall results indicated that 1.1, 11.7 and 86.9 per cent of farms dependent only on concentrate feed ingredients, only branded feed and combination of both.

Table 4.6.2.4 Details of types of concentrates fed to animal in different farms

Farm Type	Number / Per cent	Type of concentrate		
		Home	Branded	Both
Small	Number	2	24	149
	Per cent	1.1%	13.7%	85.1%
Medium	Number	1	13	86
	Per cent	1.0%	13.0%	86.0%
Large	Number	1	4	70
	Per cent	1.3%	5.3%	93.3%
Overall	Number	4	41	305
	Per cent	1.1%	11.7%	86.9%

4.6.2.5 Source of green grass

The source of green grass in different farms is given in the Table 4.6.2.5. In small, medium and large farms 6.3, 1.0 and 5.3 per cent had not practised green grass feeding. In small and medium farms, combination of fodder cultivation and collection of local grass was the major source of green grass with proportions of 39.4 and 45 per cent respectively. In large farms, cultivation of green fodder was the major source (68%) of green grass. The overall results showed that 4.6 per cent were not having green grass feeding, 22.0 per cent dependent on cultivation, 22.3 per cent on local grass, 36.3 per cent on local and cultivation where as 5.1 per cent on grazing only. The farmers who were purchasing green grass were in negligible numbers.

4.6.2.6 Type of Fodder cultivation

Table 4.6.2.6 presents the type of fodder cultivation in the farms. In small, medium and large farms 45.1, 26.0 and 8.0 per cent of the farms were not having any fodder cultivation. In small and medium farms intercropping was dominant with a share of 27.4 and 29.0 per cent respectively. In large farms majority (84.0 per cent) were practising pure cropping. In small, medium and large farms 7.4, 4.0, 2.7 per cent combined both inter and pure cropping. The overall picture revealed that 31.7, 23.1, 39.1 and 5.4 per cent were having no fodder cultivation, intercropping, pure cropping and combination of both respectively.

Table 4.6.2.6 Details of type of fodder cultivation in different dairy farms

Farm Type	Number / Per cent	Fodder Cultivation			
		no	Inter	Pure	both
Small	Number	79	48	33	13
	Per cent	45.1%	27.4%	18.9%	7.4%
Medium	Number	26	29	41	4
	Per cent	26.0%	29.0%	41.0%	4.0%
Large	Number	6	4	63	2
	Per cent	8.0%	5.3%	84.0%	2.7%
Overall	Number	111	81	137	19
	Per cent	31.7%	23.1%	39.1%	5.4%

Table 4.6.2.5. Details of sources of green fodder in dairy farms

Farm Type	Source of green fodder										
	No green fodder	Cultivation	Purchase	Local	Cultivation and Local	Purchase and local	Grazing only	Local and Grazing	Cultivation and purchase	Cultivation, Purchase and local	Cultivation, Local and grazing
Small	11	11	1	68	69	5	5	4	1	0	0
	6.3%	6.3%	0.6%	38.9%	39.4%	2.9%	2.9%	2.3%	0.6%	0%	0%
Medium	1	15	0	10	45	0	12	10	1	4	2
	1. %	15%	0%	1.1%	45%	0%	12%	10%	1%	4%	2%
Large	4	51	2	0	13	0	1	0	2	2	0
	5.3%	68%	2.7%	0%	17.3%	0%	1.3%	0%	2.7%	2.7%	0%
Total	16	77	3	78	127	5	18	14	4	6	2
	4.6%	22. %	0.9%	22.3%	36.3%	1.4%	5.1%	4.4%	1.1%	1.7%	0.6%

4.6.2.7 Type of fodder cultivated

The details of type of fodder cultivation in different farms are presented in Table 4.6.2.7. In small, medium and large farms majority of farmers cultivated grass fodder (53.7, 71.0 and 92.0 per cent respectively). The cultivation of legume and cereal fodder were in negligible number in all farms. The overall results revealed that 32.3, 66.9, 0.6 and 0.3 per cent of farms were without grass fodder cultivation, legume and cereal fodder cultivation respectively.

Table 4.6.2.7 Details of types of fodder cultivated in farms

Farm Type	Number / Per cent	Type of fodder			
		No	grass	legume	cereal
Small	Number	80	94	1	0
	Per cent	45.7%	53.7%	0.6%	0.0%
Medium	Number	27	71	1	1
	Per cent	27.0%	71.0%	1.0%	1.0%
Large	Number	6	69	0	0
	Per cent	8.0%	92.0%	0.0%	0.0%
Overall	Number	113	234	2	1
	Per cent	32.3%	66.9%	0.6%	0.3%

4.6.2.8 Variety of fodder

Table 4.6.2.8 shows the details of variety of fodder cultivated in different farms. It showed that Hybrid Napier was the major variety cultivated in all farms (52.0, 69.0 and 44.0 per cent respectively). The cultivation of Congo signal and Maize were practised in very few farms.

Table 4.6.2.8 Details of variety of fodder cultivated in different farms

Farm Type	Number / Per cent	Fodder variety				
		No cultivation	Hybrid Napier(HN)	Congo signal	Maize	HN & MAIZE
Small	Number	81	91	1	1	1
	Per cent	46.3%	52.0%	.6%	.6%	.6%
Medium	Number	29	69	0	1	1
	Per cent	29.0%	69.0%	0.0%	1.0%	1.0%
Large	Number	5	33	0	36	1
	Per cent	6.7%	44.0%	0.0%	48.0%	1.3%
Overall	Number	115	193	1	38	3
	Per cent	32.9%	55.1%	.3%	10.9%	.9%

4.6.2.9 Source of straw

Figure 4.12 shows the details of source of straw in farms. In small, medium and large farm types 10.9, 3.0 and 5.3 per cent were not using paddy straw in their farms. In all types of farms, purchase was the source of paddy straw. In small, medium and large 47.4, 52.0 and 77.3 per cent purchased paddy straw. The proportion of cultivation of paddy by oneself was 23.4, 24.0 and 4.0 in small, medium and large farms. While 18.3, 21.0 and 13.3 per cent of farms respectively in small, medium and large category depended on both purchased and own cultivation. The overall result showed that 7.4, 19.4, 55.1 and 17.9 per cent of farms were without paddy straw, own source, purchased and both purchased and own source of straw.

4.6.2.10 Reason for not cultivating fodder

The reason cited by the farmers as the reason for non-cultivation of fodder is presented in Table 4.6.2.10. Lack of suitable land and preference for cash crops were the major reasons given by farmers for not cultivating fodder irrespective of farm size.

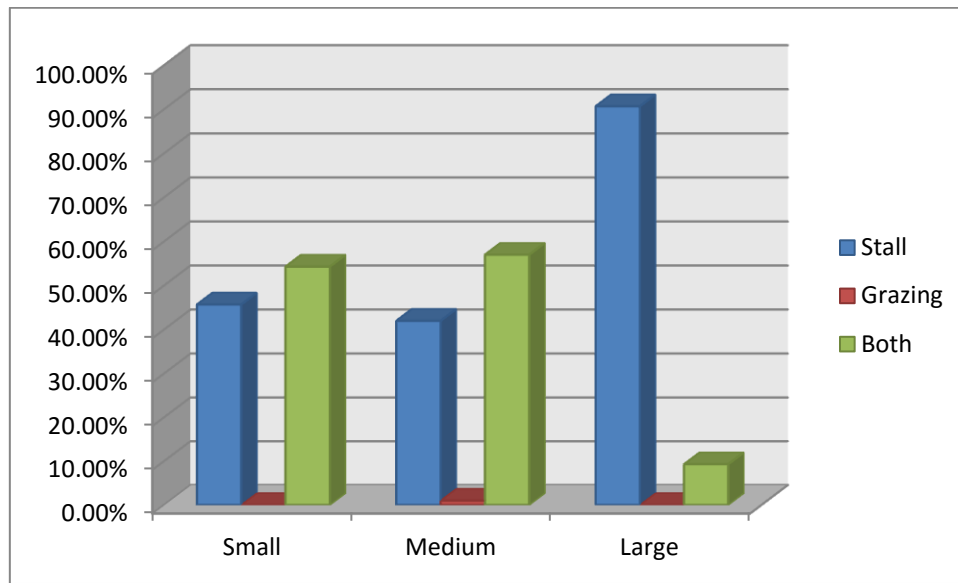


Figure 4.11 Classification based on system of feeding

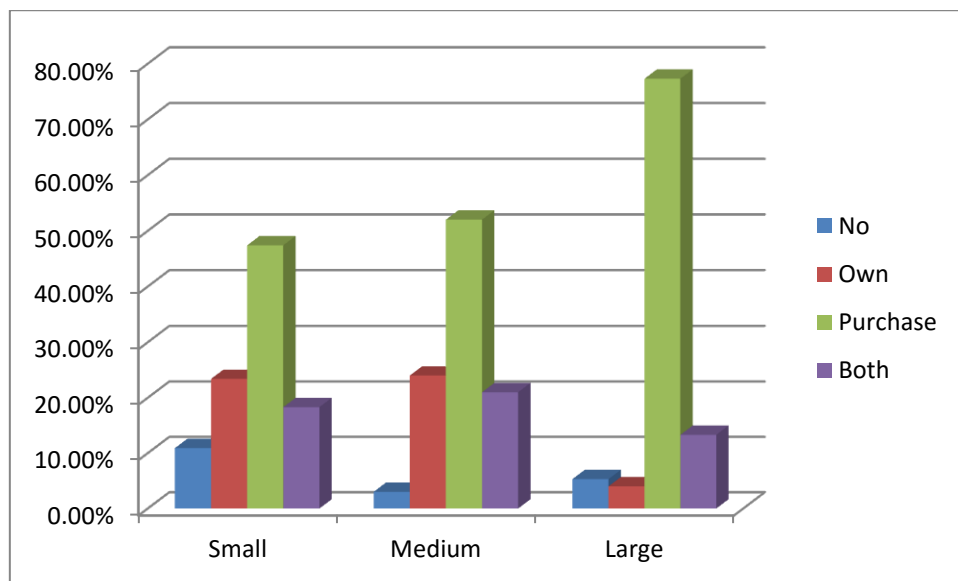


Figure 4.12 Source of straw in different types of farms

Table 4.6.2.10 Reasons perceived by farmers for not cultivating fodder

Farm Type	Number/ Per cent	Reasons for not cultivating fodder							
		0	1	2	3	4	5	6	7
Small	Number	82	8	0	75	4	3	1	2
	Per cent	46.9%	4.6%	0.0%	42.9%	2.3%	1.7%	.6%	1.1%
Medium	Number	68	2	1	27	0	0	0	1
	Per cent	68.7%	2.0%	1.0%	27.3%	0.0%	0.0%	0.0%	1.0%
Large	Number	74	0	1	0	0	0	0	0
	Per cent	98.7%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%
Overall	Number	224	10	2	102	4	3	1	3
	Per cent	64.2%	2.9%	.6%	29.2%	1.1%	.9%	.3%	.9%

0- no fodder 1- Lack of promotion programme and subsidy 2-Preference for cash crops
 3-lack of suitable land 4 – Economic viability 5- Lack of planting materials
 6 - 2 & 3 7 – Combinations

4.6.2.11 Feeding schedule (as on previous day of interview)

Table 4.6.2.11 gives the details of feeding schedule followed in different farms. In small, medium and large farms average quantity of green fodder (kg) fed to milch animals were 25.48, 19.14 and 18.65 respectively. In small farms proportion of locally collected green grass was more. In medium farms the amount was almost equal, but in large farms the proportion of cultivated green fodder was dominant (13.40 kg out of 18.65 kg). In all farms proportion of purchased grass was comparatively less. The average amount of dry fodder fed (kg) was 1.19, 2.20 and 1.33 in small, medium and large farms respectively.

The average amount of concentrate feed fed (kg) to milking animal was 5.44, 4.65 and 5.81 in small, medium and large farms respectively. The amount for dry animals was 0.38, 1.01 and 1.81. The overall result revealed that 8.72, 12.8, 0.68, 22.21, 1.49, 5.30 and 0.87 kg were the average daily amount of cultivated green fodder, collected green grass, purchased green fodder, total green fodder, dry fodder concentrate for a milking animal and concentrate for dry animals respectively.

Table 4.6.2.11 Pattern of feeding in different farms

Farm Size	Average quantity of feed and fodder fed per day per animal (kg)						
	Milch animal						Dry animal
	Cultivated green fodder	Collected green grass	Purchased green fodder	Total green fodder	Dry fodder	Concentrate	Concentrate
Small	6.17	19.17	0.14	25.48	1.19	5.44	0.38
Medium	9.69	9.10	0.35	19.14	2.29	4.65	1.01
Large	13.40	2.89	2.36	18.65	1.33	5.81	1.81
Overall	8.72	12.80	0.68	22.21	1.49	5.30	0.87

4.6.3 Breeding / reproduction

4.6.3.1 Agency providing AI service

Figure 4.13 presents the details of agency providing artificial insemination services (AI) in the farms. Irrespective of size, majority of the farms used the service of Animal Husbandry Department (AHD). In small, medium and large farms 83.4, 86.0 and 96.0 per cent of the farms were using the service of AHD. In small, medium and large farms 11.5, 14.0 and 4.0 per cent used the service of both AHD and private persons. The use of only private service was negligible in all farm sizes. Overall result showed that 86.9, 2.6 and 10.5 per cent of farms used AHD, private and both AHD and private for AI services respectively.

4.6.3.2 AI Service provider

Table 4.6.3.2 shows the details of the person providing AI service in the farms. In small farms 47.4, 38.9 and 10.3 per cent of farmers sought the service Livestock Inspector (LI), Government Veterinary surgeon and private persons respectively. In medium farms, the corresponding proportion was 64.0, 26.0 and 9.0 per cent. Large farms showed the figures respective figures as 46.7, 48.0 and 4.0 per cent. The overall picture showed that 37.1, 0.9, 52.0, 8.6 and 14 per cent of farmers sought the service of a Govt. Veterinarian, Private veterinarian, LI, Private person, Govt. Veterinarian or Private person respectively.

Table 4.6.3.2 Details of AI service provider in the farms

Farm Type	Number / Per cent	AI Done by				
		Govt.Vet	Pvt. Vet.	LI	Pvt. person	Govt. Vet &LI
Small	Number	68	1	83	18	5
	Per cent	38.9%	.6%	47.4%	10.3%	2.9%
Medium	Number	26	1	64	9	0
	Per cent	26.0%	1.0%	64.0%	9.0%	0.0%
Large	Number	36	1	35	3	0
	Per cent	48.0%	1.3%	46.7%	4.0%	0.0%
Overall	Number	130	3	182	30	5
	Per cent	37.1%	.9%	52.0%	8.6%	1.4%

4.6.3.3 Place of AI

Table 4.6.3.3 shows the details of place where AI is being done. In small farms 85.1, 9.1 and 5.7 per cent of farmers used farm premises, ICDP centre and veterinary hospital respectively for doing AI. In medium and large farms 100 per cent farmers carried out AI at farm premises. The overall picture revealed that 92.3, 4.6 and 2.9 per cent of farmers carried out AI at farm premises, ICDP centre and at veterinary hospital respectively.

Table 4.6.3.3 Details of Place where AI is done

Farm Type	Number / Per cent	Place of AI			Total
		Farm premises	ICDP centre	Vet. Hospital	
Small	Number	149	16	10	175
	Per cent	85.1%	9.1%	5.7%	100.0%
Medium	Number	100	0	0	100
	Per cent	100%	0.0%	0.0%	100.0%
Large	Number	75	0	0	75
	Per cent	100.0%	0.0%	0.0%	100.0%
Overall	Number	323	16	10	350
	Per cent	92.3%	4.6%	2.9%	100.0%

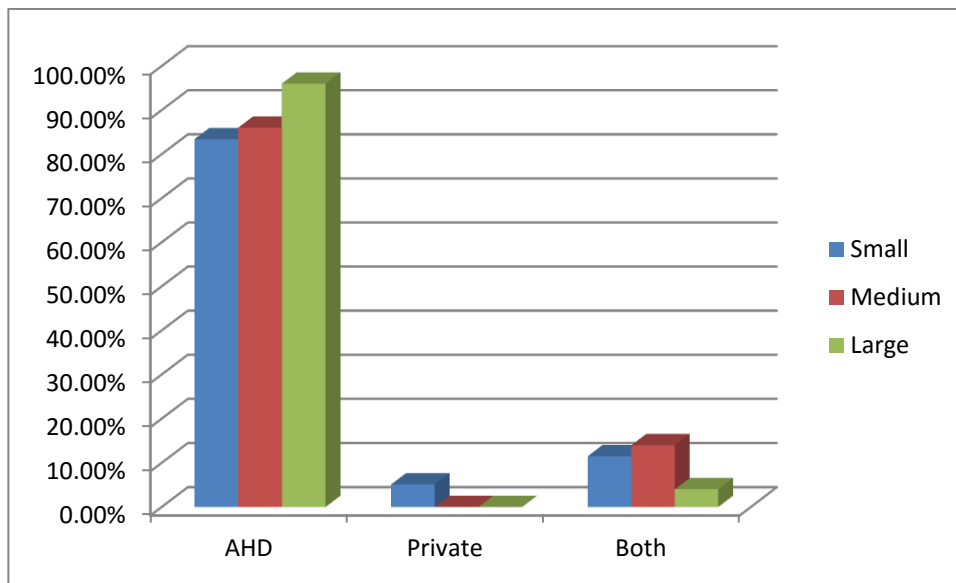


Fig. Agency providing AI service

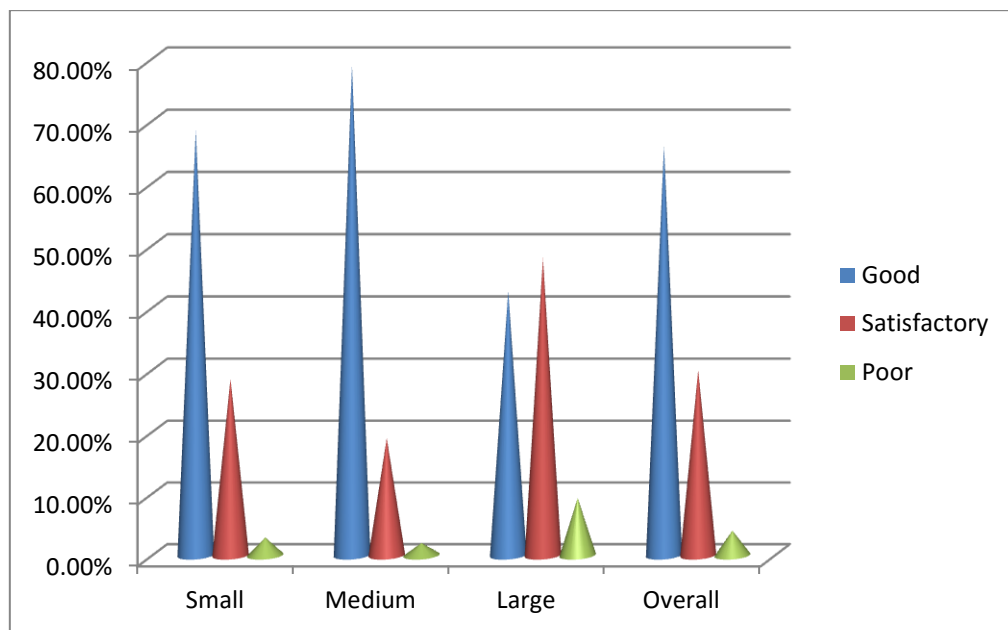


Figure 4.14 Farmers perception regarding the availability of AI service

4.6.3.3 Distance to AI centre

The details of distance to the nearest AI centre are presented in the table 4.6.3.3. The results showed that majority of the farmers were having AI centre within a distance of three kilometres from their farms.

Table 4.6.3.4 Distribution of farmers according to distance to AI centres

Farm Type	Distance to AI centre (km)									
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Small	4	15	36	40	6	15	8	15	0	5
	2.3%	8.6%	20.6%	22.9%	3.4%	8.6%	4.6%	8.6%	0.0%	2.9%
Medium	0	11	1	44	2	10	0	4	0	11
	0.0%	11.0%	1.0%	44.0%	2.0%	10.0%	0.0%	4.0%	0.0%	11.0%
Large	1	6	5	18	2	15	0	12	1	5
	1.3%	8.0%	6.7%	24.0%	2.7%	20.0%	0.0%	16.0%	1.3%	6.7%
Overall	5	32	42	102	10	40	8	31	1	21
	1.4%	9.1%	12.0%	29.1%	2.9%	11.4%	2.3%	8.9%	.3%	6.0%

4.6.3.5 Availability of AI services

Figure 4.14 presents the farmers perception regarding the availability of AI service. Majority of farmers had given ‘good’ response to availability of service in small and medium farms with respective values 68.6 and 79.0. In large farms 42.7, 48.0, 9.3 per cent of farmers described AI service availability as good, satisfactory and poor.

4.6.4 Milking

4.6.4.1 Method of milking

The details of method of milking followed in the farms are presented in Figure 4.15. Irrespective of farm size most of the farmers resorted to hand milking. In small farms 99.4 per cent followed hand milking. In medium farms 20.0, 79.0 and 1.0 per cent followed machine hand and combination of machine and hand milking. In large farms the comparative proportion of machine milking was more (44.0 per cent) but still 54.7 and 1.3 per cent followed hand milking and

combination of both. The overall results showed that 15.4, 84.0 and 0.6 per cent of the farms followed machine, hand and combination of both respectively.

4.6.4.2 Milker

Figure 4.16 presents the details of persons engaged in milking in the farms. Irrespective of the farm size, in majority of farms the farmers themselves were engaged in milking. In small, medium and large farms 97.1, 94.0 and 69.3 per cent were the proportion of farmers acting as milker. In small, medium and large farms 5.0, 6.0 and 28.0 per cent depended on a milker. The overall picture showed that 9.1, 90.3, and 0.6 per cent of the farms engaged milker, one self and both self and a milker in milking respectively.

4.6.4.3 Frequency of milking

The frequency of milking adopted in different farms is presented in the table 4.6.4.3. This showed that irrespective of farm size all the farmers followed two times milking daily.

Table 4.6.4.3 Distribution of the frequency of milking adopted in different farms

Farm type	Number / Per cent	Milking frequency
		2.0
Small	Number	175
	Per cent	100.0%
Medium	Number	100
	Per cent	100.0%
Large	Number	75
	Per cent	100.0%
Overall	Number	350
	Per cent	100.0%

4.6.4.4 Milking interval

Table 4.6.4.4 shows the milking interval followed in different farms. Irrespective of farm size, majority of the farms kept an interval of 8-12 hours between two milking. In small farms, 6.8 per cent of farmers gave only less than eight hours interval. In medium and large farms 4 and 1.3 per cent, of farmers milked their animals at an interval of less than eight hours.

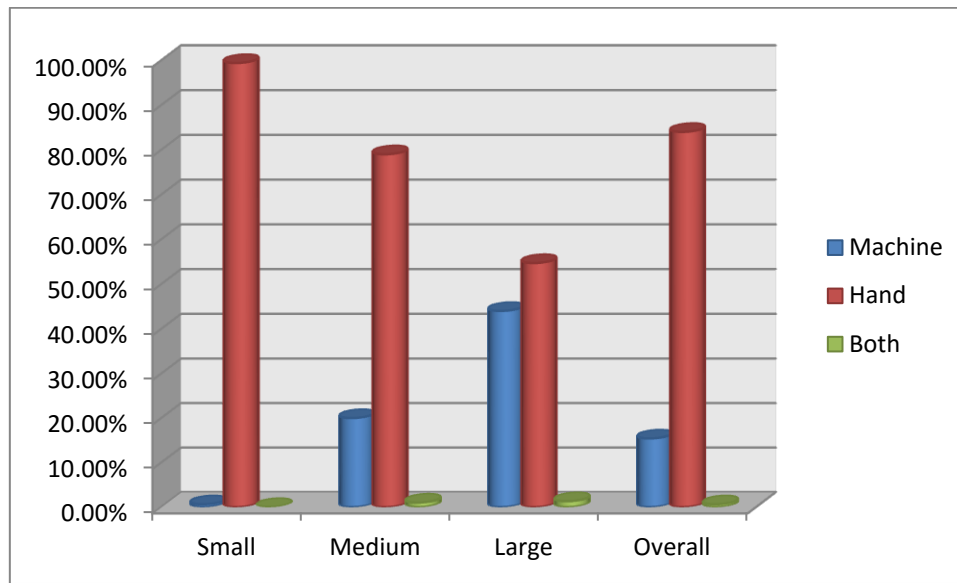


Figure 4.15 Details of method of milking followed in the farms

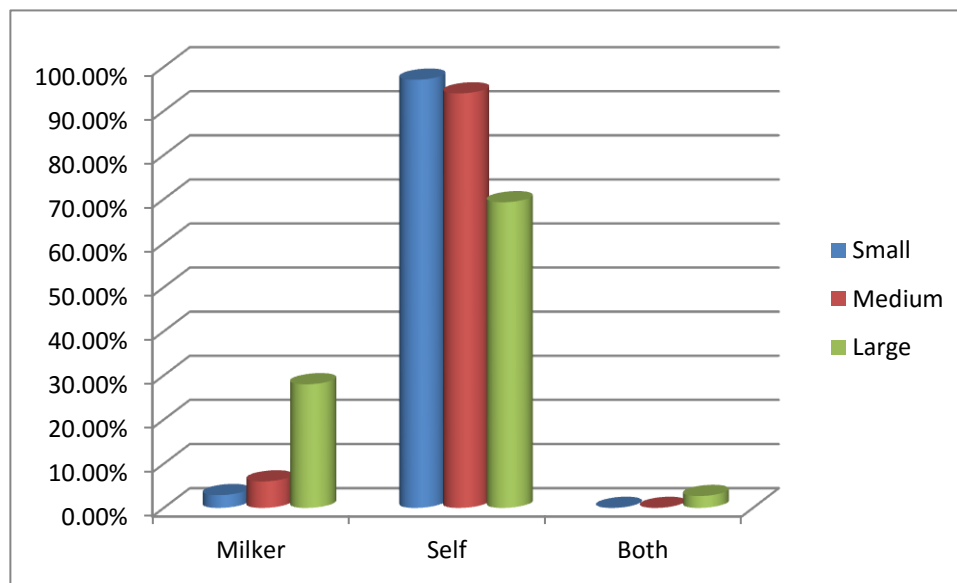


Fig.4.16 Details of the persons engaged in milking in the farms

Table 4.6.4.4 Distribution of farms on the basis of milking interval

Farm Type	No/ %	Milking interval (hrs)											
		6.5	7	7.5	8	8.5	9	9.5	10.0	10.5	11	11.5	12.0
Small	No	2	1	9	17	12	45	31	29	8	18	1	2
	%	1.1	.6	5.1	9.7	6.9	25.7	17.7	16.6	4.6	10.3	.6	1.1
Medium	No	0	3	1	5	3	25	7	28	8	15	1	4
	%	0.0	3.0	1.0	5.0	3.0	25.0	7.0	28.0	8.0	15.0	1.0	4.0
Large	No	0	0	1	3	0	5	3	54	2	4	1	1
	%	0.0	0.0	1.3	4.0	0.0	6.7	4.0	72.0	2.7	5.3	1.3	1.3
Overall	No	2	4	11	25	15	75	41	111	18	37	3	7
	%	0.6	1.1	3.1	7.1	4.3	21.4	11.7	31.7	5.1	10.6	0.9	2.0

4.6.5 Labour

4.6.5.1 Type of labour

The details of type of labour used in different farms are presented in Table 4.6.5.1. The small (99.4 per cent) and medium (70.9 per cent) farm types were dependent mainly on family labour. While in large farms, there was more (52.0 per cent) dependence on paid labour. The overall results showed that 75.7, 15.4 and 8.9 per cent of farms depended on family labour alone, paid labour alone and combination of both family and paid labour respectively.

Table 4.6.5.1 Details of type of labour used in dairy farms

Farm Size	Number / Per cent	Labour Type			Total
		Family	Paid	Both	
Small	Number	174	1	0	175
	Per cent	99.4%	.6%	0.0%	100.0%
Medium	Number	79	14	7	100
	Per cent	79.0%	14.0%	7.0%	100.0%
Large	Number	12	39	24	75
	Per cent	16.0%	52.0%	32.0%	100.0%
Overall	Number	265	54	31	350
	%	75.7%	15.4%	8.9%	100.0%

4.6.5.2 Source of labour

Table 4.6.5.3.2 presents the details of source of paid labour used in different farms. In small farms 99.4 per cent had not used any paid labour. In medium farms 74.0 per cent had no paid labour, while 20.8 and 5.2 per cent used labour from within state and from outside state respectively. In large farms 13.5 per cent had no paid labour use, but in 52.7 and 33.8 per cent, used labour both from inside and outside state. Large sized farms comparatively used labour from outside state compared to medium and small farms. The overall results indicated that 73.9, 17.2, 8.9 per cent of the farms used no paid labour, labour within state and labour from outside state respectively.

Table 4.6.5.2 Details of source of labour used in different farms.

Farm size	Number/ Per cent	Source of paid labourers			Total
		No paid labour	Within state	Outside state	
Small	Number	174	1	0	175
	Per cent	99.4%	.6%	0.0%	100.0%
Medium	Number	57	16	4	77
	Per cent	74.0%	20.8%	5.2%	100.0%
Large	Number	10	39	25	74
	Per cent	13.5%	52.7%	33.8%	100.0%
Overall	Number	241	56	29	326
	Per cent	73.9%	17.2%	8.9%	100.0%

4.6.5.3 Family labour

Table 4.6.5.3.1 presents the details of family labour utilization in farms. The results clearly showed more dependence of small and medium farms on family labour. Both male and female members were involved with a significant contribution from female labour.

The average family labour in hours per day in small farms (time for local grass collection not included) was 1.74, 3.55 in medium and 2.15 in large farms.

The male labour in hrs/day was 0.92, 2.03 and 1.24 respectively in small, medium and large farms. The respective values for female labour were 0.82, 1.52 and 0.9. The average family time spent for a milk animal (hrs/day) was 0.83, 0.58 and 0.14 in small medium and large farms respectively. The family time used for milch animals in the farms (hrs/day) was 1.46, 3.5 and 5.81 in small, medium and large farms respectively. The overall results revealed that 1.31, 1.04, 2.34, 0.61, 2.98 (hrs/day) was the average family labour time used by male, female ,by male and female both , per milk animal and for milch animals respectively.

Table 4.6.5.3.1 Distribution of family labour for farm activities (other than fodder collection)

Farm size	Family Labour (hr)				
	Male / day	Female/ day	Total / day	Time / milk animal /day	Time for milch animals /day
Small	0.92	0.82	1.74	0.83	1.46
Medium	2.03	1.52	3.55	0.588	3.5
Large	1.24	0.9	2.15	0.14	5.81
Overall	1.31	1.04	2.34	0.61	2.98

Table 4.6.5.3.2 gives the details of family labour used for collection of green grass in different farms. In small average family labour (hrs/day) rendered by male, female and both were 0.39, 0.64 and 1.04 respectively. In medium farms, the respective values were 0.41, 0.62 and 1.03. In large farms the same was 0.23, 0.17 and 0.41. The overall results were summarized as 0.36, 0.53 and 0.9 hrs/day was male, female and total family labour for collection of local green grass respectively.

4.6.5.3.2 Family Labour for collection of grass in different farms

Farm size	Family time for collection of grass(hrs/day)		
	Male	Female	Total
Small	0.39	0.64	1.04
Medium	0.41	0.62	1.03
Large	0.23	0.17	0.41
Overall	0.36	0.53	0.9

4.6.6 Waste management

The classification of farms based on waste management system is presented in the Table 4.6.6. In small farms 33.1, 45.1 and 21.7 per cent of farms were classified under poor, satisfactory and good waste management system. In medium farms, majority (58.0%) were with poor management system followed by medium (14.0 per cent) and good (28.0%). In large farms 61.3 per cent farms were having poor waste management system followed by 9.3 per cent as satisfactory and 29.3 per cent as good. The overall results showed that 46.3, 28.6 and 25.1 per cent of farms were classified as having poor satisfactory and good waste management system.

Table 4.6.6 Distribution of farms Based on the waste management system

Farm Type	Number / Per cent	Waste management system		
		Poor	Satisfactory	Good
Small	Number	58	79	38
	Per cent	33.1%	45.1%	21.7%
Medium	Number	58	14	28
	Per cent	58.0%	14.0%	28.0%
Large	Number	46	7	22
	Per cent	61.3%	9.3%	29.3%
Overall	Number	162	100	88
	Per cent	46.3%	28.6%	25.1%

4.6.7 Health care

4.6.7.1 Provider of veterinary services

Figure 4.17 shows the information regarding provision of veterinary services in the farms. The results showed that in all types of farms majority of farmers were dependent mainly on government veterinarian for the service. The respective values were 88.6, 96.0 and 96.0 per cent in small, medium and large farms respectively. In small farms 8.6 per cent sought the service of a private veterinarian. The overall picture revealed that 92.3, 4.9, 0.3, 1.1, 0.3 and 1.1 per

cent of farms depended on Government veterinarian, private veterinarian livestock inspector, self treatment, University and local person respectively for veterinary service.

4.6.7.2 Place of Veterinary service

Table 4.6.7.2 shows the details of place where animals are taken for treatment. In all types of farms majority of farmers carried out treatment in farm premises itself. The respective proportions were 66.3, 89.0 and 94.7 per cent in small, medium and large farms respectively. The overall picture revealed that 10.6, 78.9 and 10.6 per cent of farmers took their animals to hospital/consulted doctor at hospital, carried out treatment at farm premises and combination of both respectively.

Table 4.6.7.2 Details of place of veterinary service provision in the farms

Farm Type	Number / Per cent	Place of veterinary service		
		Hospital	Farm premises	Both
Small	Number	29	116	30
	Per cent	16.6%	66.3%	17.1%
Medium	Number	5	89	6
	Per cent	5.0%	89.0%	6.0%
Large	Number	3	71	1
	Per cent	4.0%	94.7%	1.3%
Overall	Number	37	276	37
	Per cent	10.6%	78.9%	10.6%

4.6.7.3 Distance to veterinary Hospital

Table 4.6.7.3 presents the details of distance to the nearest veterinary hospital. Irrespective of farm size, majority of the farms had presence of a veterinary hospital within a distance of five kilometres. In small, medium and large farms only 12.6, 16.0 and 13.3 per cent were having a veterinary hospital farther than five kilometres. The overall picture showed that 86.3 per cent of

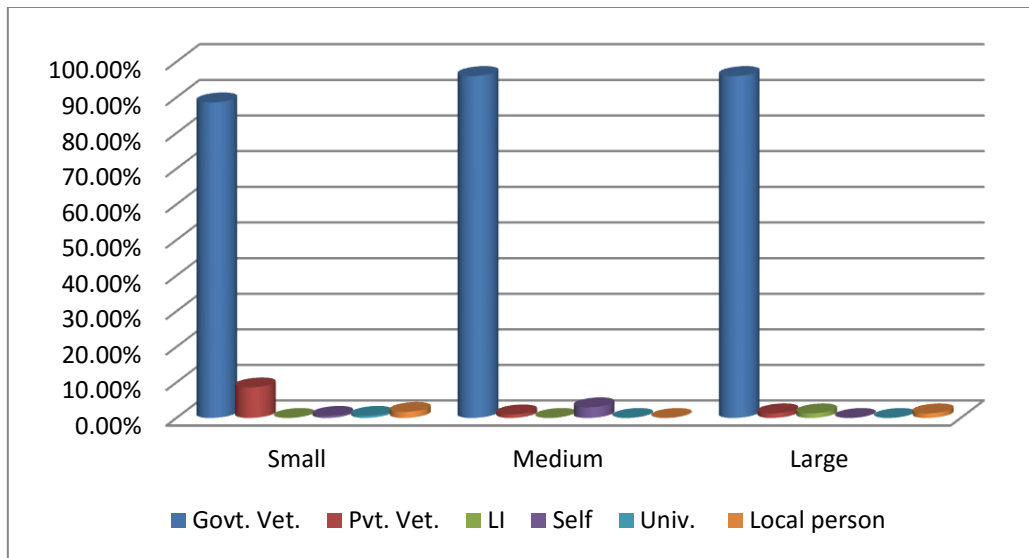


Figure 4.17 Details of veterinary service provider in different farms

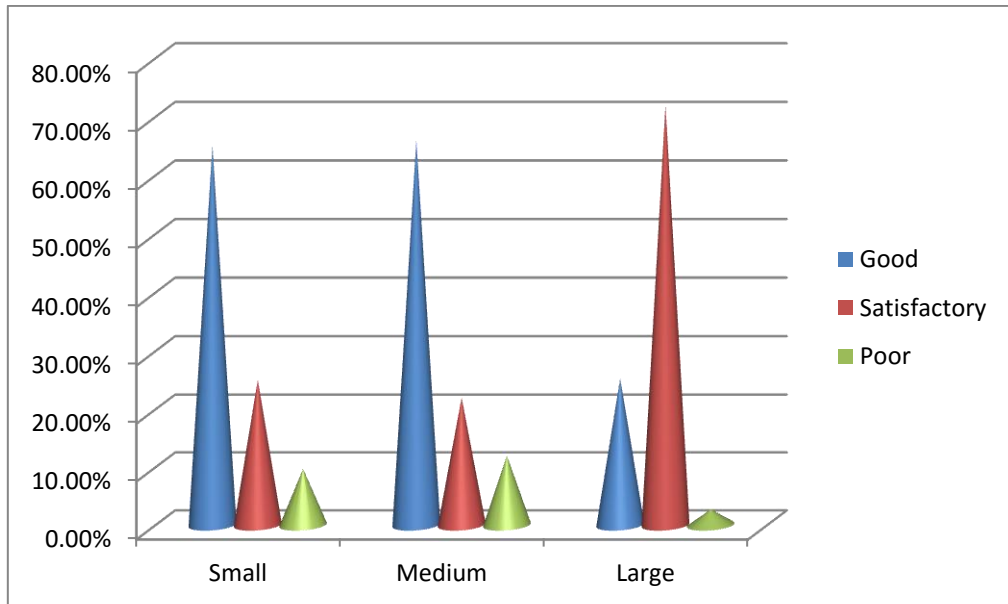


Figure 4.18 Farmers' perception regarding the availability of veterinary services

farms, were having a veterinary hospital within five kilometres and rest had a hospital at a distance more than five kilometers.

Table 4.6.7.3 Distribution of farmers based on distance to the nearest veterinary hospital

Farm Type	No / %	Distance to the nearest veterinary hospital(km)								
		.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	> 5 km
Small	No	4	7	15	19	14	32	25	31	22
	%	2.3%	4.0%	8.6%	10.9%	8.0%	18.3%	14.3%	17.7%	12.6%
Medium	No	0	33	1	7	0	8	14	19	16
	%	0.0%	33.0%	1.0%	7.0%	0.0%	8.0%	14.0%	19.0%	16.0%
Large	No	0	1	3	6	2	3	10	33	10
	%	0.0%	1.3%	4.0%	8.0%	2.7%	4.0%	13.3%	44.0%	13.3%
Overall	No	4	41	19	32	16	43	49	83	48
	%	1.1%	11.7%	5.4%	9.1%	4.6%	12.3%	14.0%	23.7%	13.7%

4.6.7.4 Availability of veterinary Services

The farmers' perception regarding the availability of veterinary services is presented in figure 4.18. Majority of farmers in small (65.1 per cent) and medium (66.0 per cent) expressed the service availability as good. In large farms, majority (72.0 per cent) expressed satisfaction on availability of veterinary service. In small, medium and large farms 9.7, 12.0 and 2.7 per cent voiced the service availability as poor. Overall picture showed that 56.9, 34.3 and 8.9 per cent expressed good satisfactory and poor response in case of availability of veterinary service.

4.7 EXTENT OF ADOPTION OF RECOMMENDED DAIRY FARMING PRACTICES

4.7.1 Adoption index

Table 4.7.1 shows adoption index of various management practices in different farms. The overall adoption score was highest (90.04 per cent) followed by medium (89.40 per cent) and small farms (84.36 per cent). The overall adoption index was 87.02 per cent. In small farms reproduction management

secured maximum (77.51 per cent) score and breeding, the least (39.74). In medium farm also the trends was same (77.51 and 44.3 per cent). In large farms 81.50 and 52.14 was maximum and minimum for reproduction and breeding management. The overall result showed that 43.74, 70.80, 53.82, 80.48, 54.92, 66.96 and 57.99 per cent were the adoption index values for breeding, housing, feeding, reproduction, milking, calf care and health practices respectively.

Table 4.7.1 Adoption index for various management practices under different farm sizes

Farm Type	Breeding	Housing	Feeding	Repdn	Milking	Calf care	Health	Overall Adoption Score
Small	39.74	66.33	52.89	77.51	52.26	67.20	58.57	84.36
Medium	44.43	72.40	53.40	84.90	58.22	67.77	59.89	89.40
Large	52.14	79.11	56.54	81.50	56.75	65.35	54.12	90.04
Overall	43.74	70.80	53.82	80.48	54.92	66.96	57.99	87.02

4.7.2 Adoption class

The classification of farms based on adoption level into classes is presented in Table 4.7.2. In all types of farms majority farms were in medium adoption class with 64.6, 68.0 and 70.7 per cent for small, medium and large farms respectively. In small, medium and large farms 23.4, 9.0 and 4.0 per cent belonged to low adoption class. The share of high adoption class was 12.0, 23.0 and 25.3 in small, medium and large farms respectively. The overall picture showed 15.1, 66.9 and 18.0 per cent were under low, medium and high adoption classes.

Table 4.7.2 Classification of farm households into adoption classes under different farm sizes.

Farm Type	Number / Per cent	Adoption class		
		Low	Medium	High
Small	Number	41	113	21
	Per cent	23.4%	64.6%	12.0%
Medium	Number	9	68	23
	Per cent	9.0%	68.0%	23.0%
Large	Number	3	53	19
	Per cent	4.0%	70.7%	25.3%
Overall	Number	53	234	63
	Per cent	15.1%	66.9%	18.0%

Mean: 87.01 SD: 9.29

4.7.3 Reason for non adoption

Table 4.7.3 shows the reasons perceived and ranked by the farmers as the reason for deviation from recommended practices. In all types of farms inadequate price for milk and high price of inputs were ranked first and second. Low demand for milk was not considered as a reason for any of the farmers in any farms

Table 4.7.3 Farmers' perception about the reason for deviation from recommended practices

Reason	Small		Medium		Large	
	Mean	Rank	Mean	Rank	Mean	Rank
Lack of Finance	3.02	3	3.65	3	3.82	4
Scarcity of Inputs	4.19	4	3.99	4	3.71	3
Inadequate price of milk	1.39	1	1	1	1	1
Low milk demand	0	0	0	0	0	0
Lack of Knowledge	4.59	5	4.29	5	5.4	6
Not commercial	5.13	6	8	7	7	7
High price of inputs	2.5	2	2	2	2	2
Lack of resources	5.73	7	5.99	6	5.03	5

4.8 REPRODUCTION AND PRODUCTION PARAMETERS

4.8.1 Reproduction

The details of some of the production and reproduction parameters are presented in table 4.8.1. The average peak yield in small farms ranged from 6 to 40 litres/ day, with an average 14.63 litres/day. In medium farms the range was 5-35 litres/day (average 14.80 litres/ day). In large farms the range and average was 6-40 and 18.64 litres/ day. The average peak yield was highest in large farms (18.64 litres/day) followed by medium (14.80 litres/day) and small farms (14.63 litres/day). The average lactation yield predicted from peak yield was 3152.14, 3189.15 and 4016.47 litres in small, medium and large farms respectively. The lactation yield predicted from test day milk yield was 2608.63, 2901.37 and 3219.50 litres in small, medium and large farms respectively. The average service period (days) was 190.65, 170.64 and 128.53 in small, medium and large farms respectively. The number of inseminations required was 2.29, 1.96 and 1.80 in small, medium and large farms respectively.

The inter calving period was 470.95, 450.64 and 408.53 days in small, medium and large farms respectively. The age at first successful service was 21.71, 23.87 and 19.23 months in small, medium and large farms. The number of AI required for first successful conception was 1.82, 2.08 and 2 in different farms respectively. The age at first calving was 30.71, 32.87 and 28.23 months in small, medium and large farms respectively.

4.8.2 Milk production

The details of milk production and production of the farms are presented in Table 4.8.2. The wet average (litres/day) was 8.98, 8.00 and 10.00 in small, medium and large farms respectively. The dry average (litres/day) was 8.13, 6.65 and 7.86 in small, medium and large farms respectively.

Table 4.8.1 Production and reproduction parameters

Parameters	Small			Medium			Large		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Peak yield (l/day)	6	40	14.63 (176)	5	35	14.80 (173)	6	40	18.64 (115)
Lactation yield 1(l)	1293	8620	3152.14 (176)	1078	7543	3189.15 (173)	1293	8620	4016.47 (115)
Lactation yield 2 (l)	0	6012	2608.63 (175)	0	6178	2901.37 (104)	1649	5723	3219.50 (36)
Service period (days)	0	1050	190.95 (130)	0	446	170.64 (74)	60	303	128.53 (33)
No. Of inseminations	0	10	2.29 (130)	0	5	1.96 (74)	1	3	1.80 (33)
Intercalving period(days)	340	1330	470.95 (130)	280	726	450.64 (74)	340	583	408.53 (33)
Age at first successful service (months)	12	39	21.71 (44)	15	46	23.87 (36)	12	42	19.23 (12)
Number of AI	1	5	1.82 (44)	1	7	2.08 (36)	1	6	2 (12)
Age at first calving (months)	21	48	30.71 (44)	24	55	32.87 (36)	21	51	28.23 (12)
Lactation yield 1- Predicted from peak yield Lactation yield 2 - Predicted from test day yield.					Figures in parenthesis indicate number of samples				

Table 4.8.2 Details of milk production under different farm sizes (litres/day)

Farm size	Morning	Evening	Total	Wet Average	Dry Average
Small	8.07	4.68	12.75	8.98	8.13
Medium	23.04	13.51	36.54	8.00	6.65
Large	96.60	67.83	164.43	10.00	7.86
Overall	31.32	20.73	52.05	8.92	7.65

4.8.3 Quality and price of milk

Table 4.8.3 shows the details of average fat, solids-not-fat (SNF) and price realized per litre from the cooperative society. The results showed that the

average fat content of morning milk was 3.89, 3.95 and 3.79 per cent in small, medium and large farms respectively. The average fat content of evening milk was 3.70, 4.31 and 4.45 per cent in respective farms. The average SNF content of morning milk was 8.14, 8.20 and 8.13 in small, medium and large farms respectively. The average SNF content of evening milk was 6.59, 7.62 and 8.04. The price realized in the morning was Rs. 29.26, Rs. 29.60 and Rs. 29.64 in small, medium and large farms respectively. The average price of evening milk was respectively Rs.24.65, Rs.29.13 and Rs.29.97. The average price/ litre of milk was Rs.29.43, Rs.29.79 and Rs.29.93 in daily basis in small, medium and large farms respectively. The overall values for the above parameters were 3.88 %, 4.04 %, 8.16 %, and 7.20 %, Rs.29.44, Rs.27.07 and Rs.29.64 respectively.

Table 4.8.3 Details of quality and price of milk obtained from society

Farm size	FAT % (AM)	FAT % (PM)	SNF % (AM)	SNF % (PM)	Price –Rs. (AM)	Price-Rs (PM)	Av. Price (Rs)
Small	3.89	3.70	8.14	6.59	29.26	24.65	29.43
Medium	3.95	4.31	8.20	7.62	29.60	29.13	29.79
Large	3.79	4.45	8.13	8.04	29.64	29.97	29.93
Total	3.88	4.04	8.16	7.20	29.44	27.07	29.64

4.8.4 Productivity of animals under different agro-climatic zones and farming systems

The details of productivity of animals under different agro-climatic zones are presented in Figure 4.19. The highest wet average was noticed in high ranges (10.29 l/day) and lowest in north zone (7.48 l/day). The wet average of animals in south, central, problem zone and overall were 8.29, 9.36, 9.91 and 8.92 l/day respectively. The dry average in different agro-climatic zones was 7.41, 8.56, 6.42, 8.98, 8.5 and 7.65 in south, central, north, problem zone, high range and overall respectively. The dry average was highest in problem zone and lowest in north zone.

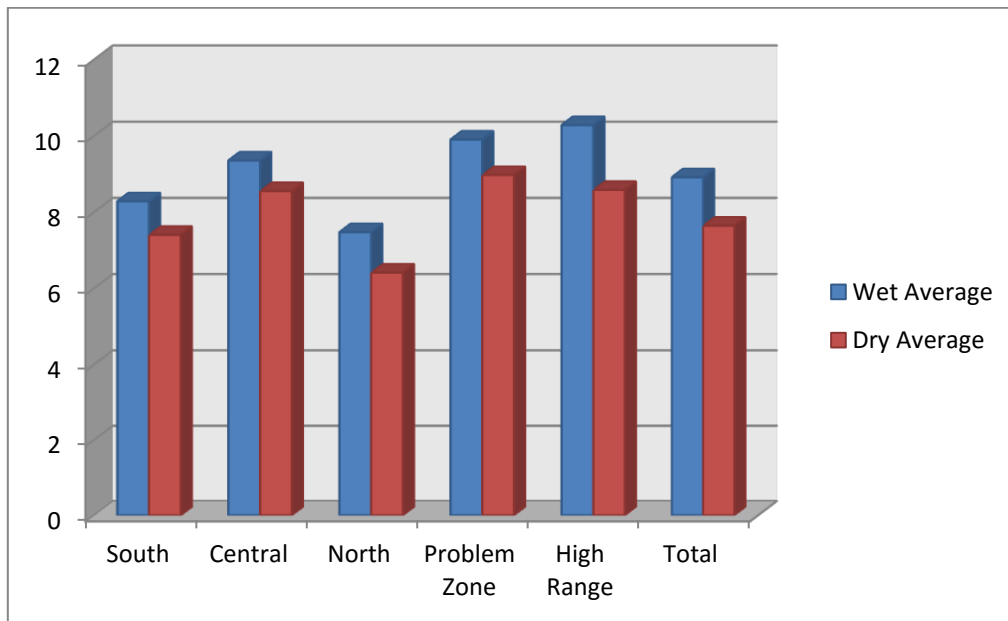


Figure 4.19 Details of average milk production (l/day) in different zones

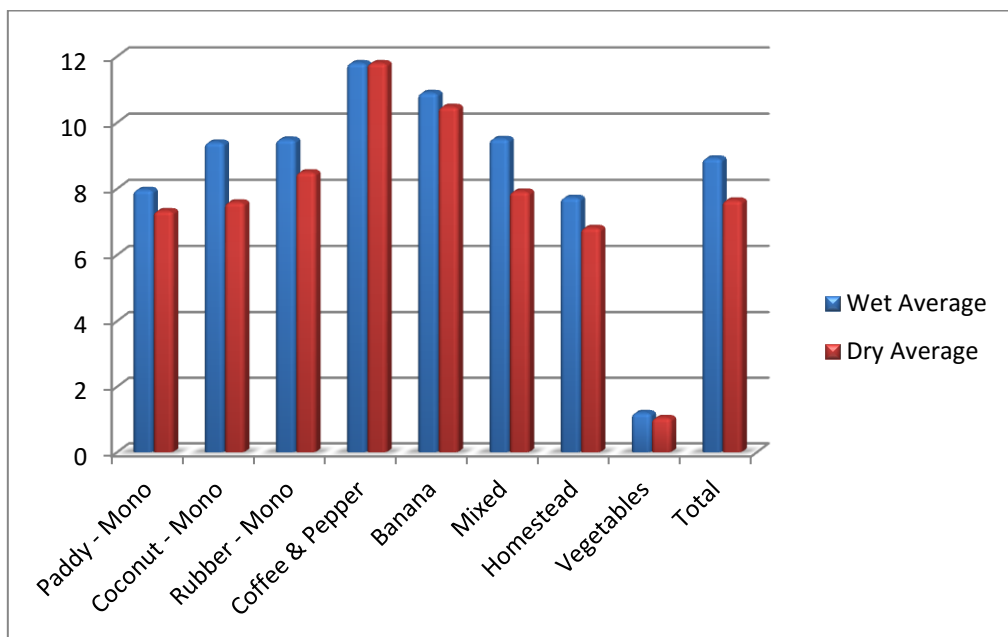


Figure 4.20 Details of average milk production (l/day) in different cropping systems

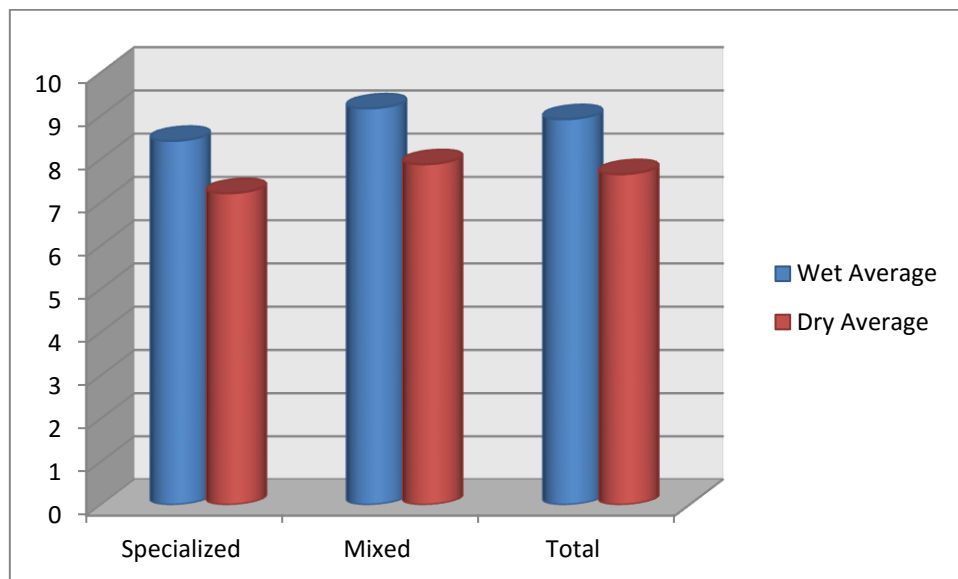


Figure 4.21 Average milk production in different income groups

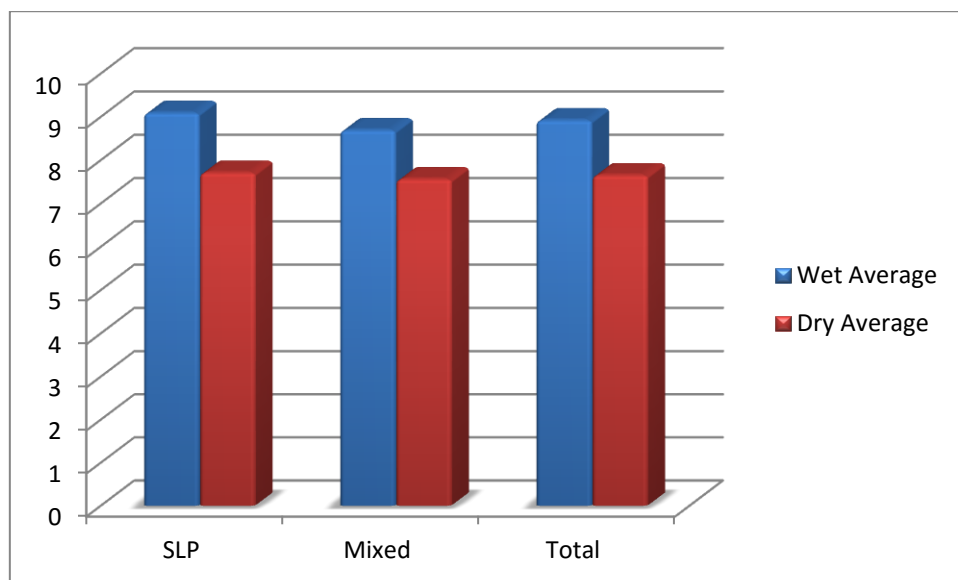


Figure 4.22 Average milk productions in different dry matter groups

The details of wet and dry average of milk production of animals in farming systems based on cropping system or major crop are presented in Figure 4.20. The wet average was highest (11.80) in farming system with coffee and pepper as the major crop. It was lowest in homestead farming system. The dry average was also highest (11.80) in coffee and pepper system and lowest in homestead system.

Figure 4.21 gives the details of wet and dry average in farming systems based on income. The wet (9.17 l/day) and dry average (7.88 l/day) was highest in mixed farming system.

Figure 4.22 details of average milk production in farming systems based on income

Table 4.8.4.4 gives the details of average milk production in farming systems based on dry matter. The wet average (9.09 l/day) and dry average (7.71 l/day) was highest in SLP system.

Table 4.8.4.4 Details of average milk production in farming systems based on dry matter

Farming system	Wet Average(l/day)	Dry Average (l/day)
SLP	9.09	7.71
Mixed	8.69	7.56
Overall	8.92	7.65

4.9 MARKETING AND DISPOSAL PATTERN

4.9.1 Disposal pattern of milk

The details of disposal pattern of milk are presented in the Table 4.9.1. The major share of milk produced in small, medium and large farms were sold to society. The respective values were 77.73, 81.83 and 84.76 per cent respectively. The share of direct selling in small, medium and large farms was 11.76, 13.14 and 13.41 per cent respectively. The share of house consumption was highest (10.43 per cent) in small farms followed by medium (5.06 per cent) and large farms (1.59

per cent). The overall disposal pattern was observed as 83.3 (society), 13.16 (direct) and 3.36 (home) per cent respectively.

Table 4.9.1 Disposal pattern of milk

Farm size	Total Production l/d	Quantity sold to society - Total	%	direct selling	%	home consumption	%
Small	12.75	9.91	77.73	1.5	11.76	1.33	10.43
Medium	36.54	29.9	81.83	4.8	13.14	1.85	5.06
Large	164.43	139.37	84.76	22.05	13.41	2.61	1.59
Overall	52.05	43.36	83.3	6.85	13.16	1.75	3.36

4.9.2 Marketing

4.9.2.1 Agency for marketing

Figure 4.23 gives the details of the agency for marketing of milk. In all farms major share of milk was sold to society. In small farms (72.6 per cent) medium farm (70.0 per cent) and large farms (85.3 per cent) was the share of milk sold to society. In small, medium and large farms 17.7, 26.0 and 14.7 per cent sold milk to neighbours respectively. The sale to hotels, society and neighbours, neighbours and hotel were in small or negligible proportion in all farms. The overall result showed that 74.6, 19.4, 2.6, 1.4, 1.7 per cent of milk was sold to society, only neighbours, hotels, both society and neighbours, and both neighbours and hotels respectively.

4.9.2.2 Distance to the society

Table 4.9.2.2 shows the average distance from the farms to society. The average distance from farm to society (km) was 1.08, 1.62, 2.67 and 1.58 in small, medium, large and overall farms respectively.

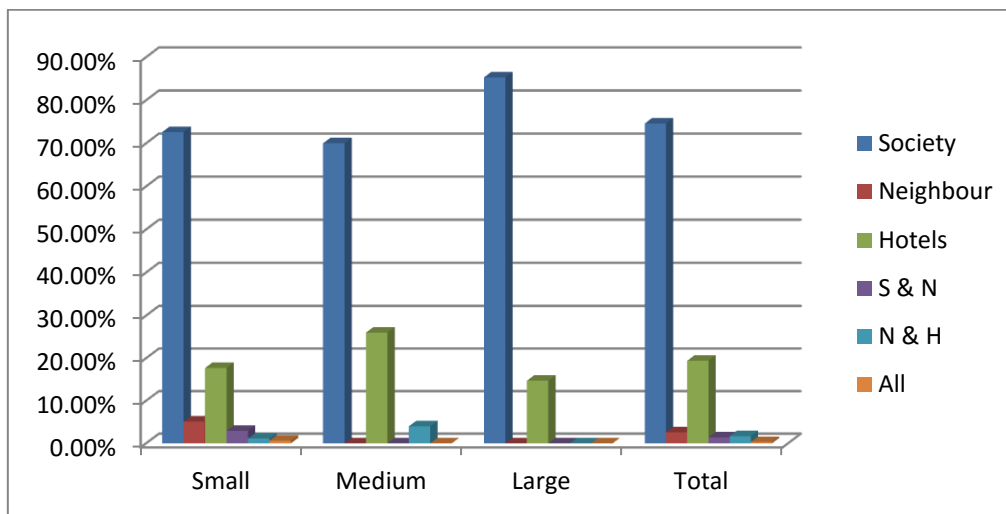


Figure 4.23 Marketing pattern of milk

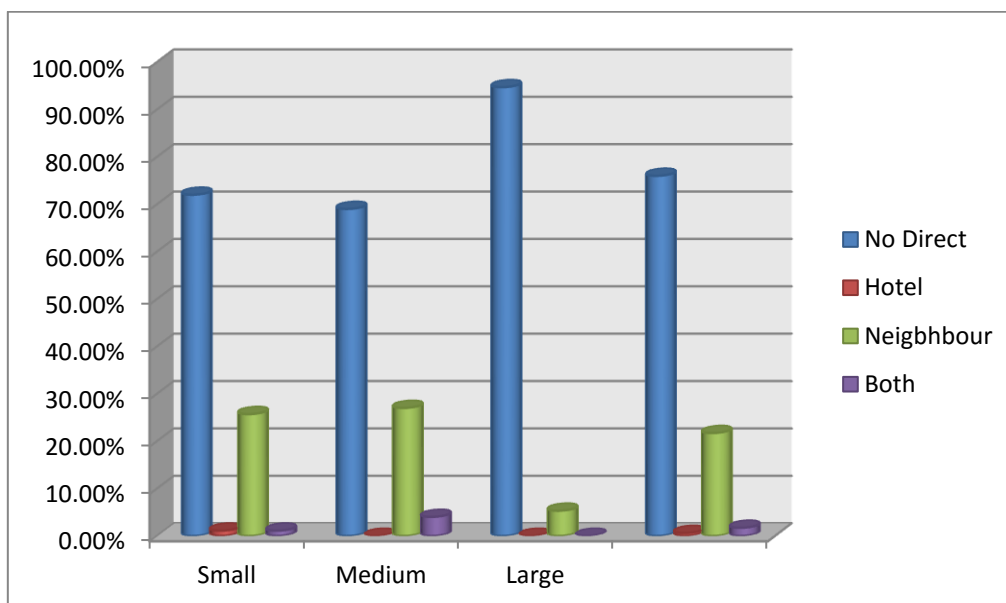


Figure 4.24 Disposal channel of directly sold milk

Table 4.9.2.2 Distance to the cooperative society

Farm size	Small	Medium	Large	Overall
Distance (km)	1.08	1.62	2.67	1.58

4.9.2.3 Mode of transport to market

Table 4.9.2.3 gives the details of the mode of transport to the society. In small farms, majority (78.9) per cent reached society on foot. In medium farms the major mode of transport was two-wheeler (64.0 per cent). In large farms also major mode was by two wheelers (70.7 per cent) followed by auto rickshaw (20.0 per cent). The overall result showed that 46.0, 39.7, 7.4, 0.9, 2.3 and 0.3 per cent used walk, two-wheeler, auto-rickshaw, milk vendor, bi-cycle and other vehicles for transporting milk.

Table 4.9.2.3 Mode of transport to market

Farm Type	Number / Per cent	MODE OF TRANSPORT					
		Walk	Two - wheeler	Auto - rickshaw	Vendor	Bi-cycle	Other vehicles
Small	Number	138	22	1	1	8	0
	Per cent	78.9%	12.6%	0.6%	0.6%	4.6%	0.0%
Medium	Number	21	64	10	2	0	0
	Per cent	21.0%	64.0%	10.0%	2.0%	0.0%	0.0%
Large	Number	2	53	15	0	0	1
	Per cent	2.7%	70.7%	20.0%	0.0%	0.0%	1.3%
Overall	Number	161	139	26	3	8	1
	Per cent	46.0%	39.7%	7.4%	0.9%	2.3%	0.3%

4.9.2.4 Selection of marketing channel (Reason)

Table 4.9.2.4 gives the reason for selecting a marketing channel by the farmers. The reason for selecting society as channel became only society was

available and direct marketing channels were absent. Direct marketing channels were selected because of the higher price realised.

Table 4.9.2.4 Details of reason for selecting a particular marketing agency

Farm Type	Number / Per cent	Reason	
		Only society available	High price
Small	Number	120	53
	Per cent	68.6%	30.3%
Medium	Number	68	29
	Per cent	68.0%	29.0%
Large	Number	69	6
	Per cent	92.0%	8.0%
Overall	Number	257	88
	Per cent	73.4%	25.1%

4.9.2.5 Agency for Direct sale

Figure 4.24 presents the details of agency used for direct sale of milk. In small, medium and large farms 72.0, 69.0 and 94.7 per cent of farmers were not having any direct sale of milk. The neighbours were the major target for direct sale in all types of farms. The sale to hotels and others were very few or negligible in all the farms. The overall result showed that 76.0, 0.6, 21.7 and 1.7 per cent was without direct sale, to hotels, neighbours and both hotels and neighbours respectively.

4.10 ROLE OF CO-OPERATIVES DAIRYING

4.10.1 Perceived benefits of participation in dairy co-operatives

The perceived benefits by the farmers regarding participation in co-operative societies are presented in Table 4.10.1. Irrespective of the farm size guaranteed market was the main benefit cited by the farmers.

Table 4.10.2 presents the complaints raised by the farmers regarding working of societies. The lower price realised for milk and low fat and SNF was the major complaints ranked as first and second by all types of farms.

Table 4.10.1 Farmers' perception regarding benefits of society (Ranking)

Parameter	Small		Medium		Large		Overall	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Guaranteed Market	3	1	3	1	3	1	3	1
Input purchase on credit	2.5	2	2.2	3	2.3	2	2.4	2
Assured supply of inputs	1.8	4	2.3	2	2	3	2	3
Personal relations	2	3	2.2	4	1.5	5	1.9	4
Bonus	1.5	7	2.1	5	1.6	4	1.7	5
Extension services	1.8	5	1.8	6	1.3	7	1.7	6
Less transaction cost	1.4	8	1.2	9	1.5	6	1.4	7
Availability of credit	1.7	6	1	10	1	10	1.3	8
AI Services	1.3	9	1.4	8	1.1	8	1.3	9
Others	0.8	11	1.5	7	1	9	1.1	10
Veterinary Services	1.1	10	1	11	1	11	1	11

4.10.2 Complaints regarding functioning of societies

Table 4.10.2 Complaints of farmers regarding functioning of DCS

Parameters	Small		Medium		Large		Overall	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Lower price of milk	2.9	1	3.0	1	3.0	1	3.0	1
No credit availability	2.3	2	2.9	2	2.0	3	2.4	2
Fat and SNF incorrect	2.1	3	2.1	4	2.5	2	2.1	3
No provision of input service	1.2	4	2.1	3	1.7	4	1.6	4
Defective weighing	1.1	5	1.5	5	1.3	5	1.3	5
Timing of collection	1.0	8	1.3	6	1.1	6	1.1	6
Lack of Bonus	1.0	6	1.0	7	1.0	7	1.0	7
Irregular payments	1.0	7	1.0	8	1.0	8	1.0	8
Others	0.7	9	0.7	9	1.0	9	0.8	9

4.11 INSTITUTIONAL ASSISTANCE

4.11.1 Level of assistance

The classification of farmers based on the extent of assistance (both fixed and recurring) received from government and other agencies. The results showed that medium level of assistance was received by all types of farms. In small farms the proportion of farmers received low, medium and high assistance was 20.0, 73.7 and 6.3 per cent respectively. In medium farms the level of assistance was 9.0, 76.0 and 15.0 per cent at low, medium and high level respectively. In large farms the respective values were 1.3, 80.0 and 18.7 per cent. The overall picture showed that 12.9, 75.7 and 11.4 per cent of farmers received low, medium and high level of assistance for dairying.

Table 4.11.1 Distribution of farmers into assistance classes based on level of assistance

Farm Type	Number / Per cent	Level of Assistance		
		Low	Medium	High
Small	Number	35	129	11
	Per cent	20.0%	73.7%	6.3%
Medium	Number	9	76	15
	Per cent	9.0%	76.0%	15.0%
Large	Number	1	60	14
	Per cent	1.3%	80.0%	18.7%
Total	Number	45	265	40
	Per cent	12.9%	75.7%	11.4%

4.11.2 Impact of level assistance on adoption of better management

The impact of level of assistance on adoption of better management is presented in the Table 4.11.2. The chi-square analysis revealed a significant association between revealed a significant association between adoption class and assistance class. In low adoption class 41.5 and 56.6 per cent of farms were in low and medium assistance class. In medium adoption class 81.2 and 10.3 per

cent were medium and high assisted farmers. In high adoption class 4.8, 71.4 and 23.8 per cent were in low, medium and high assistance classes.

Table 4.11.2 Impact of assistance on adoption score of farmers

Assistance class	Number and % within adoption class	Adoption class			Overall
		Low	Medium	High	
Low	Number	22 _a	20 _b	3 _b	45
	Per cent	41.5%	8.5%	4.8%	12.9%
Per cent	Number	30 _a	190 _b	45 _{a, b}	265
	Per cent	56.6%	81.2%	71.4%	75.7%
High	Number	1 _a	24 _a	15 _b	40
	Per cent	1.9%	10.3%	23.8%	11.4%

Numbers with different subscripts differ significantly

4.11.3 Farmers' perception regarding assistance

The farmers' perception regarding assistance is presented in Table 4.11.3. In small, medium and large farms 80.0, 73.0 and 70.7 per cent expressed very low satisfaction level regarding institutional assistance. In small, medium and large farms only 2.9, 8.0 and 5.3 per cent expressed fair satisfaction levels regarding assistance for dairying. The overall picture showed that 76.0, 19.1 and 4.9 per cent of farmers expressed very low, low and fair level of satisfaction respectively.

Table 4.11.3 Farmers perception regarding institutional assistance

Farm size	Number and per cent	Degree of satisfaction		
		Very low	Low	Fair
Small	Number	140	30	5
	Per cent	80.0%	17.1%	2.9%
Medium	Number	73	19	8
	Per cent	73.0%	19.0%	8.0%
Large	Number	53	18	4
	Per cent	70.7%	24.0%	5.3%
Overall	Number	266	67	17
	Per cent	76.0%	19.1%	4.9%

4.11.4 Farmers' perception of areas where government can assist

The farmers' perception regarding the area where government can help as ranked by the farmers is given in Table 4.11.4. In all farm types provision of subsidy for feed was the first demand raised by the farmers followed by increased rate of milk.

Table 4.11.4 Farmers' perception regarding the areas where government can interfere (Ranking)

Farm size	Small		Medium		Large	
Area	Score	Rank	Score	Rank	Score	Rank
Feed Subsidy	1.086	1.000	1.131	1.000	1.027	1.000
Rate of milk	1.971	2.000	1.929	2.000	2.000	2.000
Greed Fodder	3.840	3.000	3.848	3.000	5.000	5.000
Others	4.000	4.000	4.080	4.000	3.947	4.000
Finance	4.909	5.000	5.040	5.000	2.973	3.000
Quality of feed	5.131	6.000	7.330	8.000	7.000	7.000
Veterinary Service	5.217	7.000	6.060	7.000	7.973	8.000
Medicine	5.320	8.000	5.220	6.000	5.987	6.000
Training	7.160	9.000	7.606	9.000	9.000	9.000

4.12 DAIRY FARM PERFORMANCE

The 4.12.1 presents the Capacity Utilisation Index (CUI) in different farms. In small farms majority of the farmers (44.0 per cent) utilised only 26 to 50 per cent of the capacity whereas the proportion who used 75 to 100 per cent of the total capacity was 35 per cent. In medium farms majority (52.0 per cent) utilized 75 to 100 per cent of the total. In large farms 42.7 and 41.3 utilised 51 to 75 and 75 to 100 per cent of their total capacity.

4.12.1 Capacity Utilization Index (CUI)

Table 4.12.1 Classification of farmers based on capacity utilization index

Farm type	Number & Per cent	Capacity utilization index %				Total
		0-25	26-50	51-75	75-100	
Small	Number	18	77	45	35	175
	Per cent	10.3%	44.0%	25.7%	20.0%	100.0%
Medium	Number	0	19	29	52	100
	Per cent	0.0%	19.0%	29.0%	52.0%	100.0%
Large	Number	0	12	32	31	75
	Per cent	0.0%	16.0%	42.7%	41.3%	100.0%

4.12.2 Perceived profitability of the enterprise

The perceived profitability of the enterprise by the farmers is presented in Table 4.12.2. In small, medium and large farms, 76.0, 84.0 and 92.0 per cent perceived their profitability as somewhat profitable, while 21.7, 7 and 6.7 per cent of farmers in small, medium and large farms respectively expressed it as high loss only 2.3, 9.0 and 1.3 per cent of respective farms viewed it as more profitable.

Table 4.12.2 Classification based on perceived profitability of the enterprise

Farm type	Number & Percent	Perceived profitability				
		Very high loss	High loss	Somewhat profitable	More profitable	Most profitable
Small	Number	0	38	13	4	0
	Per cent		21.7%	76.0%	2.3%	
Medium	Number	0	7	84	9	0
	Per cent		7.0%	84.0%	9.0%	
Large	Number	0	5	69	1	0
	Per cent		6.7%	92.0%	1.3%	

4.12.3 Livestock Production Index

Table 4.12.3 presents the livestock production index under different farm sizes. The mean values were 0.88, 1.01 and 1.24 in small, medium and large farms respectively.

Table 4.12.3 Livestock production index under different farm sizes

Farm type	Mean
Small	0.8846
Medium	1.0145
Large	1.2497

4.12.4 Dairy Farm Production Index (DFPI)

The classification of farms based on – dairy farm performance index is presented in Table 4.12.4. In all farm types, farms showed medium dairy farm performance. The respective values in small, medium and large farms were 54.3, 56.0 and 45.3 per cent. Low dairy farm performance was shown by 32.0, 5.0 and zero per cent of small, medium and large farms. High performance was shown by 13.7, 39.0 and 54.7 per cent of the small, medium and large farms respectively.

Table 4.12.4 Classification of farmers based on dairy farm performance

Farm type	Number & Per cent	Dairy farm performance			Total
		Low	Medium	High	
Small	Number	56	95	24	175
	Per cent	32.0%	54.3%	13.7%	100.0%
Medium	Number	5	56	39	100
	Per cent	5.0%	56.0%	39.0%	100.0%
Large	Number	0	34	41	75
	Per cent	0.0%	45.3%	54.7%	100.0%

4.13 CONSTRAINTS EXPRESSED BY THE FARMERS

4.13.1 Feeding constraints

Table 4.13.1 presents the constraints expressed by the farmers regarding feeding of dairy animals. Each constraint was given a within group rank and an overall rank after considering all problems in different types of farms. In feeding, in all types of farms high price of concentrate feed was the major constraint. The non availability of green fodder and price of paddy straw were the other major constraints in feeding as expressed by farmers.

4.13.2 Breeding constraints

Table 4.13.2 presents constraints in breeding as expressed by the farmers. In all types of farmers, infertility was the major constraint.

4.13.3 Animal health constraints

Table 4.13.3 shows animal health care constraints as perceived by the farmers. In small farms diseases was cited as the major constraint while in medium and large farms, high cost of veterinary medicine was the major constraint.

4.13.4 Policy, social and finance related constraints

Table 4.13.4 presents the policy, social and finance related issues raised by the farmers. Low price for milk was ranked first in all types of farms and raised as the overall major constraint.

4.13.5 Marketing constraints

Table 4.13.5 shows constraints regarding marketing of milk in the farms. Inadequate price from society and low fat and SNF in milk were ranked first and second in this category. The non-availability of market for milk was not at all a concern for any farms in any seasons.

Table 4.13.1 Feeding Constraints

Small farms				Medium farms				Large farms				Overall			
Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group
1	Price of Concentrate feed	2.977	1	4	Price of Concentrate feed	2.98	1	8	Price of concentrate feed	2.96	1	5	Price of Concentrate feed	2.851	1
11	Green fodder availability	2.24	2	15	Price of Paddy Straw	2.74	2	25	Green fodder availability	1.733	2	15	Price of Paddy Straw	2.08	2
13	Price of Paddy Straw	2.177	3	19	Quality of feed	2.67	3	27	Price of Paddy Straw	1.547	3	19	Quality of feed	1.653	3
18	No grazing land	1.829	4	20	No grazing land	2.63	4	31	No grazing land	1.253	4	20	No grazing land	1.671	4
25	lack of knowledge in ration balancing	1.617	5	22	Green fodder availability	2.51	5	35	Dry Fodder	1.027	5	22	Green fodder availability	1.751	5
26	Quality of feed	1.617	6	36	Dry Fodder availability	1.23	6	36	lack of knowledge in ration	1.027	6	36	Dry Fodder availability	1.418	6
30	Dry Fodder availability	1.451	7	43	Lack of knowledge in ration balancing	1	7	38	Quality of feed	1.013	7	43	lack of knowledge in ration balancing	1.017	7

Table 4.13.2. Breeding Constraints

Small farms				Medium farms				Large farms				Overall			
Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group
7	Infertility	2.611	1	11	Infertility	2.880	1	12	Infertility	2.773	1	11	Infertility	2.431	1
31	Distant location of AI centre	1.429	2	35	Non availability of AI service in time	2.880	2	14	Distant location of AI centre	2.453	2	35	Non availability of AI service in time	1.683	2
34	Non availability of AI service in time	1.406	3	37	Distant location of AI centre	1.190	3	22	Calving problems	1.987	3	37	Distant location of AI centre	2.029	3
40	Cost of AI	1.166	4	42	Calving problems	1.010	4	24	Non availability of AI service in time	1.893	4	42	Calving problems	1.494	4
41	Calving problems	1.057	5	44	Cost of AI	1.000	5	37	Cost of AI	1.027	5	44	Cost of AI	1.023	5

Table 4.13.3 Animal health constraints

Small farms				Medium farms				Large farms				Overall			
Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group
15	Diseases	1.971	1	6	High cost of medicine	2.940	1	3	High cost of medicine	3.000	1	6	High cost of medicine	2.797	1
17	High cost of medicine	1.857	2	13	High cost of veterinary service	2.940	2	18	High cost of veterinary service	2.187	2	13	High cost of veterinary services	2.340	2
24	High cost of veterinary services	1.623	3	18	Diseases	2.670	3	26	Disease	1.707	3	18	Disease	2.031	3
27	Distant location of vet. Hospital	1.589	4	23	Non availability of vet. service in time	2.030	4	33	Lack of knowledge about diseases	1.027	4	23	Non availability of veterinary service in	1.811	4
32	Lack of knowledge about diseases	1.423	5	30	Lack of knowledge about diseases	1.820	5	39	Distant location of vet. hosp.	1.013	5	30	Lack of knowledge about diseases	1.297	5
33	Outbreak of diseases	1.417	6	33	Outbreak of diseases	1.720	6	40	Outbreak of diseases	1.013	6	33	Outbreak of diseases	1.417	6
38	Non availability of veterinary service in time	1.263	7	39	Distant location of vet. Hospital	1.020	7	41	Non availability of veterinary service in time	1.000	7	39	Distant location of vet. Hospital	1.417	7
43	Non availability of vaccine in time	1.023	8	45	Non availability of vaccine in time	1.000	8	45	Non availability of vaccine in time	1.000	8	45	Non availability of vaccine in time	1.000	8

Table 4.13.4 Policy, social and finance related constraints

Small farms				Medium farms				Large farms				Overall			
Overall Rank	Constraint	Mean	Rank with In group	Overall Rank	Constraint	Mean	Rank With in group	Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group
14	Change in cropping pattern	1.98	8	14	Low social participation	2.76	8	13	High Labour cost	2.733	8	14	Family health	2.361	8
16	Climate change	1.87	9	16	Land shortage for fodder	2.72	9	15	High Interest rates	2.307	9	16	Lack of credit	2.249	9
19	Non avail. of family labour	1.83	10	17	Lack of credit	2.69	10	16	Non avail. of hired labour	2.253	10	17	Non avail. of family labour	2.163	10
20	Lack of training and knowledge	1.82	11	21	Family health	2.53	11	17	Lack of credit	2.240	11	20	Non avail. of hired labour	2.110	11
21	Non avail. of quality animals	1.79	12	24	Non avail. Of hired labour	2.02	12	19	Waste management	2.067	12	21	Low social participation	1.963	12
22	Lack of Interest of young generation	1.78	13	25	Policy to purchase animals from outside states	2.01	13	20	Socio-psychological constraints	2.013	13	24	Land shortage for fodder	1.926	13

23	Family health	1.75	14	26	Climate change	1.960	14	21	Land shortage for fodder	2.000	14	25	Climate change	1.849	14
28	Waste management	1.52	15	27	Change in cropping pattern	1.920	15	23	Low social participation	1.987	15	27	Waste management	1.654	15
29	Lack of credit	1.5	16	28	Lack of mechanisation	1.900	16	28	Policy to purchase animals from	1.493	16	28	Lack of training and knowledge	1.503	16
35	Non avail. Of hired labour	1.4	17	29	Non avail. Of family labour	1.830	17	29	Climate change	1.293	17	29	Socio-psychological constraints	1.486	17
36	Socio-psychological constraints	1.38	18	31	Socio-psychological constraints	1.780	18	30	Lack of training and knowledg	1.267	18	31	Outside state purchase	1.414	18
37	High Labour cost	1.34	19	32	Lack of training and knowledge	1.730	19	31	Change in cropping pattern	1.253	19	32	Lack of Interest of young generation	1.394	19
39	Policy to purchase animals from outside states	1.25	20	34	Lack of Interest of young generation	1.710	20	32	Lack of mechanisation	1.040	20	34	Lack of mechanisation	1.317	20
42	Lack of mechanisation	1.05	21	38	Waste management	1.170	21	34	Lack of Interest of young generation	1.027	21	38	Change in cropping pattern	1.300	21

Table 4.13.5 Marketing constraints

Small farms				Medium farms				Large farms				Overall			
Over-All Rank	Constraint	Mean	Rank with In Group	Overall Rank	Constraint	Mean	Rank with In Group	Over-All Rank	Constraint	Mean	Rank with in group	Over-all Rank	Constraint	Mean	Rank with in group
3	Milk price from society	2.960	1	2	Milk price from society	3.000	1	2	Milk price from society	3.000	1	2	Milk price from society	2.986	1
5	Low Fat & SNF	2.766	2	7	Low Fat & SNF	2.920	2	9	Low Fat & SNF	2.933	2	7	Low Fat & SNF	2.757	2
47	No society	1.000	3	41	Low demand during flush	1.020	3	44	No society	1.000	3	41	Low demand during flush	1.031	3
48	Poor marketing facilities	1.000	4	46	Poor marketing facilities	1.000	4	46	Low demand during flush	1.000	4	46	Poor marketing facilities	1.006	4
49	Low demand during flush	1.000	5	47	No society	1.000	5	47	Poor marketing facilities	1.000	5	47	No society	1.000	5

4.14 Economics of milk production

4.14.1 Cost of production

4.14.1.1 Cost of milk production per litre on milk animal basis

The cost of milk production per milk animal per day basis is presented in the Table 4.14.1.1. The average total maintenance cost of a lactating or milk animal per day was Rs. 229.81, 203.04 and 249.51 in small, medium and large farms respectively. The average daily maintenance cost was Rs. 226.38 on overall basis. The average cost of production per litre of milk (cost B) was 28.09, 28.49, 25.68 and 27.69 respectively in small, medium, large and overall farms respectively. The average cost/litre of milk after deduction of imputed family labour (cost A) was 19.93, 22.78, 24.93 and 21.81 in small, medium large and over all farms respectively. The cost of concentrate constituted 43.43, 34.7, 40.85 per cent of total maintenance cost in small, medium and large farms respectively.

Table 4.14.1.1 Cost of milk production per litre on milk animal basis under different farm sizes

Cost parameter (Rs)	Small		Medium		Large		Overall	
	Mean	% of gross cost	Mean	% of gross cost	Mean	% of gross cost	Mean	% of gross cost
Average cost/ l of milk on milk animal basis(Cost B)								
Interest on milk animal	13.03	5.67	13.92	6.86	16.74	6.71	14.08	6.22
Depreciation on milk animal	8.44	3.67	9.36	4.61	12.3	4.93	9.53	4.21
Interest on shed	7.66	3.33	6.08	3	10.43	4.18	7.8	3.45
Depreciation on shed	6.53	2.84	6.4	3.15	6.36	2.55	6.46	2.85
Interest on equipments	0.37	0.16	1.2	0.59	2.55	1.02	1.08	0.48
Depreciation on equipments	0.31	0.13	0.97	0.48	1.64	0.66	0.78	0.34
Cost of green fodder	35.28	15.35	25.45	12.54	47.32	18.97	35.05	15.48
Cost of dry fodder	5.91	2.57	8.58	4.23	5.24	2.1	6.53	2.88
Cost of total roughage	41.18	17.92	34.03	16.76	52.56	21.07	41.58	18.37
Cost of concentrate	105.3	45.82	87.88	43.29	107.2	42.98	100.7	44.5

AI cost	0.82	0.36	0.54	0.27	0.5	0.2	0.67	0.3
Cost of Veterinary Services	2.93	1.28	3.21	1.58	3.37	1.35	3.1	1.37
Total cost on veterinary services	3.75	1.63	3.75	1.85	3.87	1.55	3.78	1.67
Labour cost	39.97	17.39	35.97	17.72	31.71	12.71	37.06	16.37
Insurance premium	3.26	1.42	3.48	1.71	4.12	1.65	3.51	1.55
Total maintenance cost	229.81		203.04		249.51		226.38	
Average cost/ l of milk (Cost B)	28.09		28.49		25.68		27.69	
Average cost/l of milk after deduction on milk animal basis (Cost A)								
Family labour for fodder	26.35	16.08	9.01	5.41	1.32	0.55	16.03	8.84
Family labour	39.55	24.13	27.59	16.58	6.78	2.81	29.11	16.06
Total imputed cost for family labour	65.9	40.2	36.59	21.98	8.1	3.36	45.14	24.91
Total maintenance cost	163.91		166.45		241.42		181.24	
Average cost/l of milk (Cost A)	19.93		22.78		24.93		21.81	

4.14.1.2 Cost of milk production per litre on milch animal basis under different farms

The details of cost of milk production per milch animal basis in the farms are presented in Table 4.14.1.2. The total maintenance cost (Rs.) in small, medium, large and overall farms was 226.01, 198.14, 219.6 and 216.68 respectively. The average cost/litre of milk (cost B) was 32.51, 34.29, 29.08 and 32.29 in small, medium, large and overall farms respectively. The average cost per litre of milk after deduction of imputed family labour cost (cost A) was 22.02, 26.33, 27.08 and 24.34 (Rs/litre) in small, medium, large and overall farms respectively. The major share of maintenance cost was contributed by the cost of concentrate which was 43.43, 34.7, 40.85 and 40.38 per cent respectively in small, medium, large and overall farms. The total roughage cost constituted 18.22, 15.08, 14.12 and 16.44 per cent respectively. The share of labour was 19.17, 17.91, 16.54 and 18.24 per cent in small, medium, large and overall farms respectively.

Table 4.14.1.2 Cost of milk production per litre on milch animal basis under different farm sizes

Cost parameter (Rs)	Small		Medium		Large		Overall	
	Mean	% of gross cost	Mean	% of gross cost	Mean	% of gross cost	Mean	% of gross cost
Average cost/ l of milk on milch animal per day basis (Cost B)								
Interest on milch animals	13.03	5.77	13.92	6.16	16.74	7.41	14.1	6.23
Depreciation on milch animals	8.44	3.73	9.36	4.14	12.3	5.44	9.53	4.22
Interest on shed	7.66	3.39	6.08	2.69	10.43	4.62	7.8	3.45
Depreciation on shed	6.53	2.89	6.4	2.83	6.36	2.81	6.46	2.86
Interest on equipments	0.37	0.16	1.2	0.53	2.55	1.13	1.08	0.48
Depreciation on equipments	0.31	0.14	0.97	0.43	1.64	0.73	0.78	0.35
Cost of green fodder	35.28	15.61	25.49	11.28	26.66	11.8	30.6	13.55
Cost of dry fodder	5.91	2.62	8.58	3.8	5.24	2.32	6.53	2.89
Cost of total roughage	41.18	18.22	34.07	15.08	31.9	14.12	37.2	16.44
Cost of concentrate	98.15	43.43	78.42	34.7	92.33	40.85	91.3	40.38
AI cost	0.82	0.36	0.55	0.24	0.5	0.22	0.67	0.3
Cost of Veterinary Services	2.94	1.3	3.21	1.42	3.37	1.49	3.11	1.38
Total cost on veterinary services	3.76	1.66	3.75	1.66	3.87	1.71	3.78	1.67
Labour cost	43.32	19.17	40.48	17.91	37.37	16.54	41.2	18.24
Insurance premium	3.26	1.44	3.48	1.54	4.12	1.82	3.51	1.55
Total maintenance cost	226.01		198.14		219.6		216.68	
Average cost/ l of milk (Cost B)	32.51		34.29		29.08		32.29	
Average cost/l of milk after deduction on milch animal basis (Cost A)								
Family labour for fodder	26.35	16.81	9.01	5.77	1.32	0.65	16	0.65
Family labour	42.9	27.36	33.03	21.16	14.05	6.88	33.9	0.65
Total imputed cost for family labour	69.25	44.17	42.03	26.92	15.37	7.53	49.9	0.65
Total maintenance cost	156.77		156.11		204.22		166.75	
Average cost/l of milk (Cost A)	22.02		26.33		27.08		24.34	

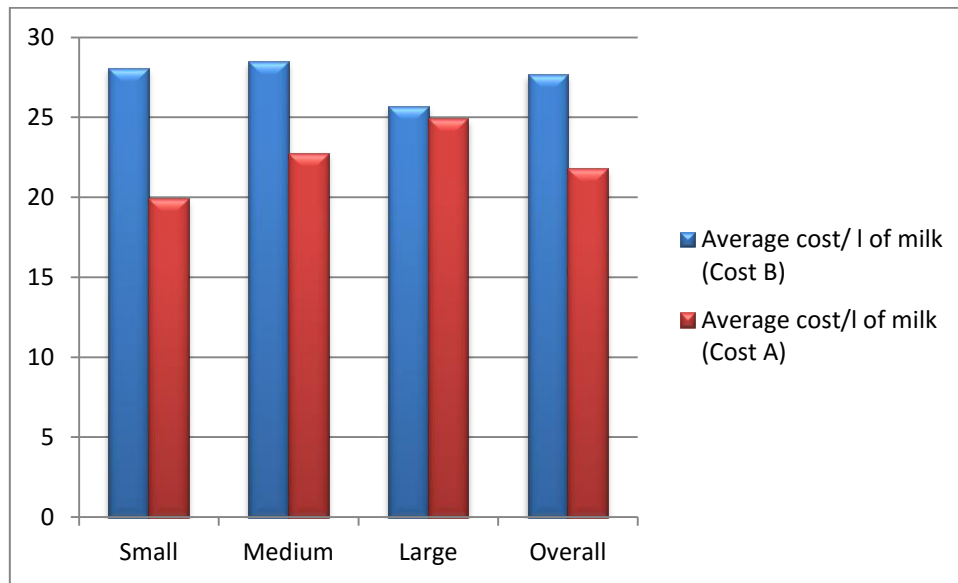


Figure 4.25 Average cost per litre of milk on milk animal basis (Rs.)

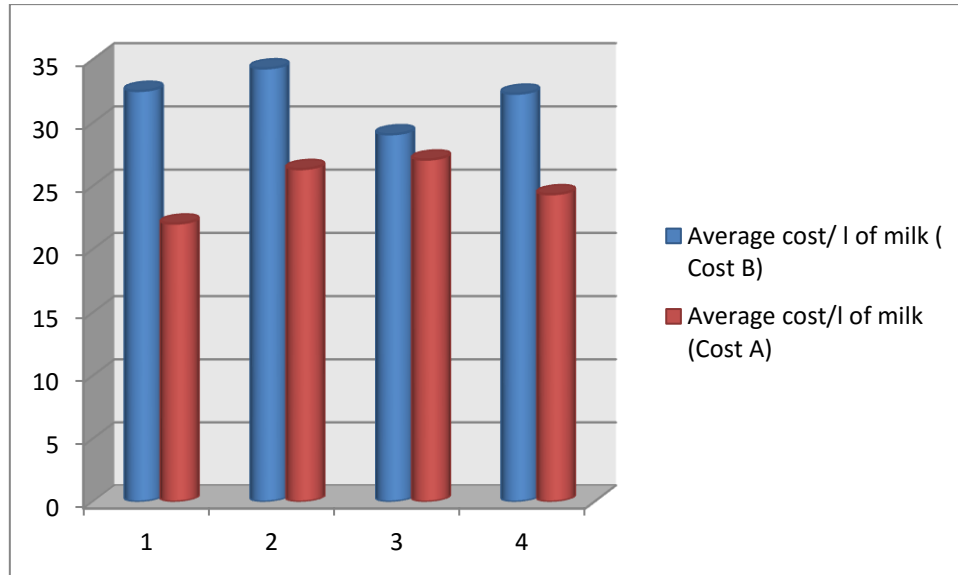


Figure 4.26 Average cost of milk per litre on milch animal basis (Rs.)

4.14.2 Cost –Returns from milk production

4.14.2.1 Cost and Returns of milk production per milk animal per day basis

The details of cost and returns from milk production per day were calculated per milk animal basis and are presented in Table 4.14.2.1. The total fixed cost was 15.81, 16.51, 21.77 and 17.29 per cent of the total gross cost/milk animal/day. The total variable cost 84.19, 81.31, 79.96 and 82.45 per cent of gross cost in small, medium, large and overall farms respectively. The gross cost/milk animal/day was Rs.229.81, Rs.203.04, Rs.249.51 and Rs.226.38 in small, medium and large farms respectively. The net return from milk animal/day was Rs.44.46, Rs.45.31, Rs.62.02 and Rs.48.46 in small, medium, large and overall farms respectively. The net return after deduction of imputed cost was Rs.110.36, Rs.81.9, Rs.70.12, and Rs.93.61 respectively.

4.14.2.2 Costs and returns of milk production per milch animal per day basis

The cost and returns per day per milch animal is presented in Table 4.14.2.2. The total fixed cost was 16.08, 19.15, 22.78 and 18.34 per cent of gross cost in small, medium, large and overall farms respectively. The total variable cost was 83.92, 90.55, 77.22 and 81.69 per cent in small, medium, large and over all farms. The net return per day per milch animal was Rs.23.34, Rs.10.39, Rs.27.74 and Rs.20.58 respectively in small, medium, large and overall farms respectively. The net return after deduction of imputed family labour cost was Rs.92.59, Rs.52.42, Rs.43.12 and Rs.70.51 in small, medium, large and overall farms respectively.

Table 4.14.2.1 Cost and Returns of milk production per milk animal per day under different farm sizes

Cost parameter (Rs)	Small	Medium	Large	Overall
	Mean	Mean	Mean	Mean
Interest on fixed capital investment	21.06	21.2	29.72	22.96
Depreciation on fixed capital	15.28	16.74	20.3	16.77
Total fixed cost	36.34 (15.81)	37.94 (18.69)	50.02 (21.77)	39.73 (17.29)
Green fodder cost	35.28	25.45	47.32	35.05
Dry fodder cost	5.91	8.58	5.24	6.53
Total roughage cost	41.18	34.03	52.56	41.58
Concentrate cost	105.3	87.88	107.23	100.74
Total feed cost	146.49	121.91	159.8	142.32
Medicine and veterinary care	3.75	3.75	3.87	3.78
Labour cost	39.97	35.97	31.71	37.06
Insurance	3.26	3.48	4.12	3.51
Total variable cost	193.47 (84.19)	165.1 (81.31)	199.5 (79.96)	186.66 (82.45)
Total variable cost after deduction of imputed cost	127.57	128.51	191.4	141.51
Gross cost	229.81	203.04	249.51	226.38
Gross cost after deduction of imputed cost	163.91	166.45	241.42	181.24
Net cost	217.81	191.04	237.51	214.38
Net cost after deduction of imputed cost	151.91	154.45	229.42	169.24
Gross return	262.27	236.34	299.53	262.85
Net returns	44.46	45.31	62.02	48.46
Net Return after deduction of imputed cost	110.36	81.9	70.12	93.61

Table 4.14.2.2 Costs and returns of milk production per milch animal per day under different farm sizes

Cost parameter (Rs)	Small	Medium	Large	Overall
	Mean	Mean	Mean	Mean
Interest on fixed capital investment	21.07	21.2	29.72	22.96
Depreciation on fixed capital	15.28	16.74	20.3	16.77
Total fixed cost	36.35 (16.08)	37.94 (19.15)	50.02 (22.78)	39.73 (18.34)
Green fodder cost	35.28	25.49	26.66	30.63
Dry fodder cost	5.91	8.58	5.24	6.53
Total roughage cost	41.18	34.07	31.9	37.16
Concentrate cost	98.15	78.42	92.33	91.26
Total feed cost	139.33	112.49	124.22	128.42
Medicine and veterinary care	3.76	3.75	3.87	3.78
Labour cost	43.32	40.48	37.37	41.23
Insurance	3.26	3.48	4.12	3.51
Total variable cost	189.66 (83.92)	160.2 (90.55)	169.58 (77.22)	176.94 (81.69)
Total variable cost after deduction of imputed cost	120.41	118.17	154.21	127.01
Gross cost	226.01	198.14	219.6	216.67
Gross cost after deduction of imputed cost	156.76	156.11	204.22	166.75
Net cost	214.01	186.14	207.6	204.67
Net cost after deduction of imputed cost	144.76	144.11	192.22	154.75
Gross return	237.35	196.53	235.34	225.26
Net returns	23.34	10.39	27.74	20.58
Net Return after deduction of imputed cost	92.59	52.42	43.12	70.51

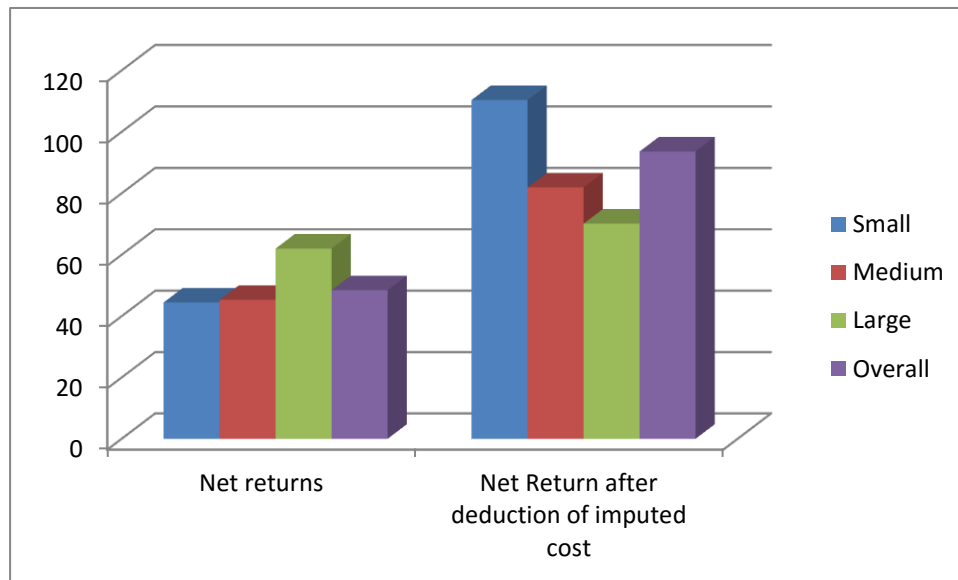


Fig.4.27 Net Returns from milk production per milk animal per day under different farm sizes

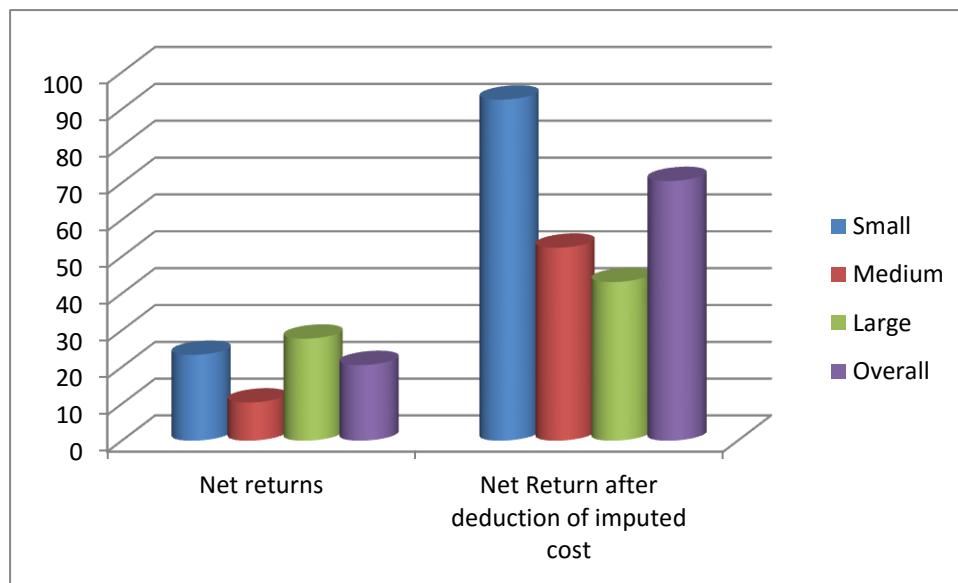


Fig.4.28 Net returns from milk production per milch animal per day under different farm sizes

4.14.2.3 Cost and Returns from milk production in different agro-climatic zones

Table 4.14.2.3 presents the cost and returns per milch animal/day in different agro- climatic zones. The net return after deduction of family labour was Rs.68.03, Rs.83.87, Rs.53.24, Rs.92.58 and Rs.82.8 in south, central, north problem zone and high range respectively. The cost B was and high range respectively.

4.14.2.4 Cost and Returns from milk production in farming system based on cropping pattern

Cost and return of milk production in farming systems based on cropping pattern per milch animal per day is presented in table 4.14.2.4. The net return after deduction of imputed cost was Rs.81.46, Rs.52.82, Rs. 80.87, Rs.117, Rs.113.8, Rs.68.6, Rs. 67.38 and Rs.93.61 in different farming systems. Cost A was Rs.22.91, Rs.25.32, Rs.23.18, Rs.18.3, Rs.18.68, Rs.24.53, Rs.25.46 and Rs.21.27 respectively

4.14.2.3 Cost and Returns from milk production in different agro-climatic zones per milch animal per day

Parameters	South	Central	North	Problem Zone	High Range
COST B (Rs/l)	31.8	29.17	34.02	28.66	31.77
COST A (Rs/l)	23.8	23.09	26.28	22.73	22.94
Gross Cost (Rs)	218.13	223.19	189.87	230.91	240.55
Gross cost after deduction of family labour (Rs)	164.22	176.37	151.69	185.86	177.92
Gross returns (Rs)	220.25	248.25	192.93	266.44	248.72
Net returns (Rs)	14.12	37.06	15.07	47.53	20.18
Net returns after deduction of family labour (Rs)	68.03	83.87	53.24	92.58	82.8

4.14.2.4 Cost and Returns from milk production in farming system based on cropping pattern per milch animal per day.

Parameters	Paddy mono	Coconut mono	Rubber mono	Spices	Banana mono	mixed cropping	homestead farming	vegetables
COST B (Rs/l)	31.96	27.61	31.08	22.5	23.48	32.45	34.84	25.91
COST A (Rs/l)	22.91	25.32	23.18	18.3	18.68	24.53	25.46	21.27
Gross Cost (Rs)	204.4	200.1	247.28	265	247.8	226.12	199.93	246.3
Gross cost after deduction of family labour (Rs)	149.8	185.89	184.25	216	202.8	173.88	149.4	199.9
Gross returns (Rs)	219.3	226.71	253.12	321	304.5	229.94	204.78	281.5
Net returns (Rs)	26.86	38.61	17.84	67.8	68.7	15.82	16.85	47.23
Net returns after deduction of family labour (Rs)	81.46	52.82	80.87	117	113.8	68.06	67.38	93.61

4.14.2.5 Cost and Returns from milk production in farming system based on income

Table 4.14.2.5 gives the details of cost and returns from milk production in farming systems based on income. The net return after deduction of family labour was Rs.69.28 and Rs.71.02 in specialized and mixed daily farming systems respectively. Cost B (Rs/litre) was 33.13 and 31.88 and cost A (Rs./litre) was 24.63 and 24.19 respectively in specialized and mixed daily systems.

4.14.2.5 Cost and Returns from milk production in farming system based on income per milch animal per day

Parameter	Specialized dairy farming	Mixed dairy farming
COST B (Rs/l)	33.13	31.88
COST A (Rs/l)	24.63	24.19
Gross Cost (Rs)	207.07	221.91
Gross cost after deduction of family labour (Rs)	158.64	171.01
Gross returns (Rs)	215.92	230.03
Net returns (Rs)	20.85	20.12
Net returns after deduction of family labour (Rs)	69.28	71.02

4.14.2.6 Cost and Returns from milk production in farming system based on dry matter

Table 4.14.2.6 shows the cost and return milk production in farming system based on dry matter. The cost B was Rs. 31.76 and Rs.33.01 and cost A was Rs.24.08 and Rs.24.68 respectively in SLPS and CLS systems. The net return after deduction of family labour was Rs.71.25 and Rs. 69.5 respectively in SLPS and CLS.

4.14.2.6 Cost and Returns from milk production in farming system based on dry matter per milch animal per day

Parameter	SLPS	CLS
COST B (Rs/l)	31.76	33.01
COST A (Rs/l)	24.08	24.68
Gross Cost (Rs)	216.71	216.63
Gross cost after deduction of family labour (Rs)	168.27	164.66
Gross returns (Rs)	227.52	222.17
Net returns (Rs)	22.82	17.54
Net returns after deduction of family labour (Rs)	71.25	69.5

4.14.3 Cost-Return traits

Table 4.14.3 shows various cost return traits. The return over feed cost (ROFC) was 110.02, 96.04 and 123.84 per milch animal per day in small, medium, large farms. The feed cost efficiency (per cent) was 80.53, 87.55 and 110.67 in small, medium, and large farms respectively. The return over variable cost (ROVC) was 59.69, 48.33 and 78.65 in small, medium and large farms. The break even output (litre) per milk animal was 6.56, 2.34 and 2.89 and per milch animal was 5.25, 3.66 and 7.32 respectively. The input output ratio excluding unpaid labour per milch animal/day was 1.51, 1.26 and 1.17 in small, medium and large farms respectively.

4.14.4 Measures of farm efficiency

Table 4.14.4 presents some of the measures of farm efficiency. The net farm income was Rs. 27.6, Rs.62.7 and Rs.391.83 in small, medium and large farms respectively. The net cash income (Rs.) was 139.09, 271.36 and 684.71 respectively. Net income per hectare (Rs) was 189.51, 185.53 and 1497.69 respectively. Net farm income per adult unit (Rs) was 10.08, 5.79 and 17.28 in small, medium and large farms. The net return per Rs. Hundred worth feed fed to livestock (per cent) was 59.84, 56.06 and 50.08. The capital per Rs.100 gross return was 27.42, 43.82 and 43.53 respectively. The rate of turnover (per cent) was 7.84, 3.04 and 14.27 per cent in small, medium and large farms respectively.

Table 4.14.4 Measures of farm efficiency

Sl no	Cost Return traits	Small	Medium	Large
1	Net farm income (Rs)	27.6	62.7	391.83
2	Net cash income (Rs)	139.09	271.36	684.71
3	Net income per hectare (Rs)	189.51	-185.53	1497.69
4	Net farm income per adult unit (Rs)	10.08	5.79	17.28
5	Net return per Rs hundred worth feed fed to livestock (%)	59.84	56.06	50.08
6	Capital per Rs 100 gross return	47.42	43.82	43.53
7	Rate of turnover (%)	7.84	3.04	14.27

Table 4.14.3 Means of cost and return traits in milk production in different farm sizes.

Sl no	Parameters	Milk animal			Milch animal		
		Small	Medium	Large	Small	Medium	Large
1	Gross return per day (Rs)	274.27	248.34	310.6	249.35	208.53	245.96
2	Total feed cost per day (Rs)	146.49	121.91	158.44	139.33	112.49	122.12
3	Return over feed cost (ROFC)	127.78	126.44	152.16	110.02	96.04	123.84
4	Feed cost efficiency (%)	91.04	106.09	130.69	80.53	87.55	110.67
5	Returns from milk (Rs)	262.27	236.34	298.6	237.35	196.53	233.96
6	Average milk yield (litres)	8.98	8	9.98	8.13	6.65	7.82
7	Total fixed cost per animal (Rs)	36.34	37.94	49.98	36.35	37.94	49.98
8	Total variable cost per animal (Rs)	193.47	165.1	197.94	189.66	160.2	167.31
9	Return over variable cost (ROVC)	80.8	83.24	112.66	59.69	48.33	78.65
10	Variable cost: fixed cost	1: 5.61	1:4.6	1:4.27	1:5.5	1:4.48	1:3.5
11	Total cost per animal including unpaid labour (Rs)	229.81	203.04	247.91	226.01	198.14	217.29
12	Total cost excluding unpaid labour (Rs)	163.91	166.45	240.28	156.76	156.11	202.32
13	Variable cost per litre (Rs)	23.34	22.79	20.26	26.85	27.33	22.12
14	Price per litre of milk (Rs)	29.43	29.79	29.91	29.43	29.79	29.91
15	Break even output (litre)	6.56	2.34	2.89	5.25	3.66	7.32
16	Per cent break even output to total out put	90.7	25.31	23.49	111.73	33.33	38.27
17	Input output ratio including unpaid labour	1.12	1.14	1.29	1.02	0.97	1.09
18	Input output ratio excluding unpaid labour	1.61	1.42	1.34	1.51	1.26	1.17

4.14.5 Milk production function

The Cobb. Douglas production function was estimated for different types of farms and overall. The estimated determinants of milk production and coefficient of multiple determinations (R^2) of the function is presented in Table 4.14.5.

The estimated milk production function for different farms revealed that coefficients of concentrate total roughage and different farms revealed that coefficients of concentrate, total roughage and adoption index were positive and statistically highly significant ($P < 0.01$) in small farms with R^2 as 63.0 per cent, indicating the importance these input in increasing a milk production. The labour cost was positive and significant ($P < 0.05$) in small farms. In medium farms the coefficient of concentrate was highly significant and roughage was significant at 5% level. In large farms the coefficient of concentrate was highly significant. The overall results showed positive and highly significant effects of concentrate and adoption index and significant effect of total roughage ($P < 0.05$) with R^2 value as 67.0 per cent.

4.14.6 Resource use efficiency of milk production

Table 4.14.6 shows the estimation of resources use efficiency in milk production. The ratio of MVP to factor prices provides a measure of Resource Allocative Efficiency. The marginal value product (MVP) of inputs in milk production for different farms are given in table 4.14.6. The results showed that in small farms the MVPs of two inputs viz. roughages and labour was significantly less than unity, signifying over utilization of these inputs. The MVP value of concentrate was significantly higher than unity indicating their under utilization in milk production process.

In medium farms, the MVP of concentrate was positive and significantly greater than unity indicating their under utilisation. In large farms the MVP value of concentrate was positive and significantly greater than unity indicating their under utilization.

Table 4.14.5 Estimated Coefficients of milk production function

Farm size/ (Observations)	Parameter	Regression coefficient		R ² (%)
		B	Std. Error	
Small (175)	(Constant)	-0.958	0.922	63
	Concentrate	0.619**	0.051	
	Roughage	0.191**	0.045	
	Veterinary Service	-0.008	0.029	
	Labour cost	0.088*	0.04	
	Adoption Index	0.589**	0.218	
Medium (100)	(Constant)	0.153	1.229	81.4
	Concentrate	0.734**	0.058	
	Roughage	0.091*	0.046	
	Veterinary Service	-0.045	0.045	
	Labour cost	0.018	0.08	
	Adoption Index	0.377	0.31	
Large (75)	(Constant)	4.224	0.94	65.7
	Concentrate	0.585**	0.056	
	Roughage	0.018	0.024	
	Veterinary Service	-0.007	0.061	
	Labour cost	-0.039	0.064	
	Adoption Index	-0.262	0.227	
Overall (350)	(Constant)	-0.126	0.599	67.0
	Concentrate	0.671**	0.032	
	Roughage	0.053*	0.022	
	Veterinary Service	0.002	0.023	
	Labour cost	0.031	0.032	
	Adoption Index	0.512**	0.141	

** Significant at 1% level

* Significant at 1% level

Table 4.14.6 Marginal value products of various inputs under different farm sizes

Farm size	Inputs	MVP
Small	Conc.	1.54**(0.13)
	Roughages	0.59** (0.14)
	Labour	0.21** (0.1)
Medium	Conc.	2.02** (0.16)
	Roughages	0.63(0.32)
Large	Conc.	1.68**(0.16)

Figures in the parenthesis are standard errors of regression coefficients

** Significant at 1% level

4.14.7 Technical efficiency of milk production

Farm specific technical efficiencies were worked out from the stochastic frontier production function. The results are presented in Table 4.14.7. The mean technical efficiency in small, medium and large farms was 99.80, 83.22 and 99.96 per cent respectively.

4.14.7 .1 Determinants technical efficiency in milk production

Estimates of determinants of Cobb-Douglas function of farms – specific technical efficiency has been estimated for farm types and is presented in table 4.14.7.1. In small farms, the adoption index and herd size was having significant ($P > 0.05$) influence on farm specific technical efficiency. In large farms education index was having significant ($P > 0.05$) influence and overall level farming experience index had significant ($P > 0.05$) and herd size was having highly significant influence on technical efficiency of farms.

Table 4.14.7 Technical efficiency of milk production under different farm sizes

Sl no	Variables	N=172			N=99			N=73		
		Small			Medium			Large		
		Regression coefficient	Std Error	Significance	Regression coefficient	Std Error	Significance	Regression coefficient	Std Error	Significance
A	<u>Frontier Production function</u>									
1	Constant	1.419	0.419	3.381	1.902	0.331	5.748	3.207	0.373	8.601
2	Concentrate cost/ Animal/Day (Rs)	0.653	0.0485	13.466	0.772	0.0374	20.651	0.571	0.052	11.049
3	Total Roughage cost/ Animal /Day (Rs)	0.221	0.0443	4.993	0.0959	0.0412	2.33	0.00069	0.021	0.329
4	Total Veterinary Cost /Animal /Day (Rs)	-0.001	0.028	-0.037	-0.0521	0.041	-1.127	-0.0234	0.572	-0.0408
5	Total Labour Cost/Animal/Day	0.0785	0.04	1.949	0.008	0.0707	0.1135	-0.053	0.0612	-0.8213
B	<u>Diagnosis Statistics</u>									
1	Sigma -Square (σ^2)	0.067	0.0076	80874	0.0769	0.0185	4.1517	0.025	0.0042	5.889
2	Gamma (γ)	0.00007	0.0282	0.0026	0.7811	0.1205	6.48	7E-06	0.0116	6.6E-05
3	Log-likelihood	-11.77			22.146			31.606		
4	Mean Technical Efficiency (%)	99.80%			83.22%			99.96%		

Note: N= Number of samples ** Significant at 1% level, * Significant at 5% level, NS=Not Significant

Table 4.14.7.1 Determinants of Technical Efficiency in different farm sizes

Particulars	Type of farms			
	Small	Medium	Large	Overall
No. Of observation	175	100	75	350
Constant	-.002**	-.763	0.000**	.323 (.248)
Education index	2.070×10^{-7} (0.0)	-.014 (.031)	2.396×10^{-7} (0.0)*	.007 (.15)
Farming experience index	1.314×10^{-6} (0.0)	-.004 (.025)	1.171×10^{-7} (0.0)	-.025* (.10)
Adoption index	-3.610×10^{-6} (0.0)*	.014 (.039)	-1.397×10^{-7} (0.0)	-.019 (.006)
Herd size	1.211×10^{-5} (0.0)*	.124 (.141)	-3.935×10^{-7} (0.0)	-.075** (0.057)
R ²	.075	.015	.118	.049

Figures in parenthesis indicate standard error of the co-efficients

* Significant at 5% level

** Significant at 1% level

4.15 CORRELATION BETWEEN VARIOUS SOCIO-ECONOMIC, ADOPTION, PRODUCTION AND COST-RETURN PARAMETERS

4.15.1 Correlation between socio-economic production and net return of the farmers and adoption index

Table 4.15.1 shows the correlation between socio-economic production and net return of the farmers and adoption index of their farms. Education of the farmer family education index, family size, attendance, extension, programmes, land holding motivation level, gross return from milch animals, wet average and dry average are positively correlated with adoption index. Adoption index was negatively correlated with age and experience.

Table 4.15.1 Correlation between socio-economic parameters and adoption index

Sl no	Parameters	Correlation Coefficient
1	Age	-0.09
2	Education of the farmer	0.271**
3	Family Education Index	0.194**
4	Family size	0.149**
5	Family participation in dairying	0.043
6	Extension programmes attended	0.174**
7	Land holding	0.220**
8	Experience in dairying	-0.058
9	Family experience	-0.043
10	Motivation	0.353**
11	Mass media exposure	0.381**
12	Social participation	0.09
13	Cost A per liter for milch	-0.011
14	Net return from milch animals	0.158**
15	Gross return from milch animals	0.381**
16	Wet average	0.448**
17	Dry average	0.356**

** Significant at 1% level

4.15.2 Correlation between dairy farm performance index, production, cost and adoption index

Table 4.15.2 describes the correlation between dairy farm performance index, production, cost and adoption index. The results revealed that dairy farm performance index was negatively correlated with cost/litre of milk and positively correlated with wet, dry average and adoption index.

Table 4.15.2 Correlation between dairy farm performance index, production, cost and adoption index

Parameter	Cost / l of milk	Wet average	Dry average	Adoption score
Dairy farm performance index	-0.328**	0.474**	0.315**	0.426**

** Significant at 1% level

4.15.3 Correlation between the physiological state of animals in the farm and productivity, cost and return parameters

Table 4.15.3 presents the details of correlation between the physiological state of animals in the farm and productivity, cost and return parameters. The results showed that per cent of animals in milk is positively correlated with wet average, dry average and gross return and negatively with cost/litre. The per cent of dry animals was negatively correlated with wet, dry averages and gross return but positively with cost. The per cent of animals in the first 100 days of lactation was positively related with wet, dry averages and gross return but negatively with cost. The per cent of animals in first three lactation numbers out of total milch animals was not significantly correlated with any of productivity, cost – return parameters.

4.15.3 Correlation between the physiological state of animals in the farm and productivity, cost and return parameters

Parameter	Wet average	Dry Average	Cost/l per milch	Gross return per milch animal
% of animals in milk of total milch animals	-.121*	.409**	-.465**	.409**
% of dry animals of total milch animals	.121*	-.409**	.465**	-.409**
% of pregnant animals of total milch animals	-.090	-.202**	.188**	-.185**
% of animals in first three lactations of total milch animals	.026	.032	.036	.024
% of animals in first 100 days of lactations of total milch animals	.320**	.339**	-.179**	.317**

** Correlation is significant at the 0.01 level

4.16 MILK PRICING

In Kerala the Co-operative Dairy sector is handling around 18-19 per cent of total milk production of the state. At present there are 3683 number of primary dairy co-operatives (as on 31.03.2016) of which 3235 are APCOS and 448 are Non-APCOS. Dairy Development Department, Govt. of Kerala is the administrative department for the Dairy Co-operatives of the state and the Director, Dairy Development is the registrar for the DCS of the state.

Presently the DCS procures 15.3 lakh litre of milk per day .Considering a total population of 348 lakh (census, 2011, Ministry of Home Affairs, Government of India) the requirement of milk is 36.073 lakh tones per annum whereas the total milk production of the state is only in the tune of 31.02 LT/annum showing a gap of 5.05 LT/annum.

The Dairy Co-operatives of the state are at present following a two time milk collection pattern. AM Collection (usually between 5 am to 7 am) and PM collection (2.30 pm to 6 pm). The KCMMF is providing the milk price chart to the Dairy Co-operatives. The price paid for milk received in Dairy is based on Dairy to Society Chart and the prices due to dairy farmers are calculated based on Society to Producer Price Chart.

4.16.1 Price determination of milk

The price of milk poured in the DCS by the producers is based on a two axis pricing policy method in which the Fat Value and SNF value are the parameters. The Fat value is determined in the DCS by conventional methods like Gerber method (IS: 1224 (part 1), 1977), Milk O Tester or advanced methods like Ultrasonic Milk Analysers.

SNF value is determined using the formula

$$(\text{CLR}/4) + 0.2 \times F + 0.5$$

Where, CLR = Corrected Lacto Meter Reading at 290 C

F = Per cent of Fat in milk analyzed

Knowing the CLR Value, the SNF value can even be directly read from the Milk Chart published by KCMMF(Appendix V). The fat per cent is given in the first Column (Y axis) and SNF and rate for a particular Corrected Lactometer Reading (CLR) is in the top row (X axis). In the chart published by KCMMF, the minimum and maximum per cent for Fat is 3.0 and 10.0 respectively whereas the minimum and maximum values for SNF are 6.9 and 9.1. The CLR ranges from 23 to 32. Knowing the values of Fat and SNF or CLR the price of the analysed sample of milk can be directly read from the chart. The price due to the farmer can be calculated as.

Total Milk Price due to a Producer = Milk price / litre as shown in milk chart X Total Quantity of milk poured by farmer in litre

The above prices were arrived at taking in to consideration the value of Fat @ Rs. 211.46 and SNF @ Rs.258.46. (The rates were taken as per the price revision w.e.f 21-07-14)

4.16.2 Critical appraisal of the two-axis milk chart followed by KCMMF

01. No Thrust on Organoleptic and Microbiological Quality of milk.

The quality of milk is a sum total of the Organoleptic quality, physico-chemical Quality and Microbiological Quality of Milk. As per the milk chart published by KCMMF over the years, the significant parameters viz organoleptic and Microbiological quality of milk has been totally ignored. These parameters especially the microbiological quality is having public health implication and hence needs thrust. A three axis pricing pattern with due preference to microbial quality of raw milk will be a scientific approach to the proposed modification in price chart.

02. Non Proportionate penalty factor for inferior quality of milk and incentive for premium milk

As per the price chart of KCMMF revised and published on 28.06.2010 and 05.09.2011, it has been remarked as footnote that for milk poured with quality of TS less than 12 % (with SNF less than 8%), the producer will be penalized @ Rs

0.20 per point, and for TS above or equal to 12%, the penalty shall be Rs 0.10 per point.

But in the same footnote, it is recorded that for premium quality of milk poured (with SNF above 8.1% and TS less than 12%), an incentive of mere Rs 0.02 per point is included.

This is injustice to the farmers pouring premium quality milk without any adulterations. This sounds a negative approach and unjustifiable means to promote farmers to pour superior quality milk.

03. Significant factors that contribute to the production cost of milk being ignored in the present price chart.

There are many factors that significantly contribute to the cost of production of milk. The dairying sector of Kerala is unique and is different from the situation that prevails in other states of the country. Among the different factors that significantly contribute to the cost of milk production, certain factors viz. cost of compound feed, cost for infrastructure development etc. has shown steep positive hike / inclination throughout the year. It is evident that the hike in price paid to farmer for a particular quality of milk over the years is not in par with the per cent hike for compound / concentrated feed, general cost of living , labour cost and interest rates etc. Hence it is recommended to give due consideration to the parameters that significantly contributes to the cost of milk production while fixing the procurement price of milk along with the cost of fat and SNF contained in the milk.

04. Time bound revision of price chart not implemented

As per the WP (C) No. 13468, 13483 and 16764 of 2011 of the Hon. High Court of Kerala, had upheld the full autonomy of KCMMF, with democratically elected representatives to decide the procurement and consumer price of milk. The court reminded the original agreement with the National dairy development board (NDDB) regarding this while the co-operative structure was formed in the state.

At present there is no time bound revision of the price chart. During the period from 2007-08 to 2015-16, the milk price chart of KCMMF have been revised on 13.11.2007, 03. 10. 2008, 28. 06. 2010, 05.09.2011, 14.10.2012 and 21.07.2014 (till date). It has been noted that there is no special pattern followed for revision of price chart which is not scientific. The primary farmers who suffer due to hike in variable factors such as compound cost, feed cost, labour cost, interest rates etc are hence socio economically affected.

05. Unscientific revision of price charts published by KCMMF on 14.10.2012 and 21.07.14

As per KCMMF, the Fat value and SNF value per kg are the indices for milk price computation. But as per price chart revised and published by KCMMF on the above mentioned dates, it can be observed that at each and every point of Fat and SNF combinations in the chart, there has been a flat increase of price as follows

- 13.11.2007 (+ 61 paisa flat in all points)
- 03. 10. 2008 (+ 90 paisa flat in all points)
- 28. 06. 2010 (+ Rs . 2.76 flat in all points)
- 05.09.2011 (+ Rs. 4.20 flat in all points)
- 14.10.2012 (+ Rs. 4.60 flat in all points)
- 21.07.2014 (+ Rs. 2.40 flat in all points) till date

This act of flat increase in price has violated the two axis price fixation pattern so far followed by KCMMF.

06. Zero Value for milk in the Price chart of KCMMF.

As per the KCMMF Price chart, implemented from 21.07.2014 and being followed till date, there is no price for the milk sample poured with the following set of quality parameters

- For milk with fat per cent ranging from 3.0 to 3.4 % and SNF per cent less than 8.2 (Total Solids - 11.2 to 11.6)
- For milk with fat per cent ranging from 3.5 to 4.7 % and SNF per cent less than 7.7 (Total Solids - 11.2 to 12.4)
- For milk with fat per cent ranging from 4.8 to 5.9 % and SNF per cent less than 7.7 (Total Solids – 12.5 to 13.6)

The milk produced by high yielding cross bred cattle population of the state with a varying germplasm is often low in fat and SNF content. Moreover the stage of lactation also affects these parameters in milk. The milk poured in by the farmers with the above combinations are considered as substandard and only fat value is paid to them.

4.16.3 Suggestions for the existing pricing policy

1. Three axis pricing policy

A three axis pricing pattern with due preference to microbial quality of raw milk will be a scientific approach to the proposed modification in price chart.

2. Same rates for penalty to sub standard milk and premium for high quality milk

In case of penalty implied to inferior quality of milk, the same rate shall apply as incentive to basic price of premium quality milk poured. This will be a motivation to farmers for pouring in good quality milk.

3. Timely revision of Milk Pricing Chart strictly based on fat and SNF rates

The milk price chart shall be reviewed and revised at a timely interval (within 60 days of start of each financial year) strictly based on the fat and SNF rates.

4. Including a fixed “factor” in accordance with the parameters that significantly affect the cost of milk production

It is recommended to give due consideration to the parameters that significantly affects the cost of milk production in fixing the procurement price along with the cost of fat and SNF contained in the milk. A factor-‘*Farmer Comfort Factor*’ (FCF) shall be calculated on the basis of factors that contribute significantly to the cost of milk production such as cost of compound / concentrated feed, general cost of living , labour cost and interest rates etc. Irrespective of revision of primary KCMMF Chart, the FCF factor shall be calculated every year within 60 days of start of each financial year and included as a fixed value to be paid to the farmers for every point of fat - SNF combinations

4.16.4 Milk pricing – New Formula

It is the need of the hour to modify the formula for fixing the price of milk. While fixing the price of milk due consideration must be given to the factors significantly contributing to the cost of production along with the quality parameters of milk.

Being the significant contributors, the external factors viz.

- Hike in Cost of compound feed (over a period of previous four years from the date of revision of price chart)
- The labour cost calculated as on 1st April of the current year
- The Consumer Price Index of Kerala as on 1st April of the current year
- Existing bank repo rate as on 1st April of the current year

As per Table 4.14.1.1 it has been observed that cost of compound feed and cost of labour are the significant contributors of the cost of milk production. They are in the proportion as cited below

Table 4.16.4.1 Contribution of various factors contributing to the cost of milk production

Factors affecting total cost of milk production	% contribution
Compound Feed Cost	44.5
Labour Cost	16.37

Hence the price fixed as per Fat value and SNF value (TS Index Value) in the present KCMMF Chart shall be revised as

Price of Milk per Litre = TS Index + FCF (Farmer Comfort Factor)

TS Index = The price per litre of milk based on Fat and SNF alone as indicated in present milk price chart by KCMMF .

Farmer Comfort Factor (FCF) = Feed Cost Index (FCI) + Labour Cost Index (LCI) + Consumer Price Index (CPI) + Bank Repo Rate Index (BRI)

Feed Cost Index (FCI) in Rupees

FCI = 44.5 % of average hike in price of compound feed over a period of last 4 years. *e.g.* For FCI fixation to be done during 2016-17, the compound feed cost during the year 2012-13 shall be taken as the index

Table 4.16.4.2 Hike in the price of compounded cattle feed over the years

Year	Price / 50 Kg	% HIKE
2012-13	900	0
2013-14	910	1
2014-15	960	7
2015-16	990	11
Average Hike		3.8

Therefore the FCI (in Rs) = 44.5 % of 3.8 =Rs 1.69

Labour cost Index (in paise) - LCI

LCI (in paise) = 16.37 % of labour cost as on 1st April of current year as published in wages act of Govt. of Kerala . eg. As on 01.04.2016, the minimum wages act published by GOK is Rs 373

Therefore the LCI in paise = 16.37 % of 373 = 61.00 paise

Consumer Price Index factor (in paise) - CPI

CPI Factor (in paise) = 25 % of CPI (with Base : 2011-12 = 100) on 1ST April of current year (2016)

Therefore the CPI in paise = 25 % of 141 = 35.25 paise

Bank Repo Rate Factor – BRI

BRI (in paise) = Repo rate in per cent as on 1st April of current year as published by RBI. BRI as on 01.04.2016 is 7% (in paise) = 7 paise

Therefore the Farmer Comfort Factor (FCF) for the year 2016 will be

FCF (in Rs) = 1.69 + 0.61 + 0.35 + 0.07 = Rs 2.72

The FCF shall be common to all the points of Fat and SNF in the price chart

Table 4.16.4.3 Comparison between existing KCMMF chart and proposed chart with inclusion of Farmer Comfort Factor

Milk Quality		Price per litre as per existing Chart	Price as per proposed chart					
			TS Index	FCI	LCI	CPI	BRI	Total Price / Litre
FAT %	SNF %	(Rs)	(Rs)	(Rs)	(Rs)	(Rs)	(Rs)	(Rs)
1	2	3	4	5	6	7	8	9 = 4+5+6+7+8
3.6	8.5	29.58	29.58	1.69	0.61	0.35	0.07	32.3
3.4	8.4	28.9	28.9	1.69	0.61	0.35	0.07	31.62
3.9	8.5	30.22	30.22	1.69	0.61	0.35	0.07	32.94
4.1	8.3	30.12	30.12	1.69	0.61	0.35	0.07	32.84
4.6	8.4	31.44	31.44	1.69	0.61	0.35	0.07	34.16

4. RESULTS

The salient findings of the present study have been presented in this chapter.

4.1. AGRO-CLIMATIC ZONES

For the present study the state of Kerala was identified into five agro-climatic zones which are described in Table 4.1. Each zone was having specific agro-ecological situation which formed the basis for development of distinct agriculture and dairy production systems in that zone.

Table 4.1 Agro-Climatic Zones of Kerala selected for the study.

Sl No.	Agro-Climatic zone
1	South
2	Central
3	North
4	Problem Zone (Kuttanad wet lands)
5	High Range

4.2. IDENTIFICATION OF DAIRY FARMING / PRODUCTION SYSTEMS

After identifying the five agro-climatic zones, districts and blocks for the study purpose were selected by proper sampling procedure .The farming system based on number of milch cows was identified and this classification based on farm size was mainly used throughout the present study. After identifying the farming system based on farm size it was attempted to identify different farming systems within these farm sizes as described below.

4.2.1 Production/Farming systems based on number of milch cows (Farm size)

The details of distribution of small, medium and large farms are presented in Table 4.2.1. The results indicated that of the 10266 dairy households enumerated in 10 blocks, small sized farms were predominant with a share of 78.80 per cent, followed by medium (20.40 per cent) and large farms were having mere 0.70 per cent share to total. The same pattern of distribution of farms was observed in all the blocks selected for the present study.

4.2.2 Production / Farming systems based on major crop / cropping pattern

The details of distribution dairy farming systems based on the major crop or cropping pattern of the household is presented in Table 4.2.2. The results indicated, out of the eight farming systems identified the overall picture showed that mixed farming was dominant type (50.0 per cent) followed by homestead farming (20.6 per cent) , paddy monoculture (16.6 per cent) ,coconut monoculture (6.9 per cent) and rubber monoculture (3.7 per cent). In small, medium and large sized farms, the mixed and homestead farming system was dominant.

Table 4.2.1 Dairy farming systems identified based on number of milch animals (farm size) in selected blocks

Sl no	Agro-climatic zone	District	Name of block	Small	%	Medium	%	Large	%	Total
1	South	Pathanamthitta	Parakode	1305	86.80%	194	12.90%	4	0.30%	1503
2			Pandalam	672	85%	117	14.80%	2	0.30%	791
3	Central	Thrissur	Ollukkara	1308	86.10%	206	13.60%	5	0.30%	1519
4			Irinjalakuda	391	82.10%	80	16.80%	5	1.10%	476
5	North	Palakkad	Kuzhalmannam	2297	92.20%	183	7.30%	11	0.40%	2491
6			Chittur	3402	67%	1620	31.90%	58	1.10%	5080
7	Problem Zone (Kuttanad wet lands)	Alappuzha	Haripad	715	78.70%	188	20.70%	6	0.70%	909
8			Veliyanad	176	69.30%	72	28.30%	6	2.40%	254
9	High Range	Wayanad	Mananthavady	5767	90%	612	9.60%	29	0.50%	6408
10			Kalpetta	3756	89.80%	417	10%	10	0.20%	4183
TOTAL				10266	78.80%	2660	20.40%	97	0.70%	13023

Table 4.2.2 Dairy farming systems identified based on the major crop/cropping pattern

Farm type	Number / Per cent	Major crop/Cropping pattern							
		Paddy - Mono	Coconut - Mono	Rubber - Mono	Coffee & Pepper	Banana	Mixed	Homestead	Vegetables
Small	Number	35	1	8	0	1	90	39	1
	Per cent	20.0%	0.6%	4.6%	0.0%	0.6%	51.4%	22.3%	0.6%
Medium	Number	21	4	3	1	4	47	20	0
	Per cent	21.0%	4.0%	3.0%	1.0%	4.0%	47.0%	20.0%	0.0%
Large	Number	2	19	2	0	0	38	13	1
	Per cent	2.7%	25.3%	2.7%	0.0%	0.0%	50.7%	17.3%	1.3%
Overall	Number	58	24	13	1	5	175	72	2
	Per cent	16.6%	6.9%	3.7%	0.3%	1.4%	50.0%	20.6%	0.6%

4.2.3 Farming systems based on income from farming activities.

Table 4.2.3 showed the distribution of farming systems bases on the share of income from different farming activities. The majority of the farms under small (68.6 per cent) medium (64.0 per cent) and large (58.7 per cent) were following mixed type of farming system. The proportion of specialized farms were comparatively highest in large farms (41.3 per cent) and lowest (31.4 per cent) in small farms. The overall picture also showed that mixed farming was dominant (64.86 per cent) than specialized dairy farming system (34.86 per cent).

Table 4.2.3 Dairy farming systems identified based on the income from the farm under different farm sizes

Farm type	Number / Per cent	Income	
		Specialized	Mixed
Small	Number	55	120
	Per cent	31.4%	68.6%
Medium	Number	36	64
	Per cent	36.0%	64.0%
Large	Number	31	44
	Per cent	41.3%	58.7%
Overall	Number	122	227
	Per cent	34.86	64.86

4.2.4 Farming systems based on dry matter availability

The classification of dairy farming system based on the availability of the source of dry matter to livestock is presented in the Table 4.2.4. The presence of SLP (Sole Livestock Production) farmers was 56.0 per cent, 51.0 per cent and 70.7 per cent in small, medium and large farms respectively. The overall picture also showed that 57.7 per cent of farming system was SLP type and 42.3 per cent was C-L type (Crop-Livestock mixed).

Table 4.2.4 Dairy farming systems identified based on the dry matter source under different farm sizes

Farm type	Number / Per cent	Dry matter source	
		SLP	C-L Mixed
Small	Number	98	77
	Per cent	56.0%	44.0%
Medium	Number	51	49
	Per cent	51.0%	49.0%
Large	Number	53	22
	Per cent	70.7%	29.3%
Overall	Number	202	148
	Per cent	57.7%	42.3%

4.3. SOCIO –PERSONAL AND ECONOMIC DATA OF FARMERS

The socio-personal and economic data of farmers under different farm sizes are described below.

4.3.1 Age

Table 4.3.1 reveals the age of the farmers (the person who leads the dairy activities) under different farm sizes. The results showed that, in small farms (65.7 per cent), medium (69.0 per cent) and in large farms (50.7 per cent) fell in the age group of 40-60 years. In large farms the proportion of farmers within age group of 39 or below was comparatively higher (36.0 per cent). In small farms the proportion of farmers in the age group of 61 or above was higher (20.0 per cent) compared to other farm sizes. The overall picture also showed that majority of the farmers (63.4 per cent) fell under the age group of 40-60 years.

Table 4.3.1 Distribution of farmers according to their age under different farm sizes

Farm Type	Number / Per cent	Age class (in years)		
		39 or below	40-60	61 or above
Small	Number	25	115	35
	Per cent	14.3%	65.7%	20.0%
Medium	Number	12	69	19
	Per cent	12.0%	69.0%	19.0%
Large	Number	27	38	10
	Per cent	36.0%	50.7%	13.3%
Overall	Number	64	222	64
	Per cent	18.3%	63.4%	18.3%

Mean: 50.16 SD: 10.96

4.3.2 Gender/Sex

Table 4.3.2 shows the sex/gender of the person who leads the dairy activities in the household. The results revealed that, at overall level ,male (70.9 per cent) had lead role in dairy activities and female had leadership in 29.1 (per cent) per cent dairy farms.

In small, medium and large groups 58.9 , 73.0 and 96.0 per cent farms were having a male leader. In only 4.0 per cent of large farms, the female was having a leading role.

Table 4.3.2 Distribution of farmers according to the gender/sex

Farm Type	Number / Per cent	Sex	
		Male	Female
Small	Number	103	72
	Per cent	58.9%	41.1%
Medium	Number	73	27
	Per cent	73.0%	27.0%
Large	Number	72	3
	Per cent	96.0%	4.0%
Overall	Number	248	102
	Per cent	70.9%	29.1%

4.3.3 Educational Status and Level

Table 4.3 and 4.3.3.1 shows the educational status and level of education of farm heads. The results revealed that in small farms, majority of the farmers (44.0 per cent) had completed secondary education followed by middle school education (27.4 per cent). The proportion of people with graduate level was 6 per cent and farmers with post graduate and professional education was nil. In small farmers 6.9 per cent people were illiterate. The medium farms also almost followed the pattern of small farms. But in large farms the per cent of illiterate, primary school, middle secondary, senior secondary, graduate, postgraduate and professional were 0, 0, 9.3, 25.3, 32.0, 30.7, 1.3 and 1.3 respectively. Overall picture showed the predominance of secondary school education (38.0 per cent).

Table 4.3.3.1 showed that irrespective of farm size, majority of farmers had medium level of education. Very few farmers in the small and medium farms had high level of education. Where as in large farms, 33.3 per cent had higher education level. The share of low education level was 28.0, 19.0, zero per cent in small, medium and large farms respectively. The overall picture showed that the proportion of farm heads with low medium and high level of education was 13.4, 76.6, and 10 per cent respectively.

Table 4.3.3 Distribution of farmers according to their education status

Farm Type	Number / Per cent	Education							
		Illiterate	Primary	Middle	Secondary	Senior Secondary	Graduate	PG	Professional
Small	Number	12	16	48	77	16	6	0	0
	Per cent	6.9%	9.1%	27.4%	44.0%	9.1%	3.4%	0.0%	0.0%
Medium	Number	10	9	20	37	20	4	0	0
	Per cent	10.0%	9.0%	20.0%	37.0%	20.0%	4.0%	0.0%	0.0%
Large	Number	0	0	7	19	24	23	1	1
	Per cent	0.0%	0.0%	9.3%	25.3%	32.0%	30.7%	1.3%	1.3%
Overall	Number	22	25	75	133	60	33	1	1
	Per cent	6.3%	7.1%	21.4%	38.0%	17.1%	9.4%	0.3%	0.3%

Table 4.3.3.1 Distribution of farmers according to their level of education

Farm Type	Number/ Per cent	Education Class		
		Low	Medium	High
Small	Number	28	141	6
	Per cent	16.0%	80.6%	3.4%
Medium	Number	19	77	4
	Per cent	19.0%	77.0%	4.0%
Large	Number	0	50	25
	Per cent	0.0%	66.7%	33.3%
Overall	Number	47	268	35
	Per cent	13.4%	76.6%	10.0%

Mean: 2.83

SD: 1.2

4.3.4 Family Education Index

Table 4.3.4 shows the family education index of dairy households. The results indicated that the majority of the dairy families had medium level of education index, irrespective of farm size. The proportion of families with low level of education index was 22.9, 20.0 and 8.0 per cent in small, medium and large farms respectively. The share of families with high level of education index was 14.0, 15.0, and 34.7 per cent in small, medium and large farms respectively. Overall picture showed that majority of farm families had medium level (65.4 per cent) of education index followed by low (18.9 per cent) and high (15.7 per cent) level of education index.

4.3.5 Family size

The size of family of the dairy farmers under different farm sizes is presented in Table 4.3.5. The results showed that medium sized families were in majority in all farm size groups. Corresponding values were 66.9, 56.0 and 64.0 in small, medium and large farms. In medium sized farms, the proportion of large sized families were comparatively more. The overall picture showed that the per cent of small, medium and large sized families were 18.0, 63.1 and 18.9 in dairy households

Table 4.3.4 Distribution of farm households according to the family education index

Farm Type	Number / Per cent	Education Index of Family		
		Low	Medium	High
Small	Number	40	121	14
	Per cent	22.9%	69.1%	8.0%
Medium	Number	20	65	15
	Per cent	20.0%	65.0%	15.0%
Large	Number	6	43	26
	Per cent	8.0%	57.3%	34.7%
Overall	Number	66	229	55
	Per cent	18.9%	65.4%	15.7%

Mean: 3.071 SD: 1.09

Table 4.3.5 Distribution of farm households according to the family size

Farm Size	Number / Per cent	Family Size		
		Small	Medium	Large
Small	Number	26	117	32
	Per cent	14.9%	66.9%	18.3%
Medium	Number	19	56	25
	Per cent	19.0%	56.0%	25.0%
Large	Number	18	48	9
	Per cent	24.0%	64.0%	12.0%
Overall	Number	63	221	66
	Per cent	18.0%	63.1%	18.9%

4.3.6 Family participation in dairying

The level of participation of family members in dairy activities is depicted in Table 4.3.6. It revealed that irrespective of the farm size, majority of the farms had medium level of family participation. In small, medium and large farms 13.7, 15.0 and 32.0 per cent of the farms had low level of family participation and 40.0, 36.0 and 17.0 per cent had high level of family participation respectively. The proportion of family participation was highest in medium farms (36.0 per cent)

and was lowest (22.7 per cent) in large farms. Overall picture showed a proportion of 18.0, 55.4, and 26.6 per cent of low, medium and high participation.

Table 4.3.6 Distribution of farm households according to the level of participation of members in dairying

Farm Type	Number / Per cent	Family Participation		
		Low	Medium	High
Small	Number	24	111	40
	Per cent	13.7%	63.4%	22.9%
Medium	Number	15	49	36
	Per cent	15.0%	49.0%	36.0%
Large	Number	24	34	17
	Per cent	32.0%	45.3%	22.7%
Overall	Number	63	194	93
	Per cent	18.0%	55.4%	26.6%

Mean: 63.31 SD: 27.27

4.3.7 Special Training

Table 4.3.7 shows whether a special training in dairying was received by the farmers. The results clearly indicated that in all farm sizes 70-80 per cent of the farmers had not received and special training in dairying. In small, medium and large farms only 15.4, 17.0, 29.3 per cent received a special training respectively.

Table 4.3.7 Distribution of farmers according to the special Training received in dairying

Farm Size	Number / Per cent	Special Training	
		Yes	No
Small	Number	27	148
	Per cent	15.4%	84.6%
Medium	Number	17	83
	Per cent	17.0%	83.0%
Large	Number	22	53
	Per cent	29.3%	70.7%
Overall	Number	66	284
	Per cent	18.9%	81.1%

4.3.7.1 Agency of training

Table 4.3.7.1 shows the agency which conducted the training. The results revealed that Government departments played an upper role in imparting training to dairy farmers. In overall 92.3 per cent of the training were organized by Government and only 8.3 per cent by Non-Government Organizations.

Table 4.3.7.1 Classification according to the agency provided the special training

Agency	Number / Per cent	Farm type			
		Small	Medium	Large	Total
GOVT.	Number	24	17	19	60
	Per cent	82.8%	100.0%	100.0%	92.3%
NGO	Number	5	0	0	5
	Per cent	17.2%	0.0%	0.0%	8.3%

4.3.7.2 Duration of training

Table 4.3.7.2 reveals the overall picture regarding the duration of training. This showed that 1.05 ± 0.13 days was the average duration of training received by farmers.

Table 4.3.7.2 Average duration of the special training received

Farm Size	Av. Duration(days)
Small	0.99 ± 0.19
Medium	0.89 ± 0.22
Large	1.40 ± 0.29
Overall	1.05 ± 0.13

4.3.8 Participation in extension programmes

Table 4.3.8 shows the details of farmers' participation in extension programmes. The results showed that 41.1, 67.0 68.0 per cent did not participate in any extension programmes during the previous year of study. In small sized farms only 0.6 per cent of the farmers attended six extension programmes in the particular year. In medium and large farms the corresponding values were zero

and 0.3 per cent. Overall picture showed that 54.3 and 30.9 per cent of farmers attended one and two extension programmes respectively in the previous year.

Table 4.3.8 Distribution according to the number of extension programmes attended in the previous year,

Farm Size	Number / Per cent	No. of Extension programmes						
		0	1.0	2.0	3.0	4.0	5.0	6.0
Small	Number	72	68	22	7	3	2	1
	Per cent	41.1%	38.9%	12.6%	4.0%	1.7%	1.1%	.6%
Medium	Number	67	23	6	2	1	1	0
	Per cent	67.0%	23.0%	6.0%	2.0%	1.0%	1.0%	0.0%
Large	Number	51	17	3	2	2	0	0
	Per cent	68.0%	22.7%	4.0%	2.7%	2.7%	0.0%	0.0%
Overall	Number	190	108	31	11	6	3	1
	Per cent	54.3%	30.9%	8.9%	3.1%	1.7%	0.9%	0.3%

Mean: 0.70 SD: 1.01

4.3.9 Dairying as major occupation

Figure 4.1 shows the distribution of farmers according to the criteria whether dairying is their major occupation. The results showed that the proportion of farmers who considered dairying as their major occupation was 20.6, 41.0 and 49.3 per cent respectively in small, medium and large size farms . Overall picture showed that 32.6 per cent of farmers considered dairying as their major occupation.

4.3.10 Major occupation / sources of income of farm households

Figure 4.2 shows the major occupation or sources of income of farm households. The results revealed that majority of the farmers irrespective of farm size had dairying, agriculture or allied fields as their major sources of income. In small farms 20.6, 29.1, 20.0 per cent farmers were dependent on dairying, agriculture and agriculture plus private job as their major source of income. In medium farms 40, 28.0 and 11.0 per cent involved in dairying agriculture and agriculture plus private job as their major source of income. In large famers 53.3, 28.0, 10.7 per cent took dairying, agriculture and business as their major source of

income. Overall picture showed that the major sources of income in dairy households were dairying (33.2 per cent), Agriculture (30.9 per cent) Government job (1.7 per cent), private job (5.4 per cent), business (2.9 per cent), agricultural labour (2.3 per cent), industrial labour (1.1 per cent) labour (3.1 per cent), Agriculture + Govt. job (3.4 per cent), agriculture + government + private job (1.1 per cent) and agriculture + industrial labour (1.7 per cent).

4.3.11 Land holding

Table 4.3.11 shows the distribution of farm house holds according to their land holding. In small farms the proportion of families having different land holdings were less than 30 cent (20.6 per cent), 30-100 cents (60 per cent), 101-500 (73 per cent), and more than 500 cents (6.0 per cent). In medium farms the corresponding proportions were 18.0, 19.0, 50.0 and 13.0 per cent respectively. In large farms the proportion was 6.7, 12.0, 49.3 and 32.0 per cent respectively. Irrespective of farm size, majority of farmers were having a land holding between 101- 500 cents. The overall picture showed the distribution of land holding as 16.9 per cent (less than 30 cents) , 25.1 (30-100) 45.7 (101-500) and 12.3 per cent (500 cents).

Table 4.3.11 Distribution of farm households according to the land holding

Farm Type	Number/ Per cent	Land Holding in cents			
		<30	30-100	101-500	>500
Small	Number	36	60	73	6
	Per cent	20.6%	34.3%	41.7%	3.4%
Medium	Number	18	19	50	13
	Per cent	18.0%	19.0%	50.0%	13.0%
Large	Number	5	9	37	24
	Per cent	6.7%	12.0%	49.3%	32.0%
Overall	Number	59	88	160	43
	Per cent	16.9%	25.1%	45.7%	12.3%

Mean: 264.60 SD: 319.28

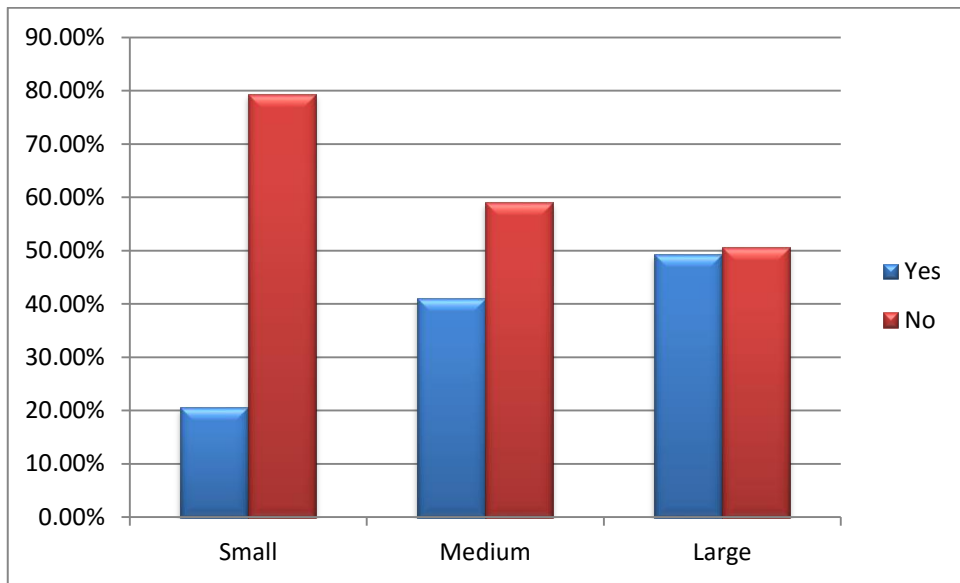


Figure 4.1 Distribution of farmers according to the criteria of dairying as the major occupation

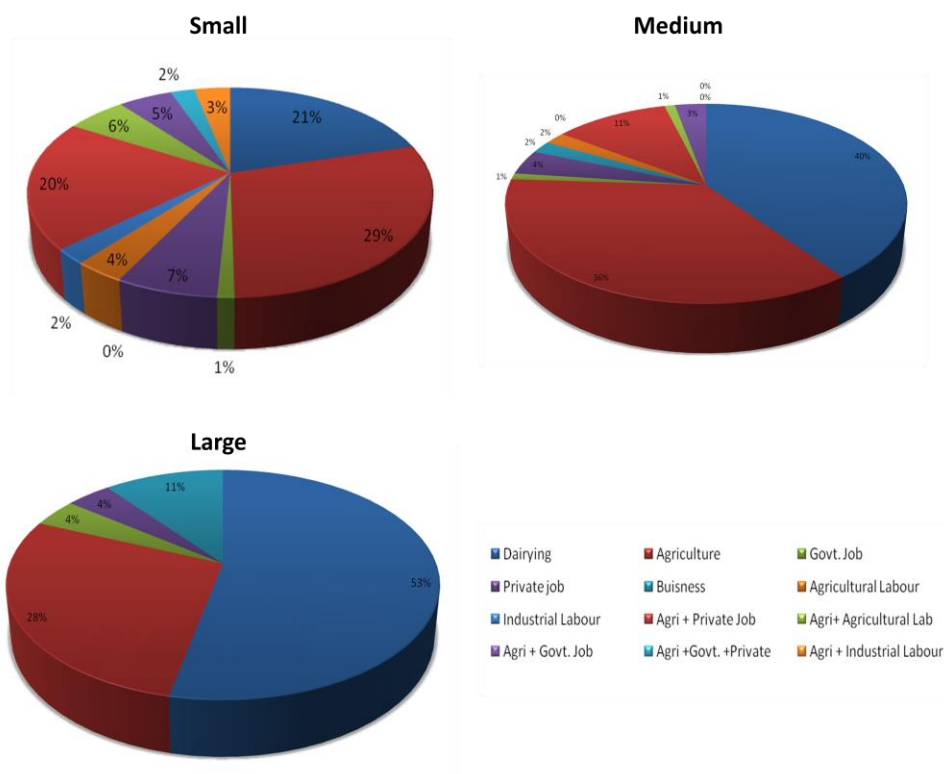


Figure 4.2 Distribution of farm households according to the major sources of income

4.3.12 Experience in dairying

The table 4.3.12 shows the experience of farmers in dairying. The results indicated that in all farm sizes majority of the farmers were having medium level of experience in dairying. In small, medium and large farms the farmers with medium level of experience was 69.7, 72.0 and 40.0 per cent respectively. In large farms 42 per cent of the farmers were having low level of experience and in small farms 22.3 per cent were having high level of experience ,which were comparatively higher in respective groups. The overall picture showed that 20, 64.0 and 16.0 per cent of farmers were having low medium and high experience in dairying.

Table 4.3.12 Distribution of farmers according to the experience in dairying

Farm Type	Number / Per cent	Experience		
		Low	Medium	High
Small	Number	14	122	39
	Per cent	8.0%	69.7%	22.3%
Medium	Number	14	72	14
	Per cent	14.0%	72.0%	14.0%
Large	Number	42	30	3
	Per cent	56.0%	40.0%	4.0%
Overall	Number	70	224	56
	Per cent	20.0%	64.0%	16.0%

Mean: 2.88 SD: 1.35

4.3.13 Family Experience Index

Table 4.3.13 shows the family experience index of the dairy households under different farm sizes. Irrespective of farm sizes medium level of experience was dominant with 69.1, 68.0 and 34.7 per cent in small, medium and large farms respectively. Low family experience index was observed in 10.9, 16.0 and 57.3 per cent of small, medium and large farms respectively. The overall picture showed that 22.3, 61.4 and 16.3 per cent of farm families were having low, medium and high experience in dairying.

4.3.13 Distribution of farm households according to the family experience index

Farm Type	Number / Per cent	Family Experience		
		Low	Medium	High
Small	Number	19	121	35
	Per cent	10.9%	69.1%	20.0%
Medium	Number	16	68	16
	Per cent	16.0%	68.0%	16.0%
Large	Number	43	26	6
	Per cent	57.3%	34.7%	8.0%
Overall	Number	78	215	57
	Per cent	22.3%	61.4%	16.3%

Mean: 2.13

SD: 1.11

4.3.14 Purpose of cattle rearing

Table 4.3.14 shows the purposes for which cattle rearing was under taken and preference were given ranks. In all farm types and overall, the major reason for rearing cattle was in the order of rank- self employment, source of additional income, manure, use of crop by products, availability of quality milk, inheritance and interest in cattle rearing.

Table 4.3.14 The purposes of cattle rearing as ranked by the farmers

Purpose	Mean/ Rank	Farm Type			Overall
		Small	Medium	Large	
Self employment	Mean	1.00	1.02	1.00	1.00
	Rank	I	I	I	I
Additional Income	Mean	1.25	1.31	1.18	1.26
	Rank	II	II	II	II
Manure	Mean	2.02	2.37	2.02	2.12
	Rank	III	III	III	III
Use of Crop By-products	Mean	3.12	3.48	3.03	3.19
	Rank	IV	IV	IV	IV
Quality Milk	Mean	3.35	3.92	3.89	3.66
	Rank	V	V	V	V
Inheritance	Mean	3.96	4.77	4.87	4.41
	Rank	VI	VI	VI	VI
Interest	Mean	5.16	5.70	5.75	5.47
	Rank	VII	VII	VII	VII

4.3.15 Motivation for dairying

Table 4.3.15 shows the distribution of farmers according to the level of motivation in dairying. In small farms 26.9, 60.0 and 13.1 per cent farmers were having low, medium and high level of motivation in dairying. In medium farms 22.0, 59.0 and 19.0 per cent were having low, medium and high level of motivation. In large farms 5.3, 62.7, 32.0 per cent were having corresponding motivation level. In overall 20.9, 60.3 and 18.9 per cent were having low, medium and high motivation level. Comparatively the motivation level was lowest in small farms and highest in large farms.

Table 4.3.15 Distribution of farmers according to the motivation level in dairying

Farm Size	Number/ Per cent	Motivation for dairying		
		Low	Medium	High
Small	Number	47	105	23
	Per cent	26.9%	60.0%	13.1%
Medium	Number	22	59	19
	Per cent	22.0%	59.0%	19.0%
Large	Number	4	47	24
	Per cent	5.3%	62.7%	32.0%
Overall	Number	73	211	66
	Per cent	20.9%	60.3%	18.9%

Mean: 3.48 SD: 1.13

4.3.16 Previous job before start of dairying

The previous jobs ,the farmers were engaged before starting dairying was shown in Figure 4.3. The result showed that majority of the farmers were engaged in agriculture, animal husbandry and allied works as traditional farmers. The per cent of farmers in these groups were 82.9, 85 and 76 per cent in small, medium and large groups respectively. In large farms 9.3, 2.7, and 12.0 per cent were working abroad, Government employees and in private job respectively.

4.3.17 Shift in sector

Figure 4.4 shows the shift of farmers from other sectors to dairy sector

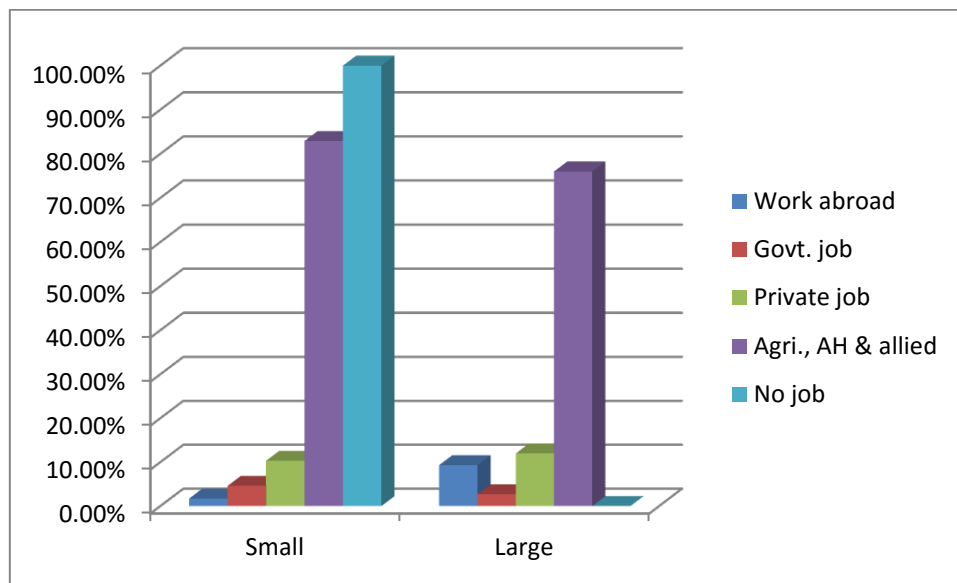


Figure 4.3 Distribution of farmers according to their previous job

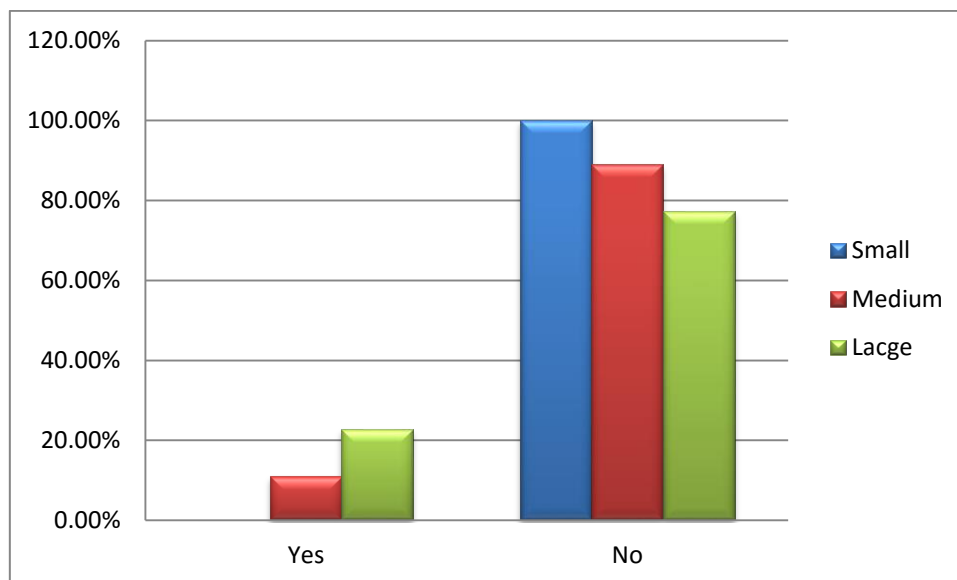


Figure 4.4 Distribution of farmers according to the shift in sector

The results revealed that, there were no shifted farmers in small farms whereas in medium and large farms 11 and 22.7 per cent shift was seen

4.3.18 Extent of information utilisation

Table 4.3.18 shows the extent of information utilisation by the farmers from different communication or mass media sources. Medium level of information utilisation was observed in all types of farms. The respective values were 62.3, 63.0 and 76.0 per cent. In large farms only 6.7 per cent farmers were having low level of information utilisation overall picture showed that 17.1, 65.4 and 17.4 per cent farmers were having low, medium and high level of information utilisation.

Table 4.3.18 Distribution of farmers according to their extent of information utilization

Farm Type	Number / Per cent	Information utilization		
		Low	Medium	High
Small	Number	35	109	31
	Per cent	20.0%	62.3%	17.7%
Medium	Number	20	63	17
	Per cent	20.0%	63.0%	17.0%
Large	Number	5	57	13
	Per cent	6.7%	76.0%	17.3%
Overall	Number	60	229	61
	Per cent	17.1%	65.4%	17.4%

Mean: 12.14 SD: 5.27

4.3.19 Social participation

Table 4.3.19 shows the extent of social participation of dairy farmers. In small farmers were having low, medium and high level of social participation. In medium farms the corresponding values were 79.0, 16.0 and 5.0 per cent respectively. In large farms it was 88.0, 5.3 and 6.7 per cent respectively. The overall picture showed that 70.3, 23.4 and 6.3 per cent of farmers were having low, medium and high level of social participation.

Table 4.3.19 Distribution of farmers according to their social participation

Farm Type	Number / Per cent	Social participation		
		Low	Medium	High
Small	Number	101	62	12
	Per cent	57.7%	35.4%	6.9%
Medium	Number	79	16	5
	Per cent	79.0%	16.0%	5.0%
Large	Number	66	4	5
	Per cent	88.0%	5.3%	6.7%
Overall	Number	246	82	22
	Per cent	70.3%	23.4%	6.3%

Mean: 1.36

SD: 0.59

4.3.20 Credit orientation

Table 4.3.20 shows the distribution of farmers according to their credit orientation. In all farm types and in overall, majority of the farmers were having medium level of credit orientation. The corresponding values were 32.6, 37.0 and 26.7 per cent respectively. The credit orientation was comparatively lower in medium farms and higher in large farms. The overall picture showed that 26.3, 32.6 and 41.1 per cent of farmers were having low, medium and high level of credit orientation.

Table 4.3.20. Distribution of farmers according to their credit Orientation

Farm Type	Number / Per cent	Credit Orientation		
		Low	Medium	High
Small	Number	45	57	73
	Per cent	25.7%	32.6%	41.7%
Medium	Number	31	37	32
	Per cent	31.0%	37.0%	32.0%
Large	Number	16	20	39
	Per cent	21.3%	26.7%	52.0%
Overall	Number	92	114	144
	Per cent	26.3%	32.6%	41.1%

Mean: 3.49

SD: 1.31

4.4 HERD PROFILE

This section presents the details of composition of the herd, herd size, herd building, physiological state of animals, cattle transactions, calf disposal pattern, mortality and insurance of animals in the farm.

4.4.1 Composition of the herd

The details of composition of the herd in different farms are given in Table 4.4.1. In small farms the composition of the herd were as milk animals (24.14 per cent), dry animals (3.15 per cent), Milch animals (27.29 per cent), heifers (11.26 per cent), female calves (10.40 per cent), male calves (6.68 per cent), and total calves (17.08 per cent). In medium farms the respective values were 25.33, 5.24, 30.56, 8.48, 8.31, 6.89 and 15.20 per cent. In large farms it was 26.54, 8.20, 34.74, 6.10, 9.21, 3.0 and 12.2 per cent respectively. In all farms, milch animals proportion was dominant. All the farms showed almost same pattern of distribution of different categories of cattle. The overall picture showed a composition of, in milk animals (25.92 per cent), dry (6.81 per cent), milch (32.74 per cent), heifer (7.37 per cent), female calf (9.17 per cent) male calf (4.41 per cent) and total calves (13.58 per cent).

Table 4.4.1 Composition of the herd under different farm sizes

Farm size	In Milk	Dry	Milch	Heifer	Calf - Female	Calf - Male	Total Calves	Total
Small	253.0 (24.14)	33.0 (3.15)	286.0 (27.29)	118.0 (11.26)	109.0 (10.40)	70.0 (6.68)	179.0 (17.08)	1048
Medium	445.0 (25.33)	92.0 (5.24)	537.0 (30.56)	149.0 (8.48)	146.0 (8.31)	121.0 (6.89)	267.0 (15.20)	1757
Large	1265.0 (26.54)	391.0 (8.20)	1656.0 (34.74)	291.0 (6.10)	439.0 (9.21)	143.0 (3.00)	582.0 (12.21)	4767
Overall	1963.0 (25.92)	516.0 (6.81)	2479.0 (32.74)	558.0 (7.37)	694.0 (9.17)	334.0 (4.41)	1028.0 (13.58)	7572

Figures in parenthesis indicate per cent to total

4.4.2 Average herd size based on Standard Animal Unit (SAU)

Figure 4.5 showed the average herd size of the farms under different farm sizes based on Standard Animals Unit (SAU). In small, medium and large farms, the herd size was 3.13 ± 0.08 , 9.52 ± 0.3 and 36.38 ± 3.65 respectively. The overall herd size was 12.08 ± 1.05 .

4.4.3 Herd building

4.4.3.1 Mode of replacement of animals in farms

The mode of replacement of animals in the farm is presented in the Figure 4.6. Irrespective of farm size the preferred mode of replacement was purchase. In small, medium and large farms 59.4, 69.0 and 88.0 per cent of farmers preferred purchase as the mode of replacement or herd building. The overall picture showed that 68.3 per cent of farmers preferred purchase and 31.7 per cent preferred farm rearing. The preference for purchase was highest in large farms and lowest in small farms.

4.4.3.2 Composition of purchased animals in the farms

Table 4.4.3.2 shows the composition of purchased animals in the farms. It was revealed that in small, medium and large farms, 52.45, 62.57 and 83.57 per cent were adult animals respectively. Heifers constituted 15.25, 7.38 and 5.50 per cent in small, medium and large farms respectively. The calves were 3.35, 1.12 and 5.50 in small, medium and large respectively in purchased animals.

Table 4.4.3.2 Composition of purchased animals in the farms

Farm size	Adult	Heifer	Calf	Total
Small	150.0 (52.45)	18.0 (15.25)	6.0 (3.35)	174.0
Medium	336.0 (62.57)	11.0 (7.38)	3.0 (1.12)	350.0
Large	1383.0 (83.51)	16.0 (5.50)	32.0 (5.50)	1431.0
Overall	1869.0	45.0	41.0	1955.0

Figures in parenthesis indicate per cent to total

4.4.3.3 Composition of animals reared in the farms

Table 4.4.3.3 shows the composition of animals reared in the farm. The proportion of adult animals in total reared animals was 46.50, 37.99 and 15.28 in

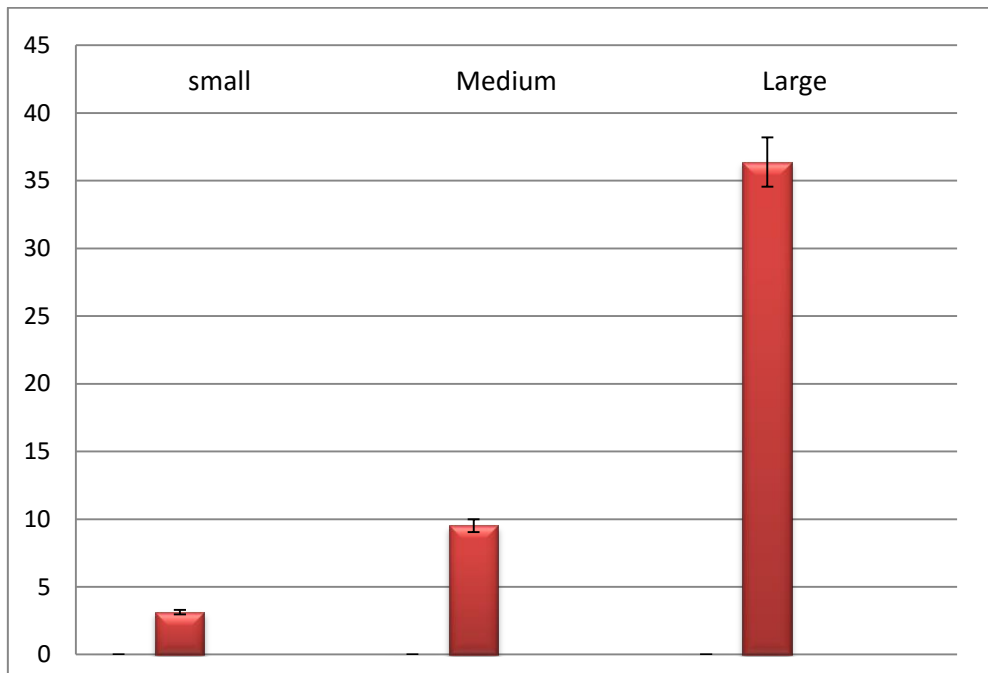


Figure 4.5 Average herd size under different farm sizes

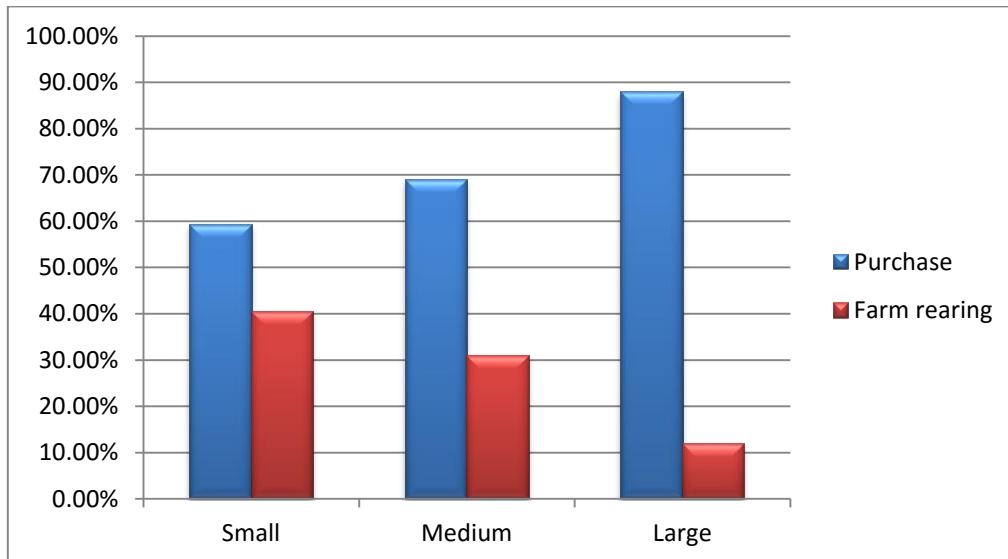


Figure 4.6 Preferred mode of replacement of animals in farms

small, medium and large farms respectively. The respective values for heifers were 66.1, 94.63 and 94.50. The calves reared were 93.6, 95.88 and 96.37 per cent in small, medium and large farms respectively.

Table 4.4.3.3 Composition of animals reared in the farms

Farm size	Adult	Heifer	Calves	Total
Small	133.0 (46.50)	78.0 (66.10)	167.0 (93.30)	378.0
Medium	204.0 (37.99)	141.0 (94.63)	256.0 (95.88)	601.0
Large	253.0 (15.28)	275.0 (94.50)	561.0 (96.39)	1089.0
Overall	590.0	494.0	984.0	2068.0

Figures in parenthesis indicate per cent to total

4.4.3.4 Details of purchase in farms (Based on the last purchased animal)

4.4.3.4.1 Type of purchase

Table 4.4.3.4.1 shows the details of type of purchase in the farms. The result indicated that irrespective of the size, direct purchase was the dominant type. The government scheme linked purchase was only 21.1, 25.0 and 10.7 per cent in small, medium and large farms respectively. The proportion of direct purchase was 78.9, 75.0 and 89.3 per cent respectively. The overall picture showed 80.0 and 20.0 per cent was direct and scheme purchase respectively.

Table 4.4.3.4.1 Details of type of purchase of animals.

Type of Purchase	Number & per cent	Small	Medium	Large	Total
Direct	Number	138	75	67	280
	Per cent	78.90%	75.00%	89.30%	80.00%
Scheme	Number	37	25	8	70
	Per cent	21.10%	25.00%	10.70%	20.00%
Overall	Number	175	100	75	350

4.4.3.4.2 Source of purchase

Table 4.4.3.4.2 shows the source of purchase of animals. In small farms 66.3, 3.4, 30.3 per cent of animals were purchased from within district, within state and outside state. In medium farms 56.0, 4.0 and 40.0 per cent were the

respective figures. In case of large farms 30.3, 40.0 and 76.0 per cent were the proportion of within district, within state and outside state purchase respectively. The overall picture showed 54.3, 2.9 and 42.9 per cent respectively in different sources of purchase.

Table 4.4.3.4.2 Details of source of purchase

Source of Purchase	Number & per cent	Small	Medium	Large	Total
Within District	Number	116	56	18	190
	Per cent	66.3%	56.0%	24.0%	54.3%
Within State	Number	6	4	0	10
	Per cent	3.4%	4.0%	0.0%	2.9%
Outside State	Number	53	40	57	150
	Per cent	30.3%	40.0%	76.0%	42.9%
Overall	Number	175	100	75	350

4.4.3.4.3 Finance for purchase

The source of finance for purchase of animals in the farms is described in Table 4.4.3.4.3 .Using own finance was the dominant source of finance in all types of farms. The respective values were 60.0, 63.0 and 78.7 in small, medium and large farms. The subsidy linked purchase was 20.6, 20.0 and 9.3 per cent in small, medium and large farms respectively. The overall picture showed that own finance , loan, own finance plus loan and subsidy linked purchases were 64.9, 11.1, 6.0 and 18.0 per cent respectively.

4.4.3.4.4 Breed purchased

Table 4.4.3.4.4 shows the details of the breed purchased in the farms. In small farms ,37.7 and 62.3 per cent were Crossbred Jersey and Crossbred Holstein Friesian respectively. In medium farms the respective figures were 35.0 and 65.0 per cent. The large farms showed a high proportion of CBHF (86.7 per cent) and CBJ with only 13.3 per cent proportion of the purchase. The overall picture showed that 31.7 and 68.3 per cent of purchased animals were CBJ and CBHF respectively.

Table 4.4.3.4.3 Details of finance for purchase

Finance for Purchase	Number & per cent	Small	Medium	Large	Total
Own finance	Number	105	63	59	227
	Per cent	60.0%	63.0%	78.7%	64.9%
Loan	Number	21	12	6	39
	Per cent	12.0%	12.0%	8.0%	11.1%
Own finance + Loan	Number	13	5	3	21
	Per cent	7.4%	5.0%	4.0%	6.0%
Subsidy Linked	Number	36	20	7	63
	Per cent	20.6%	20.0%	9.3%	18.0%

Table 4.4.3.4.4 Details of breed purchased

Breed Purchased	Number & Per cent	Small	Medium	Large	Total
CBJ	Number	66	35	10	111
	Per cent	37.7%	35.0%	13.3%	31.7%
CBHF	Number	108	64	65	237
	Per cent	62.3%	65.0%	86.7%	68.3%

4.4.3.4.5 Production level of animal purchased

The detail of production level of animals is presented in Table 4.4.3.4.5. In small and medium farms majority of the animals belonged to the production level of 10-15 litres/day. In large farms, the majority of the animals purchased were having a production level of 15-20 litres/day (64.0 per cent). The overall picture showed that out of total animals purchased 0.6, 16.9, 34.3, 32.6 and 15.7 per cent belonged to per day production level of 1-5, 5-10, 10-15, 15-20 and more than 20 respectively.

Table 4.4.3.4.5 Details of production level of animal purchased

Production level of purchased animal	Number & Per cent	Small	Medium	Large	Total
1-5 l	Number	2	0	0	2
	Per cent	1.1%	0.0%	0.0%	.6%
5-10 l	Number	33	26	0	59
	Per cent	18.9%	26.0%	0.0%	16.9%
10-15 l	Number	63	37	20	120
	Per cent	36.0%	37.0%	26.7%	34.3%
15-20 l	Number	48	18	48	114
	Per cent	27.4%	18.0%	64.0%	32.6%
> 20 l	Number	29	19	7	55
	Per cent	16.6%	19.0%	9.3%	15.7%

4.4.3.4.6 Stage of purchase

Table 4.4.3.4.6 shows the details of stage of purchase of animals in the farms. Majority of animals purchased in small (65.1 per cent), medium (63.0 per cent) and large (78.7 per cent) were lactating animals, while that of pregnant animals was 29.1, 36.0 and 20.0 per cent in respective farms. The purchase of heifers and calves were very few in all types of farms. The overall picture revealed that 67.4, 29.1, 3.1 and 0.3 per cent of the purchased animals were lactating, pregnant, heifer and calves respectively.

Table 4.4.3.4.6 Details of stage of the purchased animal

Stage of Purchase	Number & per cent	Small	Medium	Large	Total
Lactating	Number	114	63	59	236
	Per cent	65.1%	63.0%	78.7%	67.4%
Pregnant	Number	51	36	15	102
	Per cent	29.1%	36.0%	20.0%	29.1%
Heifer	Number	9	1	1	11
	Per cent	5.1%	1.0%	1.3%	3.1%
Calf	Number	1	0	0	1
	Per cent	.6%	0.0%	0.0%	.3%

4.4.3.4.7 Lactation number of the animal purchased

Details of the lactation number of the purchased animals are given in the Table 4.4.3.4.7. In small, medium and large farms, the majority of the animals purchased, were belonging to first order lactation followed by second and third. The share of second order lactation was 41.7, 54.0 and 50.7 per cent in small, medium and large farms respectively. The overall picture showed that the proportion of animals belonging to first, second, third, fourth and fifth lactation was 36.6, 47.1, 14.9, 0.9 and 0.3 per cent respectively.

Table 4.4.3.4.7 Details of lactation number of the purchased animal

Lactation number of purchased animal	Number & Per cent	Small	Medium	Large	Total
1.0	Number	62	33	33	128
	Per cent	35.4%	33.0%	44.0%	36.6%
2.0	Number	73	54	38	165
	Per cent	41.7%	54.0%	50.7%	47.1%
3.0	Number	37	11	4	52
	Per cent	21.1%	11.0%	5.3%	14.9%
4.0	Number	2	1	0	3
	Per cent	1.1%	1.0%	0.0%	.9%
5.0	Number	1	0	0	1
	Per cent	.6%	0.0%	0.0%	.3%

4.4.3.5 Preference in purchase of animals in the farms

4.4.3.5.1 Preferred type of purchase

The details of farmers preference in type of purchase of animals is presented in table 4.4.3.5.1. The preference for direct purchase was 52.0, 25.0 and 60.0 per cent in small, medium and large sized farms respectively. The preference for scheme linked purchase was 47.4, 67.0 and 40.0 per cent in respective farms. The preference for combination of both was 0.6, 8.0 and zero

per cent in small, medium and large farms. The overall values were 46.0, 51.4 and 2.6 per cent for direct, scheme linked and combination purchases.

Table 4.4.3.5.1 Details of preference for the type of purchase of animals

Farm Type	Number / Per cent	Preferred type of animal purchase			Total
		Direct	Scheme	Combination	
Small	Number	91	83	1	175
	Per cent	52.0%	47.4%	.6%	100.0%
Medium	Number	25	67	8	100
	Per cent	25.0%	67.0%	8.0%	100.0%
Large	Number	45	30	0	75
	Per cent	60.0%	40.0%	0.0%	100.0%
Overall	Number	161	180	9	350
	Per cent	46.0%	51.4%	2.6%	100.0%

4.4.3.5.2 Preferred source of purchase

Table 4.4.3.5.2 shows the details of preferred source of purchase of animals in the farms. The preference for within district purchase was 77.7, 69.0 and 16.0 per cent in small, medium and large farms respectively. In large farms 66.7 per cent of farmers preferred outside state purchase. The overall result showed that the preference for within district, within state, outside state and combination purchase was 62.0, 6.6, 29.7 and 1.7 per cent respectively.

4.4.3.5.3 Preference for finance

Table 4.4.3.5.3 shows the details of preference of farmers for finance for purchase of animals. The subsidy based purchase was 52.0, 69.0 and 29.3 per cent in small, medium and large farms respectively. In case of large farms majority of the farmers (52.0 per cent) preferred own source of finance. The overall picture showed that 41.4, 4.0, 0.3, 52.0 and 2.6 per cent preferred own finance, loan own + loan, own + subsidy and loan + own + subsidy as source of finance of purchase of animals.

Table 4.4.3.5.2 Details of preferred source of purchase of animals

Farm Type	Number / Per cent	Preferred source of purchase			
		Within District	Within state	Outside state	Combinations
Small	Number	136	8	30	1
	Per cent	77.7%	4.6%	17.1%	.6%
Medium	Number	69	2	24	5
	Per cent	69.0%	2.0%	24.0%	5.0%
Large	Number	12	13	50	0
	Per cent	16.0%	17.3%	66.7%	0.0%
Total	Number	217	23	104	6
	Per cent	62.0%	6.6%	29.7%	1.7%

Table 4.4.3.5.3 Details of preference of finance for purchase of animals

Farm Type	Number / Per cent	Finance source preferred for animal purchase				
		Own	Loan	Own + Loan	Own + Subsidy	Loan + Own + Subsidy
Small	Number	76	0	0	91	8
	Per cent	43.4%	0.0%	0.0%	52.0%	4.6%
Medium	Number	29	1	0	69	1
	Per cent	29.0%	1.0%	0.0%	69.0%	1.0%
Large	Number	39	13	1	22	0
	Per cent	52.0%	17.3%	1.3%	29.3%	0.0%
Total	Number	144	14	1	182	9
	Per cent	41.1%	4.0%	.3%	52.0%	2.6%

4.4.3.5.4 Preference for breed

The details of preference for a particular breed by farmers during purchase are given in Table 4.4.3.5.4. The preference for CBJ animals was 56.0, 28.0 and 8.0 per cent in small, medium and large farms. The preference for CBHF was 40.6, 56.0 and 57.3 per cent in respective farms. The preference for local animals was negligible. In small, medium and large farms 2.9, 16.0 and 34.7 per cent preferred combination of both breeds. The overall picture showed that 37.7, 48.6,

0.3 and 13.4 per cent of farmers preferred CBJ, CBHF, local and combination of CBJ and CBHF respectively.

Table 4.4.3.5.4 Details of breed preference by farmers for purchase

Farm Type	Number / Per cent	Breed Preferred			
		CBJ	CBHF	Others	Mixed
Small	Number	98	71	1	5
	Per cent	56.0%	40.6%	0.6%	2.9%
Medium	Number	28	56	0	16
	Per cent	28.0%	56.0%	0.0%	16.0%
Large	Number	6	43	0	26
	Per cent	8.0%	57.3%	0.0%	34.7%
Overall	Number	132	170	1	47
	Per cent	37.7%	48.6%	0.3%	13.4%

4.4.3.5.5 Preference for production level

Table 4.4.3.5.5 shows the preference for production level of animals purchased. Majority of small (31.4 per cent) and medium farms (38.0 per cent) and 15-20 litres/day production level. In large farms majority (40.0 per cent) preferred more than 20 l production per day. The overall results showed that 9.7, 26.9, 33.7, and 29.7 preferred production level of 5-10, 11-15, 15-20 and more than 20 litres/day respectively.

Table 4.4.3.5.5 Details of preferred production level of animals

Farm Type	Number / Per cent	Preferred production level(Litres)				Total
		5 to 10	11 to 15	15 to 20	> 20	
Small	Number	30	42	55	48	175
	Per cent	17.1%	24.0%	31.4%	27.4%	100.0%
Medium	Number	4	32	38	26	100
	Per cent	4.0%	32.0%	38.0%	26.0%	100.0%
Large	Number	0	20	25	30	75
	Per cent	0.0%	26.7%	33.3%	40.0%	100.0%
Overall	Number	34	94	118	104	350
	Per cent	9.7%	26.9%	33.7%	29.7%	100.0%

4.4.3.5.6 Preference of stage of purchase

The details of stage of lactation of animals preferred by farmers for purchase are described in table 4.4.3.5.6. Irrespective of farm size, the farmers preferred lactating animals for purchase. In small, medium and large farms 88.0, 60.0 and 66.7 per cent preferred lactating animals respectively. The preference of lactating ones was followed by pregnant animals. The preference for heifers and calf purchase was negligible. The overall results showed that 75.4, 20.6, 1.7 and 2.3 per cent of farmers preferred lactating pregnant, heifer and calf respectively.

Table 4.4.3.5.6 Details of Stage of lactation of animals preferred by farmers

Farm Type	Number / Per cent	Preferred stage of lactation (days)			
		Lactating	Pregnant	Heifer	Calf
Small	Number	154	18	3	0
	Per cent	88.0%	10.3%	1.7%	0.0%
Medium	Number	60	36	3	1
	Per cent	60.0%	36.0%	3.0%	1.0%
Large	Number	50	18	0	7
	Per cent	66.7%	24.0%	0.0%	9.3%
Overall	Number	264	72	6	8
	Per cent	75.4%	20.6%	1.7%	2.3%

4.4.3.5.7 Preference for lactation number

Table 4.4.3.5.7 shows the details of the preferred lactation number for purchase by farmers. The results revealed that majority of farmers in small farms preferred a combination of first and second lactation order (64.6 per cent) followed by combination of first, second and third lactation (10.3 per cent). In medium farms 45 per cent preferred combination of first and second lactation followed by first, second and third combination (34.0 per cent). In large farms 56.0 per cent preferred combination of first and second lactation followed by 17.3 per cent preferring a combination of first, second and third lactation. The overall result showed that 4, 16.0, 0.6, 0.9, 57.1, 18.6 and 2.9 per cent preferred first,

second, third, fourth, combination of first and second, combination of first, second and third and other combinations respectively.

Table 4.4.3.5.7 Details of preferred lactation number for purchase

Farm Type	Number / Per cent	Preferred lactation no						
		I	II	III	IV	Combination of I & II	Combination of I, II and III	Combination
Small	Number	7	30	2	3	113	18	2
	Per cent	4.0%	17.1%	1.1%	1.7%	64.6%	10.3%	1.1%
Medium	Number	0	13	0	0	45	34	8
	Per cent	0.0%	13.0%	0.0%	0.0%	45.0%	34.0%	8.0%
Large	Number	7	13	0	0	42	13	0
	Per cent	9.3%	17.3%	0.0%	0.0%	56.0%	17.3%	0.0%
Overall	Number	14	56	2	3	200	65	10
	Per cent	4.0%	16.0%	.6%	.9%	57.1%	18.6%	2.9%

4.4.4 Physiological state of animals in the farm

4.4.4.1 Status of animals based on lactation number

Table 4.4.4.1 shows the lactation number or order of lactation of animals present in the farms. The results showed that irrespective of farm size, almost 90 per cent of animals were in the first five lactation orders. In small farms majority (94 per cent) belonged to second order, followed by first (28.3 per cent) and third (21.1 per cent). In medium size the proportion of second, first and third lactation order were 32.3, 25.7 and 25.5 respectively. In large farms, respective order was 30.0, 26.6 and 27.3 per cent respectively. The overall analysis showed the presence of 1st to 8th lactation number as 26.6, 30.6, 26.2, 9.6, 4.3, 1.6, 0.6 and 0.2 per cent respectively.

Table 4.4.4.1 Distribution of animals based on lactation number in the farms

Farm size	1	2	3	4	5	6	7	8	Total
Small	86 28.4 %	94 31. %	64 21.1%	44 14.5%	8 2.6%	2 0.7%	1 0.3%	4 1.3%	303
Medium	127 25.7%	160 32.4%	126 25.5%	55 11.1%	11 2.2%	7 1.4%	6 1.2%	2 0.4%	494
Large	439 26.6%	496 30.1%	452 27.44%	136 8.2%	87 5.3%	31 1.9%	8 0.5%	1 0.06%	1650
Overall	652 26.6%	750 30.7%	642 26.2%	235 9.6%	106 4.3%	40 1.6%	15 0.6%	7 0.3%	2447

4.4.4.2 Status of animals based on stage of lactation and pregnancy

The distribution of animals based on stage of lactation and pregnancy are detailed in Table 4.4.4.2. The results indicated that, irrespective of farm size majority of animals in small (23.33 per cent), medium (23.57 per cent) and large farms (20.15 per cent) were in the first 100 days of lactation. The proportion of dry animals were 7.9, 12.2 and 16.8 per cent in small, medium and large farms respectively. The proportion of pregnant animals was 27.44, 24.43 and 24.6 respectively in small, medium and large farms. Overall result showed that the animals upto 100 days of lactation, between 100 and 200 days, 200 to 300 day more than 300 days, dry and pregnant were 21.26, 15.46, 16.49, 7.11, 14.79 and 24.9 respectively.

Table 4.4.4.2 Distribution of animals based on stage of lactation and pregnancy status

Farm size	upto 100 days	100-200 days	200-300 days	more than 300	Dry	Preg nant	Total
Small	91 23.33 %	58 14.9 %	59 15.1 %	44 11.3 %	31 8.0 %	107 27.4 %	390
Medium	165 23.6 %	73 10.4 %	175 25%	30 4.3 %	86 12.3 %	171 24.4 %	700
Large	444 20.2%	378 17.2 %	309 14%	160 7.3 %	370 16.8 %	542 24.6 %	2203
Overall	700 21.3%	509 15.5%	543 16.5 %	234 7.1 %	487 14.8 %	820 24.9 %	3293

4.4.4.3 Distribution of animals based on their physiological status and peak states of production

Table 4.4.4.3 gives details of per cent of animals in milk, dry, pregnant, in first three lactations and in first 100 days of lactation. In small farms 90.57, 9.43, 35.43, 84.57 and 36.57 were under respective groups. In medium farms, the respective proportion was 84.81, 15.19, 31.66, 76.43 and 35.40. In large farms the proportion of above categories were 79.63, 20.37, 30.86, 84.47 and 38.15 respectively. The overall picture showed that 86.58 per cent of animals were in milk out of total milch animals, 13.42 per cent were dry, 33.37 per cent were pregnant, 82.22 per cent were in first three lactation order and 36.58 per cent in first 100 days of lactation.

Table 4.4.4.3 Details of distribution of animals based on their physiological status and peak production state.

Farm Size	% of animals in milk of total milch animals	% of dry animals of total milch animals	% of pregnant animals of total milch animals	% of animals in Ist three lactation no. of total milch animals	% of animals in Ist 100 days of lactation of total milch animals
Small	90.57	9.43	35.43	84.57	36.57
Medium	84.81	15.19	31.66	76.43	35.40
Large	79.63	20.37	30.86	84.47	38.15
Overall	86.58	13.42	33.37	82.22	36.58

4.4.4.4 Age and pregnancy status of heifers

Table 4.4.4.4 shows the average age, per cent of pregnant heifers in the farms. In small farms, average age of heifers was 20.11 months and 33.05 per cent were pregnant. In medium farms age and per cent of pregnancy was 21.65 and 31.54. In large farms, the respective figures were 19.73 and 31.2. The overall results showed that the average age of heifers were 20.49 months and 32.09 per cent heifers were pregnant.

Table 4.4.4.4 Details of age and pregnancy status of heifers in the farms.

Farm size	Average age of heifer	No of pregnant heifer	Total heifer	% of pregnant heifers
Small	20.11	39	118	33.05
Medium	21.65	47	149	31.54
Large	19.73	93	291	31.2
Overall	20.49	179	558	32.07

4.4.4.5 Age wise distribution of male calves

The age-wise distribution of male calves is given in the Table 4.4.4.5. In small farms 37.14, 35.71, 25.71 and 1.43 per cent were below three months, 3-6 months, 6-12 months and above 12 months respectively. In medium farms the corresponding values were 53.72, 19.85, 23.14 and 3.31 per cent. In large farms the respective figures were 55.2, 25.1, 19.5 and zero per cent. The overall results showed that 50.89, 25.45, 22.16 and 1.5 per cent of male calves were below three months, between three and six months, between six and twelve months and above twelve months respectively. Irrespective of farm size majority of male calves were below three months of age.

Table 4.4.4.5 Details of Age wise distribution of male calves

Farm size	Male calves	Age of male calves (months)							
		below 3	%	3 to 6	%	6 to 12	%	above 12	%
Small	70	26	37.14	25	35.71	18	25.71	1	1.43
Medium	121	65	53.72	24	19.85	28	23.14	4	3.31
Large	143	79	55.24	36	25.17	28	19.58	0	0
Overall	334	170	50.89	85	25.45	74	22.16	5	1.5

4.4.4.6 Age wise distribution of female calves

The age-wise distribution of female calves in different farms is given in Table 4.4.4.6. The results indicated that majority of the female calves were below

three months of age irrespective of farm size. In small farms the female calves below three months, between three and six months and between six and twelve months were 43.12, 35.72 and 21.1 per cent respectively. In medium farms, the respective figures were 35.62, 38.36 and 26.03. In large farms ,it was 46.01, 30.75 and 23.23 per cent. The overall results showed that 43.37 per cent of female calves were below three months of age, 33.14 per cent of female calves between three and six months and 23.49 per cent between six and twelve months of age.

Table 4.4.4.6 Details of Age wise distribution of female calves

Farm size	Age of female calves (months)						
	Female calves	Below 3	%	3 to 6	%	6 to 12	%
Small	109	47	43.12	39	35.78	23	21.1
Medium	146	52	35.62	56	38.36	38	26.03
Large	439	202	46.01	135	30.75	102	23.23
Overall	694	301	43.37	230	33.14	163	23.49

4.4.5 Cattle transactions

4.4.5.1 Cattle purchase (previous year)

Table 4.4.5.1 shows the details of purchase of animals and value of purchase. The results revealed that irrespective of farm size, the majority of animals purchased were milch cows and purchase of heifers and calves was in negligible numbers. In small, medium and large farms the average purchase value of milch animals was Rs. 41,523, Rs.42,441 and Rs.48,827 respectively. Overall level it was Rs. 46,816. The average value of heifer and calf was Rs. 7,000 and 501 in small farms. In medium farms it was Rs. 22,243 for heifers. In medium and large farms no purchase of heifers and calves were recorded in the previous year of study.

Table 4.4.5.1 Details of animal purchase in the farm during the previous year

Farm size	Purchase details								
	Milch animal	value (lakh Rs)	Av. value/ milch animal (lakh Rs)	Heifer	value (lakh Rs)	Av. value/ heifer (lakh Rs)	calf	value (lakh Rs)	Av. value/ calf (lakh Rs)
Small	65.0	26.99	0.415	4.0	0.28	0.07	2.0	0.01	0.005
Medium	102.0	43.29	0.412	7.0	1.55	0.224	0.0	0.0	0.0
Large	393.0	191.89	0.488	0.0	0.0	0.0	0.0	0.0	0.0
Overall	560.0	262.17	0.468	11.0	1.84	.167	2.0	0.01	0.005

4.4.5.2 Sale of animals (previous year)

The details of sale of animals in the farm in the preceding year of present study are described in Table 4.4.5.2. The results showed that majority of the sale were of milch animals and male calves. The number of heifers and female calves were comparatively lower. In small, medium and large farms the average sale value of milch animals were Rs. 22, 493, Rs. 20,985 and Rs. 23,947 respectively. The overall value was Rs. 23,051. In large farms the sale of both male and female calves was comparatively more.

4.4.6 Calf disposal pattern

Table 4.4.6.1 and Table 4.4.6.2 shows the disposal pattern of female and male calves in different farms. Irrespective of farms size, majority of female calves were retained in the farm. While majority of male calves were sold out. But in large farms the proportion of females retained was comparatively low. In small, medium and large farms the proportion of females retained were 86.3, 90.0 and 84.0 per cent respectively. The overall retaining rate was 86.9 per cent. In small, medium and large farms 99.4, 100 and 100 per cent of males were sold out. The overall picture was 99.7 per cent selling and 0.3 per cent retention.

Table 4.4.5.2 Details of sale of animals in the farm during the previous year

Farm size	Sale Details											
	Milch animal	Value (in lakh Rs)	Av. Value (Rs)	Heifer	Value (in lakh Rs)	Av. Value (Rs)	Male calf	Value	Av. Value (Rs)	female calf	Value (in lakh Rs)	Av. Value (Rs)
Small	63	14.17	22,493	9	1.18	13,111	49	2.58	5,255	12	0.82	6,854
Medium	65	13.64	20,985	10	0.94	9,400	77	2.51	3,255	26	1.79	6,885
Large	189	45.26	23,947	17	3.4	20,000	128	2.71	2,116	19	0.59	3,105
Overall	317	73.07	23,051	36	5.52	15,333	254	7.79	3,067	57	3.20	5,618

Table 4.4.6.1 Disposal pattern of female calves

Farm Type	Number / Per cent	Total		
		Selling out	Rearing	Total
Small	Number	24	151	175
	Per cent	13.7%	86.3%	100.0%
Medium	Number	10	90	100
	Per cent	10%	90.0%	100.0%
Large	Number	12	63	75
	Per cent	16b%	84.0%	100.0%
Overall	Number	46	304	350
	Per cent	13.1%	86.9%	100.0%

Table 4.4.6.2 Disposal pattern of male calves

Farm Type	Number / Per cent	Disposal pattern of male calves		
		Selling out	Rearing	Total
Small	Number	174	1	175
	Per cent	99.4%	.6%	100.0%
Medium	Number	100	0	100
	Per cent	100%	0.0%	100.0%
Large	Number	75	0	75
	Per cent	100%	0.0%	100.0%
Overall	Number	349	1	350
	Per cent	99.7%	.3%	100.0%

4.4.7 Mortality pattern in farms in the previous year

The details of mortality pattern of animals in the farms in the previous year of the present study is presented as Figure 4.7. The results revealed that irrespective of farm size the higher rate of mortality was observed in male calves.

4.4.8 Insurance of animals

Figure 4.8 and Table 4.4.8.2 shows the number of animals insured in different farms and the reasons perceived by the farmers for not insuring their animals. The results showed that only 43.3, 45.8 and 54.0 per cent of animals were insured in small, medium and large farms respectively. The overall value it

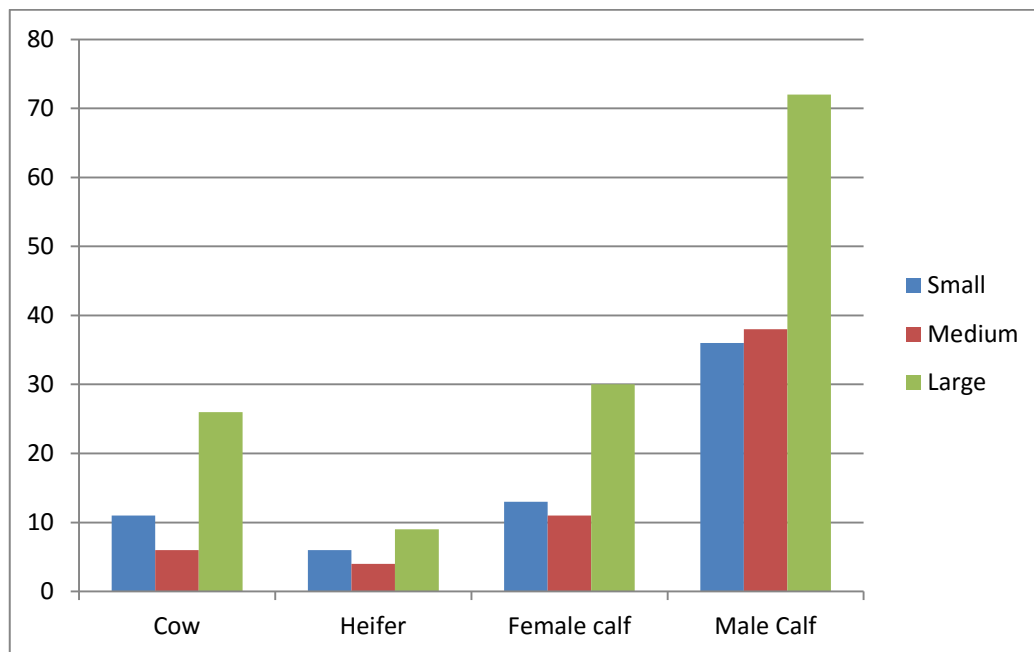


Figure 4.7 Mortality pattern of animals in the previous year (in numbers)

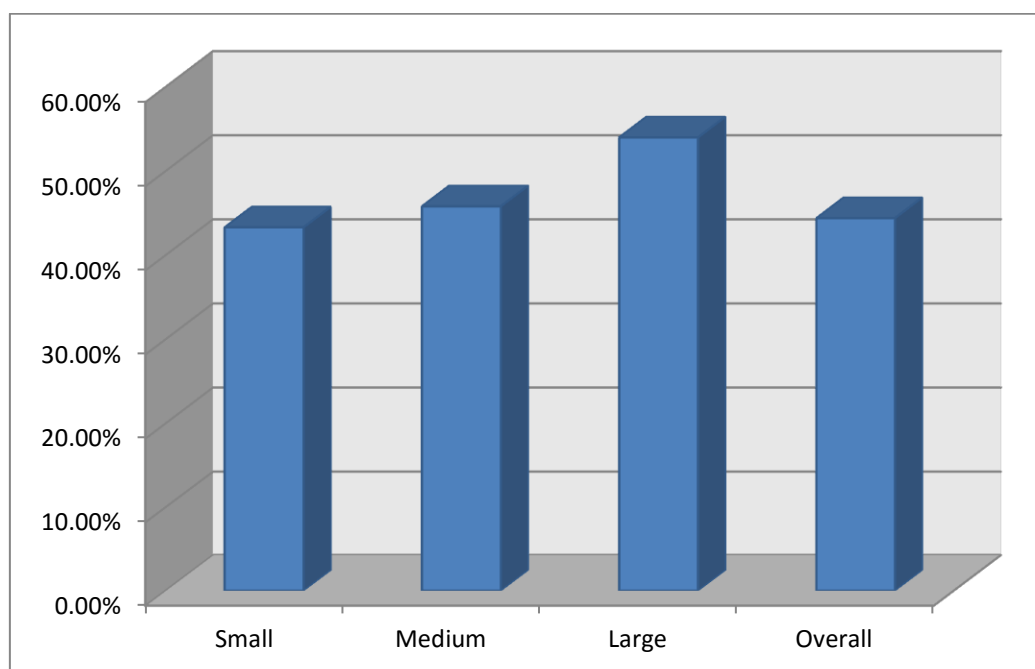


Figure 4.8 Per cent of animals insured in the farms

was 44.4 per cent. The major reasons cited by the farmers for not insuring their animals were high premium and delay in claim receipt.

Table 4.4.8.2 Reason for not insuring the animals in the farms

Reasons	Number /Per cent	Farm size		
		Small	Medium	Large
No insurance(0)	Number	86	62	51
High premium(1)	Number	23	1	0
Not aware of schemes and importance(2)	Number	4	0	0
(0), (1), and (2)	Number	5	24	11
Not interested (3)	Number	2	1	0
Difficulty in claim (4)	Number	1	0	0
(3) and 4	Number	53	12	13

4.5 FARM INVENTORY

4.5.1 Land for building

Table 4.5.1 shows the type of land used by the farmers for constructing animal sheds. It showed that 100 per cent of farmers irrespective of farm size used own land for building/cattle shed construction.

Table 4.5.1 Type of land for building

Parameter	Number/ per cent	Farm type		
		Small	Medium	Large
Own	Number	175	100	75
	Per cent	%	100.0%	100.0%
Lease	Number	0	0	0
	Per cent	0%	0.0%	0.0%

4.5.2 Land for fodder cultivation

The details of type of land used for fodder cultivation is given in the Table 4.5.2. In small, medium and large farms 48.0, 22.0 and 8.0 per cent had not cultivated fodder. Overall 32.0 per cent were not having fodder cultivation. In

small, medium and large farms majority of the farmers (46.9, 69.0, and 78.7 per cent respectively) used own land for fodder cultivation. In small, medium and large farms, 3.4, 7.0 and 8.0 per cent had leased land for fodder cultivation. The proportion of farmers who used both own and leased land farmers were 1.7, 2.0 and 5.3 per cent in small, medium and large farms respectively. The overall picture indicated that 32.0, 60.0, 5.4 and 2.6 per cent of farmers were having no fodder cultivation, own, lease and both for fodder cultivation respectively.

Table 4.5.2 .Type of land for fodder cultivation

Parameter	Number/ Per cent	Farm type			Total
		Small	Medium	Large	
No fodder	Number	84	22	6	112
	Per cent	48.0%	22.0%	8.0%	32.0%
Own	Number	82	69	59	210
	Per cent	46.9%	69.0%	78.7%	60.0%
Lease	Number	6	7	6	19
	Per cent	3.4%	7.0%	8.0%	5.4%
Both	Number	3	2	4	9
	Per cent	1.7%	2.0%	5.3%	2.6%

4.5.3 Area for sheds and fodder cultivation

Table 4.5.3 showed the details of area used for cattle shed and fodder cultivation. The average area for cattle sheds in small, medium and large farms was 199.07 sq.ft. (0.5 cents), 518.35 sq.ft. (1.3 cents) and 2024.8 sq.ft. (5.06 cents) respectively. The overall value was 681.52 sq.ft. (1.7 cents). In small farms used 20.33, 2.43, 10.92 and 11.44 cents of own land, lease land, pure cropping and intercropping for fodder cultivation. In medium farms the respective values were 64.23, 12.85, 35.07 and 35.07 cents. In large farms 217.53, 58, 165.06, 110.46 cents were the area respectively. The overall picture showed that 75.16 (own land), 17.31 (lease land), 52.65 (pure crop) and 63.08 (inter cropping) cents were the area used for fodder cultivation. In total small

(22.76), medium (76.44), large (273.53) and 91.83 (overall) cents was the average area under cultivation of fodder in different farms and in overall.

Table 4.5.3 Details of area for sheds and fodder cultivation

Farm type	Mean	Area of building		Fodder cultivation (cents)				
		(Sq.ft)	(cents)	Own land	Lease land	Pure	Inter cropping	Total fodder
Small	Mean	199.07	0.5	20.33	2.43	10.92	11.44	22.76
Medium	Mean	518.35	1.3	64.23	12.85	35.07	35.07	76.44
Large	Mean	2024.8	5.06	217.53	58	165.06	110.46	273.53
Total	Mean	681.52	1.7	75.16	17.31	52.65	6308	91.83

4.5.4 Investment on capital

Table 4.5.4 shows the pattern of investment on capital assets in different farms. The results revealed that the major share of capital expenditure was on milch animals followed by buildings. The investment on equipments was comparatively small. The share on milch animals was 56.19, 59.81 and 56.14 per cent of total capital expenditure in small, medium and large farms respectively. Overall picture showed 56.79 per cent share of milch animals on total capital assets. In case of buildings 41.7, 33.44, 37.65 and 37.28 per cent was the investment on buildings in small, medium and large and overall farms. The share of cost of equipments was 2.12, 6.75, 6.21 and 5.93 per cent in small, medium, large and for overall farms.

Table 4.5.4 Details of mean values of investment on capital assets

Farm type	Cost on capital assets						
	Milch animal (in lakh Rs)	% Of total	Building (in lakh Rs)	% of total	Equipments (in lakh Rs)	% of total	Total
Small	0.65	56.19	0.48	41.7	0.024	2.12	1.15
Medium	2.29	59.81	1.28	33.44	0.26	6.75	3.83
Large	11.97	56.14	8.02	37.65	1.32	6.21	21.31
Overall	3.54	56.79	2.33	37.28	0.37	5.93	6.24

4.5.5 Mechanisation

The level of mechanisation in different farms is presented as Figure 4.9. Irrespective of farm size, low level of mechanisation was observed. In small farms 83.4, 16.0 and 0.6 per cent of farms had low, medium and high level of mechanisation. In medium farms ,53.0, 23.0 and 24.0 per cent of farms had low, medium and high level of mechanisation. In large farms 10.7, 25.3 and 64.0 per cent were the respective values. The overall picture showed that 59.1, 20.0 and 20.9 per cent farms had low, medium and high level of mechanisation.

4.6 EXISTING MANAGEMENT PROFILE OF THE FARM

4.6.1 Housing

4.6.1.1 Type of Housing

Figure 4.10 shows the details of type of housing followed in different farms. In small farms , 88.0 and 12.0 per cent of houses were permanent and temporary respectively. In medium farms the respective figures were 94.0 and 6.0 per cent. In large farms 100 per cent of cattle sheds were permanent type. The overall picture revealed that 92.2 per cent cattle houses were permanent and 7.7 per cent of temporary type. (Temporary house - a house without a concrete floor with stone, mud or palm, stem floor without proper roof).

4.6.1.2 Type of building

Classification of cattle houses based on building pattern is presented in Table 4.6.1.2. Eleven types of building pattern were observed, based on the position of cattle shed (related to human house) floor and roof. In small, medium and large farms a separate house with metal sheet roof and concrete floor was the predominant type of building with a share of 37.1, 56 and 86.70 per cent respectively in different farms.

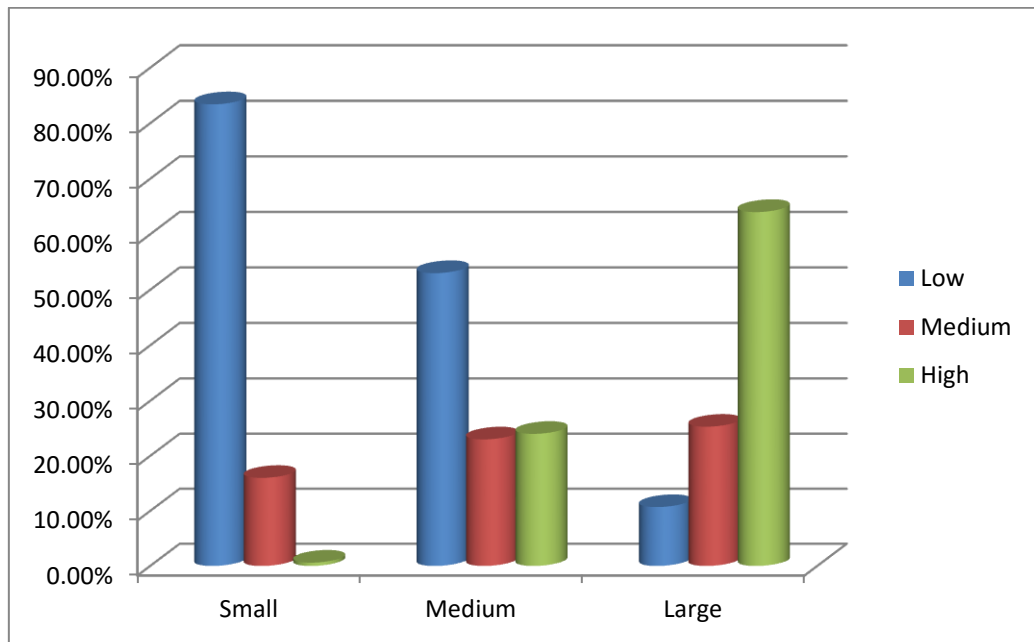


Figure 4.9 Level of mechanization in farms

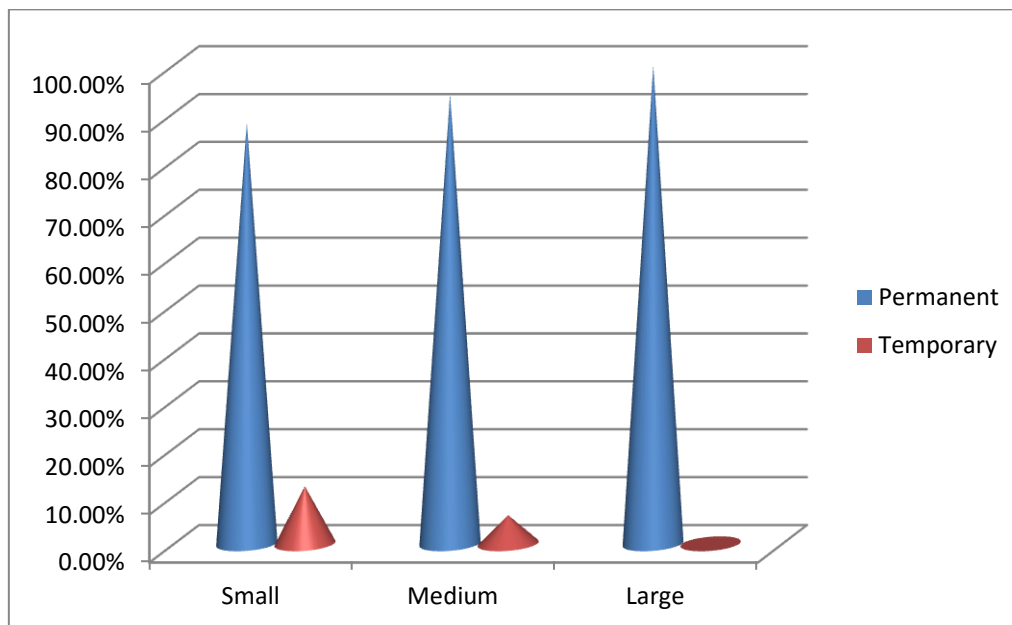


Figure 4.10 Details of type of Housing

Table 4.6.1.2 Classification of cattle houses based on building pattern

Farm type	House Type										
	1	2	3	4	5	6	7	8	9	10	11
Small	14	52	65	5	6	5	6	12	3	2	5
	8%	29.70%	37.10%	2.90%	3.40%	2.9%	3.40%	6.90%	1.70%	1.10%	2.90%
Medium	4	14	56	0	14	2	6	2	1	1	0
	4%	14%	56%	0%	14%	2%	6%	2%	1%	1.10%	0%
Large	0	2	65	0	8	0	0	0	0	0	0
	0%	2.70%	86.70%	0%	10.70%	0%	0%	0%	0%	0%	0%
Overall	18	68	186	5	28	7	12	14	4	3	5
	5.10%	19.40%	53.10%	1.40%	8%	2%	3.40%	4%	1.10%	0.90%	1.40%

1. Temporary(Floor without concrete ,with stone, mud or palm stem floor paneling

2. Separate (position) +Tiled (roof)+Concrete(floor)

3. Separate+Metal Sheet (roof)+Concrete(floor)

4. Separate + Concrete + Concrete

5. Separate +Thatched + Concrete

6. Separate +Silpaulin sheet +Concrete

7. Attached+Metal sheet+ concrete

8. Attached +Tiled + Concrete

9. Attached +Concrete+ Concrete

10. Attached+ Thatched +Concrete

11. Attached + Silpaulin+ Concrete

4.6.1.3 Heat alleviation measures

The level of heat stress alleviation measures followed in the farms are presented in the table 4.6.1.3. In small farms 60.0, 39.4 and 0.6 per cent of farmers followed low, medium and high level of heat alleviation measures. In medium farms 53.0, 38.0 and 9.0 per cent followed low, medium and high level of heat stress alleviation measures. In large farms the respective figures were 1.3, 64.0 and 34.7 per cent respectively. Overall picture showed 45.4, 44.3 and 10.3 per cent farmers following low, medium and high level of heat stress alleviation steps. In small and medium farms majority of the farmers were at low level and in large farms 64.0 per cent were at medium level.

Table 4.6.1.3 Level of heat stress alleviation measures

Farm Type	Number / Per cent	Heat alleviating measures		
		Low	Medium	High
Small	Number	105	69	1
	Per cent	60.0%	39.4%	.6%
Medium	Number	53	38	9
	Per cent	53.0%	38.0%	9.0%
Large	Number	1	48	26
	Per cent	1.3%	64.0%	34.7%
Overall	Number	159	155	36
	Per cent	45.4%	44.3%	10.3%

4.6.2 Feeding

4.6.2.1 System of feeding

Figure 4.11 presents the system of feeding followed by farmers under different farm size. In small and medium farms, majority were following stall feeding along with grazing (54.3 and 57.0 per cent) respectively. In large systems the major system was stall feeding (90.7 per cent). The overall results showed that 54.3 per cent of farms followed only stall feeding 0.3 per cent dependent only on grazing and 45.4 per cent on a combination of stall feeding and grazing.

4.6.2.2 Type of Feed

The type of feeds fed to animals in the farms is given in Table 4.6.2.2. Irrespective of farm size, majority of the farmers fed a combination of green fodder , dry fodder and concentrate. The respective proportion in small, medium and large farms was 80.6, 91.0 and 92.0 respectively. The feeding system without concentrate was almost negligible. The overall results showed that 86.0, 11.1, 2.3, 0.3 and 0.3 per cent of farms depended on green + dry fodder + concentrate, green fodder + concentrate dry fodder + concentrate green fodder + dry fodder and others.

Table 4.6.2.2 Details of type of feed fed to animals in different farms

Farm Type	Number / Per cent	Type of feeding				
		GF+DF+ Conc	GF + Conc	DF + Con	GF + DF	Others
Small	Number	141	27	6	0	1
	Per cent	80.6%	15.4%	3.4%	0.0%	.6%
Medium	Number	91	8	0	1	0
	Per cent	91.0%	8.0%	0.0%	1.0%	0.0%
Large	Number	69	4	2	0	0
	Per cent	92.0%	5.3%	2.7%	0.0%	0.0%
Overall	Number	301	39	8	1	1
	Per cent	86.0%	11.1%	2.3%	.3%	.3%

4.6.2.3 Type of grazing area

Table 4.6.2.3 shows the nature of grazing area used by the farmers. Many farmers were not allowing/not having land for grazing (42.3, 32.0, and 90.7 per cent respectively in small, medium and large farms). In small, medium and large farms 38.3, 50.0 and 2.7 per cent of the farmers depended on common land for grazing. In small, medium and large farms 17.7, 12.0 and 6.7 per cent used homestead land respectively for grazing. The overall picture revealed that 49.7, 13.7, 34.0 and 2.6 per cent of farms were classified as no grazing, homestead, common land and homestead or common land respectively.

Table 4.6.2.3 Type of grazing area

Farm Type	Number / Per cent	Grazing area			
		No grazing (0)	Homestead (1)	Common Land (2)	Both (1)&(2)
Small	Number	74	31	67	3
	Per cent	42.3%	17.7%	38.3%	1.7%
Medium	Number	32	12	50	6
	Per cent	32.0%	12.0%	50.0%	6.0%
Large	Number	68	5	2	0
	Per cent	90.7%	6.7%	2.7%	0.0%
Overall	Number	174	48	119	9
	Per cent	49.7%	13.7%	34.0%	2.6%

4.6.2.4 Type of concentrate

Table 4.6.2.4 shows the type of concentrate fed to animals in different farms. Irrespective of farm size, vast majority of farmers used a combination of branded compounded cattle feed and other concentrate feed ingredients. The respective values in small, medium and large farms were 85.1, 86.0 and 93.0 per cent respectively. In small, medium and large farms 13.7, 13.0 and 5.3 per cent of farmers used only branded feed. The overall results indicated that 1.1, 11.7 and 86.9 per cent of farms dependent only on concentrate feed ingredients, only branded feed and combination of both.

Table 4.6.2.4 Details of types of concentrates fed to animal in different farms

Farm Type	Number / Per cent	Type of concentrate		
		Home	Branded	Both
Small	Number	2	24	149
	Per cent	1.1%	13.7%	85.1%
Medium	Number	1	13	86
	Per cent	1.0%	13.0%	86.0%
Large	Number	1	4	70
	Per cent	1.3%	5.3%	93.3%
Overall	Number	4	41	305
	Per cent	1.1%	11.7%	86.9%

4.6.2.5 Source of green grass

The source of green grass in different farms is given in the Table 4.6.2.5. In small, medium and large farms 6.3, 1.0 and 5.3 per cent had not practised green grass feeding. In small and medium farms, combination of fodder cultivation and collection of local grass was the major source of green grass with proportions of 39.4 and 45 per cent respectively. In large farms, cultivation of green fodder was the major source (68%) of green grass. The overall results showed that 4.6 per cent were not having green grass feeding, 22.0 per cent dependent on cultivation, 22.3 per cent on local grass, 36.3 per cent on local and cultivation where as 5.1 per cent on grazing only. The farmers who were purchasing green grass were in negligible numbers.

4.6.2.6 Type of Fodder cultivation

Table 4.6.2.6 presents the type of fodder cultivation in the farms. In small, medium and large farms 45.1, 26.0 and 8.0 per cent of the farms were not having any fodder cultivation. In small and medium farms intercropping was dominant with a share of 27.4 and 29.0 per cent respectively. In large farms majority (84.0 per cent) were practising pure cropping. In small, medium and large farms 7.4, 4.0, 2.7 per cent combined both inter and pure cropping. The overall picture revealed that 31.7, 23.1, 39.1 and 5.4 per cent were having no fodder cultivation, intercropping, pure cropping and combination of both respectively.

Table 4.6.2.6 Details of type of fodder cultivation in different dairy farms

Farm Type	Number / Per cent	Fodder Cultivation			
		no	Inter	Pure	both
Small	Number	79	48	33	13
	Per cent	45.1%	27.4%	18.9%	7.4%
Medium	Number	26	29	41	4
	Per cent	26.0%	29.0%	41.0%	4.0%
Large	Number	6	4	63	2
	Per cent	8.0%	5.3%	84.0%	2.7%
Overall	Number	111	81	137	19
	Per cent	31.7%	23.1%	39.1%	5.4%

Table 4.6.2.5. Details of sources of green fodder in dairy farms

Farm Type	Source of green fodder										
	No green fodder	Cultivation	Purchase	Local	Cultivation and Local	Purchase and local	Grazing only	Local and Grazing	Cultivation and purchase	Cultivation, Purchase and local	Cultivation, Local and grazing
Small	11	11	1	68	69	5	5	4	1	0	0
	6.3%	6.3%	0.6%	38.9%	39.4%	2.9%	2.9%	2.3%	0.6%	0%	0%
Medium	1	15	0	10	45	0	12	10	1	4	2
	1. %	15%	0%	1.1%	45%	0%	12%	10%	1%	4%	2%
Large	4	51	2	0	13	0	1	0	2	2	0
	5.3%	68%	2.7%	0%	17.3%	0%	1.3%	0%	2.7%	2.7%	0%
Total	16	77	3	78	127	5	18	14	4	6	2
	4.6%	22. %	0.9%	22.3%	36.3%	1.4%	5.1%	4.0%	1.1%	1.7%	0.6%

4.6.2.7 Type of fodder cultivated

The details of type of fodder cultivation in different farms are presented in Table 4.6.2.7. In small, medium and large farms majority of farmers cultivated grass fodder (53.7, 71.0 and 92.0 per cent respectively). The cultivation of legume and cereal fodder were in negligible number in all farms. The overall results revealed that 32.3, 66.9, 0.6 and 0.3 per cent of farms were without grass fodder cultivation, legume and cereal fodder cultivation respectively.

Table 4.6.2.7 Details of types of fodder cultivated in farms

Farm Type	Number / Per cent	Type of fodder			
		No	grass	legume	cereal
Small	Number	80	94	1	0
	Per cent	45.7%	53.7%	0.6%	0.0%
Medium	Number	27	71	1	1
	Per cent	27.0%	71.0%	1.0%	1.0%
Large	Number	6	69	0	0
	Per cent	8.0%	92.0%	0.0%	0.0%
Overall	Number	113	234	2	1
	Per cent	32.3%	66.9%	0.6%	0.3%

4.6.2.8 Variety of fodder

Table 4.6.2.8 shows the details of variety of fodder cultivated in different farms. It showed that Hybrid Napier was the major variety cultivated in all farms (52.0, 69.0 and 44.0 per cent respectively). The cultivation of Congo signal and Maize were practised in very few farms.

Table 4.6.2.8 Details of variety of fodder cultivated in different farms

Farm Type	Number / Per cent	Fodder variety				
		No cultivation	Hybrid Napier(HN)	Congo signal	Maize	HN & MAIZE
Small	Number	81	91	1	1	1
	Per cent	46.3%	52.0%	.6%	.6%	.6%
Medium	Number	29	69	0	1	1
	Per cent	29.0%	69.0%	0.0%	1.0%	1.0%
Large	Number	5	33	0	36	1
	Per cent	6.7%	44.0%	0.0%	48.0%	1.3%
Overall	Number	115	193	1	38	3
	Per cent	32.9%	55.1%	.3%	10.9%	.9%

4.6.2.9 Source of straw

Figure 4.12 shows the details of source of straw in farms. In small, medium and large farm types 10.9, 3.0 and 5.3 per cent were not using paddy straw in their farms. In all types of farms, purchase was the source of paddy straw. In small, medium and large 47.4, 52.0 and 77.3 per cent purchased paddy straw. The proportion of cultivation of paddy by oneself was 23.4, 24.0 and 4.0 in small, medium and large farms. While 18.3, 21.0 and 13.3 per cent of farms respectively in small, medium and large category depended on both purchased and own cultivation. The overall result showed that 7.4, 19.4, 55.1 and 17.9 per cent of farms were without paddy straw, own source, purchased and both purchased and own source of straw.

4.6.2.10 Reason for not cultivating fodder

The reason cited by the farmers as the reason for non-cultivation of fodder is presented in Table 4.6.2.10. Lack of suitable land and preference for cash crops were the major reasons given by farmers for not cultivating fodder irrespective of farm size.

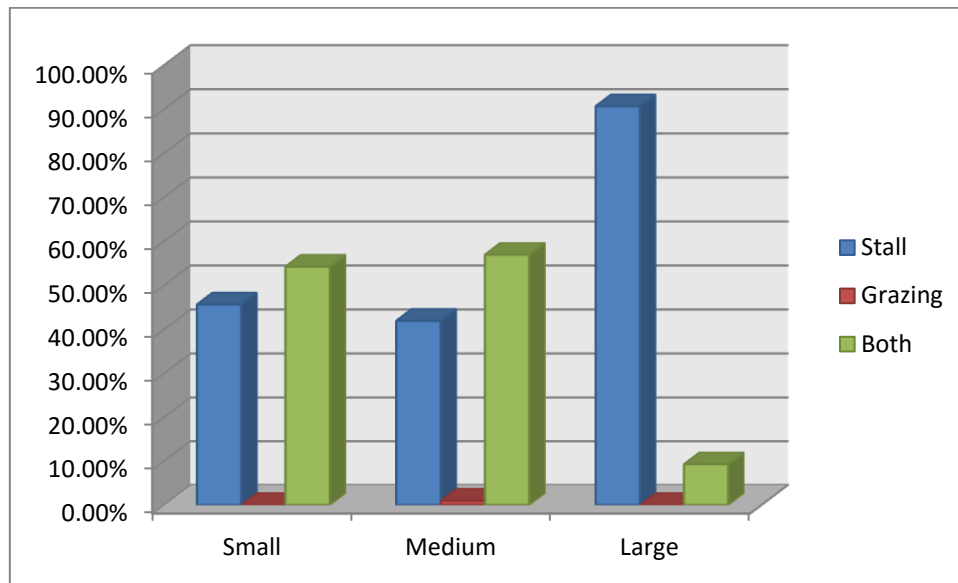


Figure 4.11 Classification based on system of feeding

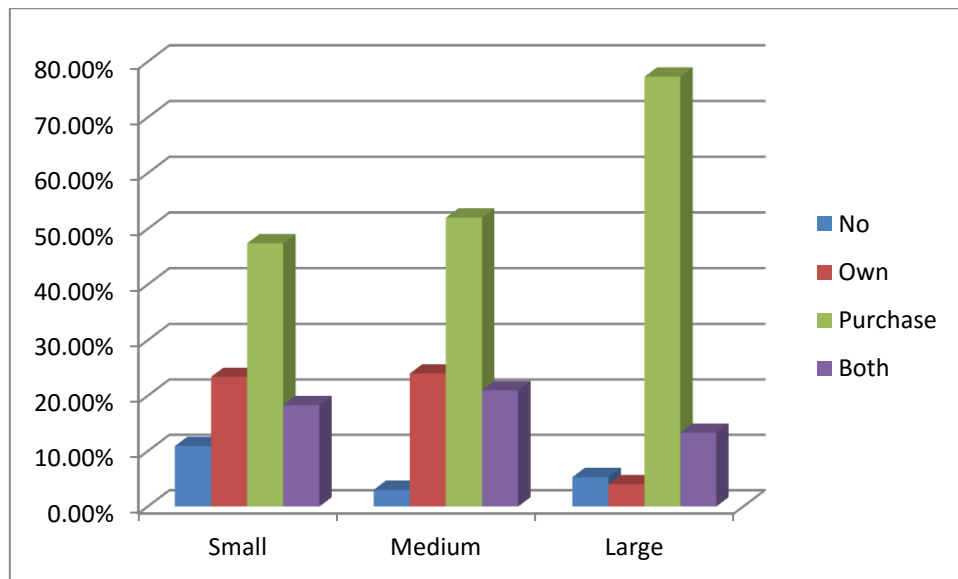


Figure 4.12 Source of straw in different types of farms

Table 4.6.2.10 Reasons perceived by farmers for not cultivating fodder

Farm Type	Number/ Per cent	Reasons for not cultivating fodder							
		0	1	2	3	4	5	6	7
Small	Number	82	8	0	75	4	3	1	2
	Per cent	46.9%	4.6%	0.0%	42.9%	2.3%	1.7%	.6%	1.1%
Medium	Number	68	2	1	27	0	0	0	1
	Per cent	68.7%	2.0%	1.0%	27.3%	0.0%	0.0%	0.0%	1.0%
Large	Number	74	0	1	0	0	0	0	0
	Per cent	98.7%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%
Overall	Number	224	10	2	102	4	3	1	3
	Per cent	64.2%	2.9%	.6%	29.2%	1.1%	.9%	.3%	.9%

0- no fodder 1- Lack of promotion programme and subsidy 2-Preference for cash crops
 3-lack of suitable land 4 – Economic viability 5- Lack of planting materials
 6 - 2 & 3 7 – Combinations

4.6.2.11 Feeding schedule (as on previous day of interview)

Table 4.6.2.11 gives the details of feeding schedule followed in different farms. In small, medium and large farms average quantity of green fodder (kg) fed to milch animals were 25.48, 19.14 and 18.65 respectively. In small farms proportion of locally collected green grass was more. In medium farms the amount was almost equal, but in large farms the proportion of cultivated green fodder was dominant (13.40 kg out of 18.65 kg). In all farms proportion of purchased grass was comparatively less. The average amount of dry fodder fed (kg) was 1.19, 2.20 and 1.33 in small, medium and large farms respectively.

The average amount of concentrate feed fed (kg) to milking animal was 5.44, 4.65 and 5.81 in small, medium and large farms respectively. The amount for dry animals was 0.38, 1.01 and 1.81. The overall result revealed that 8.72, 12.8, 0.68, 22.21, 1.49, 5.30 and 0.87 kg were the average daily amount of cultivated green fodder, collected green grass, purchased green fodder, total green fodder, dry fodder concentrate for a milking animal and concentrate for dry animals respectively.

Table 4.6.2.11 Pattern of feeding in different farms

Farm Size	Average quantity of feed and fodder fed per day per animal (kg)						
	Milch animal						Dry animal
	Cultivated green fodder	Collected green grass	Purchased green fodder	Total green fodder	Dry fodder	Concentrate	Concentrate
Small	6.17	19.17	0.14	25.48	1.19	5.44	0.38
Medium	9.69	9.10	0.35	19.14	2.29	4.65	1.01
Large	13.40	2.89	2.36	18.65	1.33	5.81	1.81
Overall	8.72	12.80	0.68	22.21	1.49	5.30	0.87

4.6.3 Breeding / reproduction

4.6.3.1 Agency providing AI service

Figure 4.13 presents the details of agency providing artificial insemination services (AI) in the farms. Irrespective of size, majority of the farms used the service of Animal Husbandry Department (AHD). In small, medium and large farms 83.4, 86.0 and 96.0 per cent of the farms were using the service of AHD. In small, medium and large farms 11.5, 14.0 and 4.0 per cent used the service of both AHD and private persons. The use of only private service was negligible in all farm sizes. Overall result showed that 86.9, 2.6 and 10.5 per cent of farms used AHD, private and both AHD and private for AI services respectively.

4.6.3.2 AI Service provider

Table 4.6.3.2 shows the details of the person providing AI service in the farms. In small farms 47.4, 38.9 and 10.3 per cent of farmers sought the service Livestock Inspector (LI), Government Veterinary surgeon and private persons respectively. In medium farms, the corresponding proportion was 64.0, 26.0 and 9.0 per cent. Large farms showed the figures respective figures as 46.7, 48.0 and 4.0 per cent. The overall picture showed that 37.1, 0.9, 52.0, 8.6 and 14 per cent of farmers sought the service of a Govt. Veterinarian, Private veterinarian, LI, Private person, Govt. Veterinarian or Private person respectively.

Table 4.6.3.2 Details of AI service provider in the farms

Farm Type	Number / Per cent	AI Done by				
		Govt.Vet	Pvt. Vet.	LI	Pvt. person	Govt. Vet &LI
Small	Number	68	1	83	18	5
	Per cent	38.9%	.6%	47.4%	10.3%	2.9%
Medium	Number	26	1	64	9	0
	Per cent	26.0%	1.0%	64.0%	9.0%	0.0%
Large	Number	36	1	35	3	0
	Per cent	48.0%	1.3%	46.7%	4.0%	0.0%
Overall	Number	130	3	182	30	5
	Per cent	37.1%	.9%	52.0%	8.6%	1.4%

4.6.3.3 Place of AI

Table 4.6.3.3 shows the details of place where AI is being done. In small farms 85.1, 9.1 and 5.7 per cent of farmers used farm premises, ICDP centre and veterinary hospital respectively for doing AI. In medium and large farms 100 per cent farmers carried out AI at farm premises. The overall picture revealed that 92.3, 4.6 and 2.9 per cent of farmers carried out AI at farm premises, ICDP centre and at veterinary hospital respectively.

Table 4.6.3.3 Details of Place where AI is done

Farm Type	Number / Per cent	Place of AI			Total
		Farm premises	ICDP centre	Vet. Hospital	
Small	Number	149	16	10	175
	Per cent	85.1%	9.1%	5.7%	100.0%
Medium	Number	100	0	0	100
	Per cent	100%	0.0%	0.0%	100.0%
Large	Number	75	0	0	75
	Per cent	100.0%	0.0%	0.0%	100.0%
Overall	Number	323	16	10	350
	Per cent	92.3%	4.6%	2.9%	100.0%

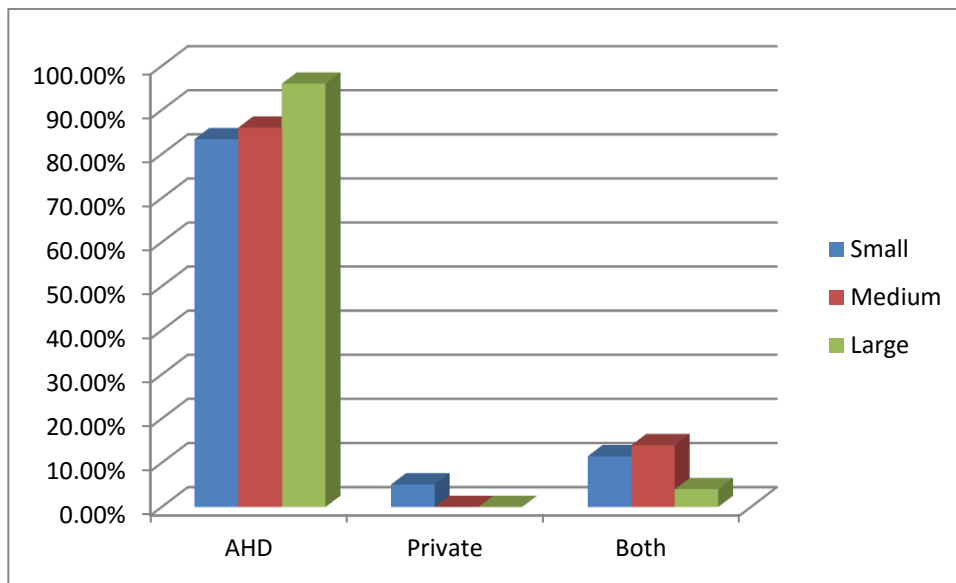


Fig. Agency providing AI service

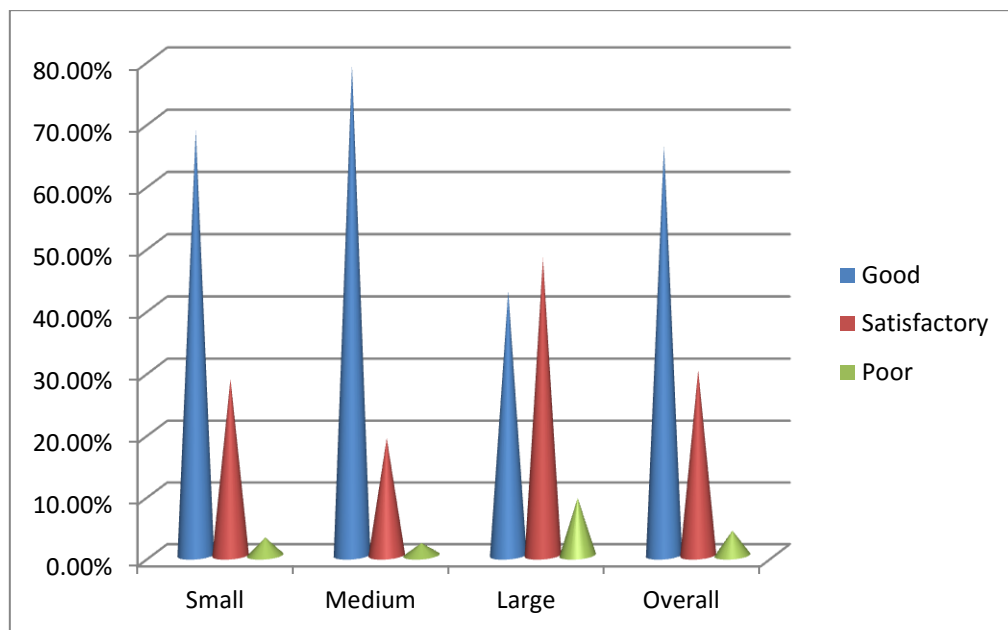


Figure 4.14 Farmers perception regarding the availability of AI service

4.6.3.3 Distance to AI centre

The details of distance to the nearest AI centre are presented in the table 4.6.3.3. The results showed that majority of the farmers were having AI centre within a distance of three kilometres from their farms.

Table 4.6.3.4 Distribution of farmers according to distance to AI centres

Farm Type	Distance to AI centre (km)									
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Small	4	15	36	40	6	15	8	15	0	5
	2.3%	8.6%	20.6%	22.9%	3.4%	8.6%	4.6%	8.6%	0.0%	2.9%
Medium	0	11	1	44	2	10	0	4	0	11
	0.0%	11.0%	1.0%	44.0%	2.0%	10.0%	0.0%	4.0%	0.0%	11.0%
Large	1	6	5	18	2	15	0	12	1	5
	1.3%	8.0%	6.7%	24.0%	2.7%	20.0%	0.0%	16.0%	1.3%	6.7%
Overall	5	32	42	102	10	40	8	31	1	21
	1.4%	9.1%	12.0%	29.1%	2.9%	11.4%	2.3%	8.9%	.3%	6.0%

4.6.3.5 Availability of AI services

Figure 4.14 presents the farmers perception regarding the availability of AI service. Majority of farmers had given ‘good’ response to availability of service in small and medium farms with respective values 68.6 and 79.0. In large farms 42.7, 48.0, 9.3 per cent of farmers described AI service availability as good, satisfactory and poor.

4.6.4 Milking

4.6.4.1 Method of milking

The details of method of milking followed in the farms are presented in Figure 4.15. Irrespective of farm size most of the farmers resorted to hand milking. In small farms 99.4 per cent followed hand milking. In medium farms 20.0, 79.0 and 1.0 per cent followed machine hand and combination of machine and hand milking. In large farms the comparative proportion of machine milking was more (44.0 per cent) but still 54.7 and 1.3 per cent followed hand milking and

combination of both. The overall results showed that 15.4, 84.0 and 0.6 per cent of the farms followed machine, hand and combination of both respectively.

4.6.4.2 Milker

Figure 4.16 presents the details of persons engaged in milking in the farms. Irrespective of the farm size, in majority of farms the farmers themselves were engaged in milking. In small, medium and large farms 97.1, 94.0 and 69.3 per cent were the proportion of farmers acting as milker. In small, medium and large farms 5.0, 6.0 and 28.0 per cent depended on a milker. The overall picture showed that 9.1, 90.3, and 0.6 per cent of the farms engaged milker, one self and both self and a milker in milking respectively.

4.6.4.3 Frequency of milking

The frequency of milking adopted in different farms is presented in the table 4.6.4.3. This showed that irrespective of farm size all the farmers followed two times milking daily.

Table 4.6.4.3 Distribution of the frequency of milking adopted in different farms

Farm type	Number / Per cent	Milking frequency
		2.0
Small	Number	175
	Per cent	100.0%
Medium	Number	100
	Per cent	100.0%
Large	Number	75
	Per cent	100.0%
Overall	Number	350
	Per cent	100.0%

4.6.4.4 Milking interval

Table 4.6.4.4 shows the milking interval followed in different farms. Irrespective of farm size, majority of the farms kept an interval of 8-12 hours between two milking. In small farms, 6.8 per cent of farmers gave only less than eight hours interval. In medium and large farms 4 and 1.3 per cent, of farmers milked their animals at an interval of less than eight hours.

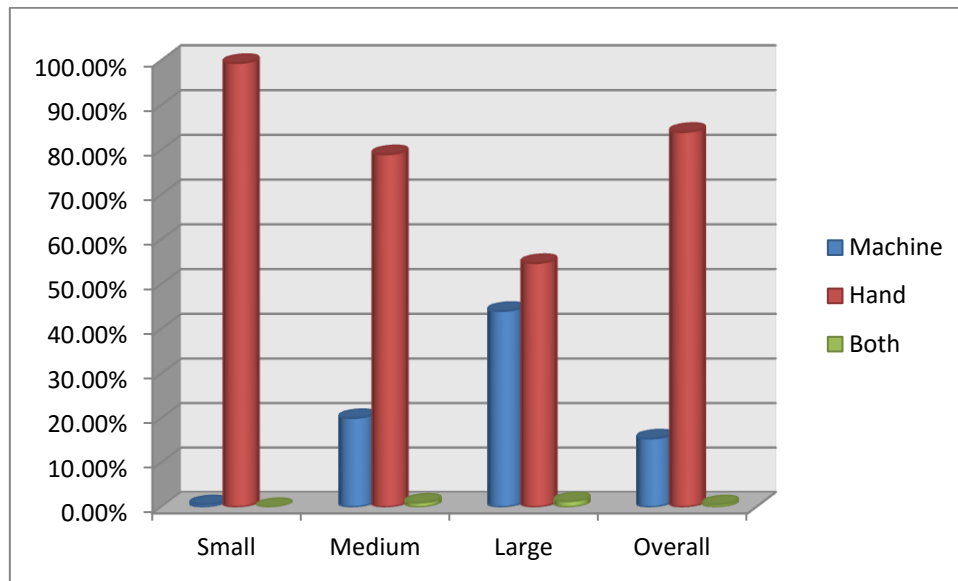


Figure 4.15 Details of method of milking followed in the farms

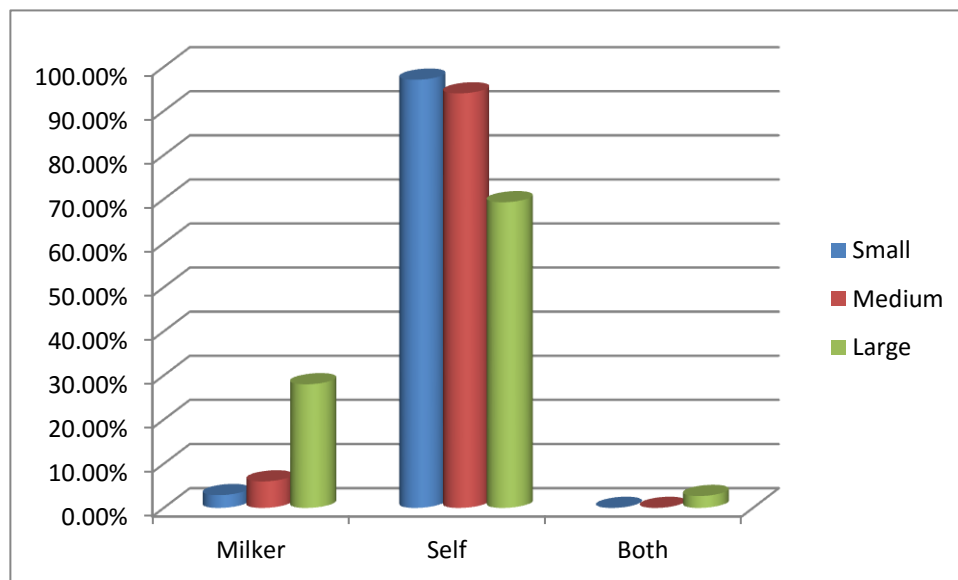


Fig.4.16 Details of the persons engaged in milking in the farms

Table 4.6.4.4 Distribution of farms on the basis of milking interval

Farm Type	No/ %	Milking interval (hrs)											
		6.5	7	7.5	8	8.5	9	9.5	10.0	10.5	11	11.5	12.0
Small	No	2	1	9	17	12	45	31	29	8	18	1	2
	%	1.1	.6	5.1	9.7	6.9	25.7	17.7	16.6	4.6	10.3	.6	1.1
Medium	No	0	3	1	5	3	25	7	28	8	15	1	4
	%	0.0	3.0	1.0	5.0	3.0	25.0	7.0	28.0	8.0	15.0	1.0	4.0
Large	No	0	0	1	3	0	5	3	54	2	4	1	1
	%	0.0	0.0	1.3	4.0	0.0	6.7	4.0	72.0	2.7	5.3	1.3	1.3
Overall	No	2	4	11	25	15	75	41	111	18	37	3	7
	%	0.6	1.1	3.1	7.1	4.3	21.4	11.7	31.7	5.1	10.6	0.9	2.0

4.6.5 Labour

4.6.5.1 Type of labour

The details of type of labour used in different farms are presented in Table 4.6.5.1. The small (99.4 per cent) and medium (70.9 per cent) farm types were dependent mainly on family labour. While in large farms, there was more (52.0 per cent) dependence on paid labour. The overall results showed that 75.7, 15.4 and 8.9 per cent of farms depended on family labour alone, paid labour alone and combination of both family and paid labour respectively.

Table 4.6.5.1 Details of type of labour used in dairy farms

Farm Size	Number / Per cent	Labour Type			Total
		Family	Paid	Both	
Small	Number	174	1	0	175
	Per cent	99.4%	.6%	0.0%	100.0%
Medium	Number	79	14	7	100
	Per cent	79.0%	14.0%	7.0%	100.0%
Large	Number	12	39	24	75
	Per cent	16.0%	52.0%	32.0%	100.0%
Overall	Number	265	54	31	350
	%	75.7%	15.4%	8.9%	100.0%

4.6.5.2 Source of labour

Table 4.6.5.3.2 presents the details of source of paid labour used in different farms. In small farms 99.4 per cent had not used any paid labour. In medium farms 74.0 per cent had no paid labour, while 20.8 and 5.2 per cent used labour from within state and from outside state respectively. In large farms 13.5 per cent had no paid labour use, but in 52.7 and 33.8 per cent, used labour both from inside and outside state. Large sized farms comparatively used labour from outside state compared to medium and small farms. The overall results indicated that 73.9, 17.2, 8.9 per cent of the farms used no paid labour, labour within state and labour from outside state respectively.

Table 4.6.5.2 Details of source of labour used in different farms.

Farm size	Number/ Per cent	Source of paid labourers			Total
		No paid labour	Within state	Outside state	
Small	Number	174	1	0	175
	Per cent	99.4%	.6%	0.0%	100.0%
Medium	Number	57	16	4	77
	Per cent	74.0%	20.8%	5.2%	100.0%
Large	Number	10	39	25	74
	Per cent	13.5%	52.7%	33.8%	100.0%
Overall	Number	241	56	29	326
	Per cent	73.9%	17.2%	8.9%	100.0%

4.6.5.3 Family labour

Table 4.6.5.3.1 presents the details of family labour utilization in farms. The results clearly showed more dependence of small and medium farms on family labour. Both male and female members were involved with a significant contribution from female labour.

The average family labour in hours per day in small farms (time for local grass collection not included) was 1.74, 3.55 in medium and 2.15 in large farms.

The male labour in hrs/day was 0.92, 2.03 and 1.24 respectively in small, medium and large farms. The respective values for female labour were 0.82, 1.52 and 0.9. The average family time spent for a milk animal (hrs/day) was 0.83, 0.58 and 0.14 in small medium and large farms respectively. The family time used for milch animals in the farms (hrs/day) was 1.46, 3.5 and 5.81 in small, medium and large farms respectively. The overall results revealed that 1.31, 1.04, 2.34, 0.61, 2.98 (hrs/day) was the average family labour time used by male, female ,by male and female both , per milk animal and for milch animals respectively.

Table 4.6.5.3.1 Distribution of family labour for farm activities (other than fodder collection)

Farm size	Family Labour (hr)				
	Male / day	Female/ day	Total / day	Time / milk animal /day	Time for milch animals /day
Small	0.92	0.82	1.74	0.83	1.46
Medium	2.03	1.52	3.55	0.588	3.5
Large	1.24	0.9	2.15	0.14	5.81
Overall	1.31	1.04	2.34	0.61	2.98

Table 4.6.5.3.2 gives the details of family labour used for collection of green grass in different farms. In small average family labour (hrs/day) rendered by male, female and both were 0.39, 0.64 and 1.04 respectively. In medium farms, the respective values were 0.41, 0.62 and 1.03. In large farms the same was 0.23, 0.17 and 0.41. The overall results were summarized as 0.36, 0.53 and 0.9 hrs/day was male, female and total family labour for collection of local green grass respectively.

4.6.5.3.2 Family Labour for collection of grass in different farms

Farm size	Family time for collection of grass(hrs/day)		
	Male	Female	Total
Small	0.39	0.64	1.04
Medium	0.41	0.62	1.03
Large	0.23	0.17	0.41
Overall	0.36	0.53	0.9

4.6.6 Waste management

The classification of farms based on waste management system is presented in the Table 4.6.6. In small farms 33.1, 45.1 and 21.7 per cent of farms were classified under poor, satisfactory and good waste management system. In medium farms, majority (58.0%) were with poor management system followed by medium (14.0 per cent) and good (28.0%). In large farms 61.3 per cent farms were having poor waste management system followed by 9.3 per cent as satisfactory and 29.3 per cent as good. The overall results showed that 46.3, 28.6 and 25.1 per cent of farms were classified as having poor satisfactory and good waste management system.

Table 4.6.6 Distribution of farms Based on the waste management system

Farm Type	Number / Per cent	Waste management system		
		Poor	Satisfactory	Good
Small	Number	58	79	38
	Per cent	33.1%	45.1%	21.7%
Medium	Number	58	14	28
	Per cent	58.0%	14.0%	28.0%
Large	Number	46	7	22
	Per cent	61.3%	9.3%	29.3%
Overall	Number	162	100	88
	Per cent	46.3%	28.6%	25.1%

4.6.7 Health care

4.6.7.1 Provider of veterinary services

Figure 4.17 shows the information regarding provision of veterinary services in the farms. The results showed that in all types of farms majority of farmers were dependent mainly on government veterinarian for the service. The respective values were 88.6, 96.0 and 96.0 per cent in small, medium and large farms respectively. In small farms 8.6 per cent sought the service of a private veterinarian. The overall picture revealed that 92.3, 4.9, 0.3, 1.1, 0.3 and 1.1 per

cent of farms depended on Government veterinarian, private veterinarian livestock inspector, self treatment, University and local person respectively for veterinary service.

4.6.7.2 Place of Veterinary service

Table 4.6.7.2 shows the details of place where animals are taken for treatment. In all types of farms majority of farmers carried out treatment in farm premises itself. The respective proportions were 66.3, 89.0 and 94.7 per cent in small, medium and large farms respectively. The overall picture revealed that 10.6, 78.9 and 10.6 per cent of farmers took their animals to hospital/consulted doctor at hospital, carried out treatment at farm premises and combination of both respectively.

Table 4.6.7.2 Details of place of veterinary service provision in the farms

Farm Type	Number / Per cent	Place of veterinary service		
		Hospital	Farm premises	Both
Small	Number	29	116	30
	Per cent	16.6%	66.3%	17.1%
Medium	Number	5	89	6
	Per cent	5.0%	89.0%	6.0%
Large	Number	3	71	1
	Per cent	4.0%	94.7%	1.3%
Overall	Number	37	276	37
	Per cent	10.6%	78.9%	10.6%

4.6.7.3 Distance to veterinary Hospital

Table 4.6.7.3 presents the details of distance to the nearest veterinary hospital. Irrespective of farm size, majority of the farms had presence of a veterinary hospital within a distance of five kilometres. In small, medium and large farms only 12.6, 16.0 and 13.3 per cent were having a veterinary hospital farther than five kilometres. The overall picture showed that 86.3 per cent of

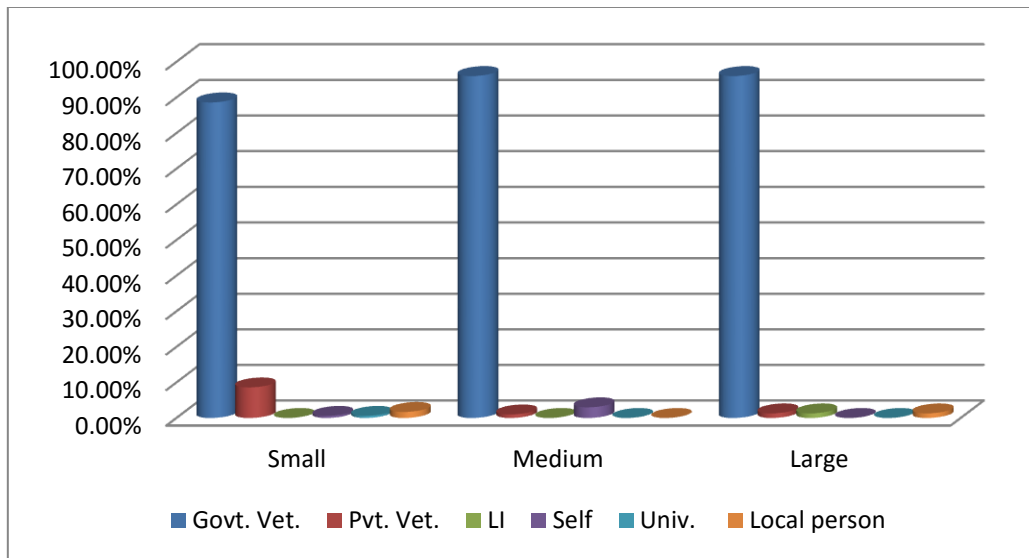


Figure 4.17 Details of veterinary service provider in different farms

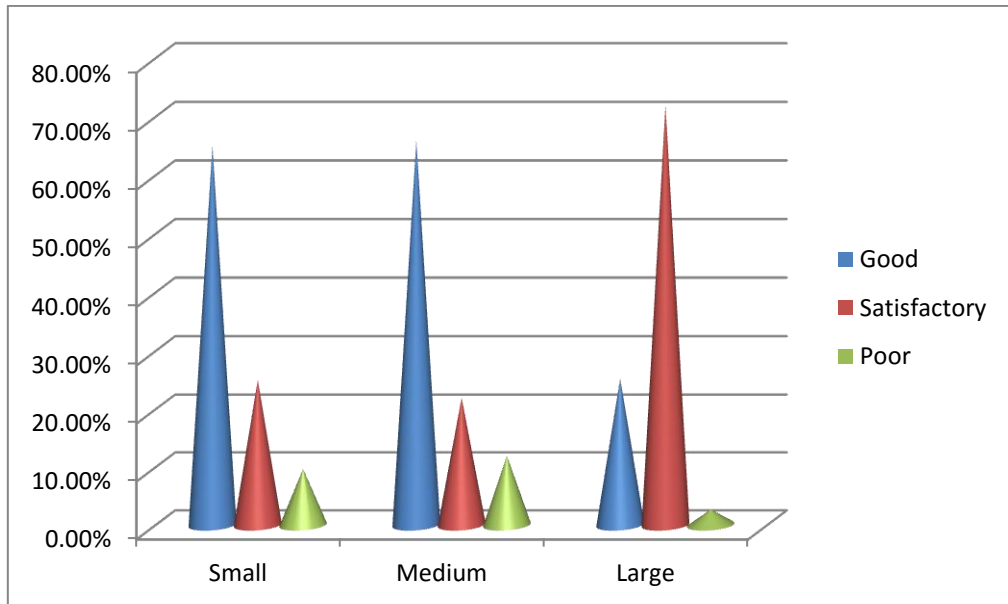


Figure 4.18 Farmers' perception regarding the availability of veterinary services

farms, were having a veterinary hospital within five kilometres and rest had a hospital at a distance more than five kilometers.

Table 4.6.7.3 Distribution of farmers based on distance to the nearest veterinary hospital

Farm Type	No / %	Distance to the nearest veterinary hospital(km)								
		.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	> 5 km
Small	No	4	7	15	19	14	32	25	31	22
	%	2.3%	4.0%	8.6%	10.9%	8.0%	18.3%	14.3%	17.7%	12.6%
Medium	No	0	33	1	7	0	8	14	19	16
	%	0.0%	33.0%	1.0%	7.0%	0.0%	8.0%	14.0%	19.0%	16.0%
Large	No	0	1	3	6	2	3	10	33	10
	%	0.0%	1.3%	4.0%	8.0%	2.7%	4.0%	13.3%	44.0%	13.3%
Overall	No	4	41	19	32	16	43	49	83	48
	%	1.1%	11.7%	5.4%	9.1%	4.6%	12.3%	14.0%	23.7%	13.7%

4.6.7.4 Availability of veterinary Services

The farmers' perception regarding the availability of veterinary services is presented in figure 4.18. Majority of farmers in small (65.1 per cent) and medium (66.0 per cent) expressed the service availability as good. In large farms, majority (72.0 per cent) expressed satisfaction on availability of veterinary service. In small, medium and large farms 9.7, 12.0 and 2.7 per cent voiced the service availability as poor. Overall picture showed that 56.9, 34.3 and 8.9 per cent expressed good satisfactory and poor response in case of availability of veterinary service.

4.7 EXTENT OF ADOPTION OF RECOMMENDED DAIRY FARMING PRACTICES

4.7.1 Adoption index

Table 4.7.1 shows adoption index of various management practices in different farms. The overall adoption score was highest (90.04 per cent) followed by medium (89.40 per cent) and small farms (84.36 per cent). The overall adoption index was 87.02 per cent. In small farms reproduction management

secured maximum (77.51 per cent) score and breeding, the least (39.74). In medium farm also the trends was same (77.51 and 44.3 per cent). In large farms 81.50 and 52.14 was maximum and minimum for reproduction and breeding management. The overall result showed that 43.74, 70.80, 53.82, 80.48, 54.92, 66.96 and 57.99 per cent were the adoption index values for breeding, housing, feeding, reproduction, milking, calf care and health practices respectively.

Table 4.7.1 Adoption index for various management practices under different farm sizes

Farm Type	Breeding	Housing	Feeding	Repdn	Milking	Calf care	Health	Overall Adoption Score
Small	39.74	66.33	52.89	77.51	52.26	67.20	58.57	84.36
Medium	44.43	72.40	53.40	84.90	58.22	67.77	59.89	89.40
Large	52.14	79.11	56.54	81.50	56.75	65.35	54.12	90.04
Overall	43.74	70.80	53.82	80.48	54.92	66.96	57.99	87.02

4.7.2 Adoption class

The classification of farms based on adoption level into classes is presented in Table 4.7.2. In all types of farms majority farms were in medium adoption class with 64.6, 68.0 and 70.7 per cent for small, medium and large farms respectively. In small, medium and large farms 23.4, 9.0 and 4.0 per cent belonged to low adoption class. The share of high adoption class was 12.0, 23.0 and 25.3 in small, medium and large farms respectively. The overall picture showed 15.1, 66.9 and 18.0 per cent were under low, medium and high adoption classes.

Table 4.7.2 Classification of farm households into adoption classes under different farm sizes.

Farm Type	Number / Per cent	Adoption class		
		Low	Medium	High
Small	Number	41	113	21
	Per cent	23.4%	64.6%	12.0%
Medium	Number	9	68	23
	Per cent	9.0%	68.0%	23.0%
Large	Number	3	53	19
	Per cent	4.0%	70.7%	25.3%
Overall	Number	53	234	63
	Per cent	15.1%	66.9%	18.0%

Mean: 87.01 SD: 9.29

4.7.3 Reason for non adoption

Table 4.7.3 shows the reasons perceived and ranked by the farmers as the reason for deviation from recommended practices. In all types of farms inadequate price for milk and high price of inputs were ranked first and second. Low demand for milk was not considered as a reason for any of the farmers in any farms

Table 4.7.3 Farmers' perception about the reason for deviation from recommended practices

Reason	Small		Medium		Large	
	Mean	Rank	Mean	Rank	Mean	Rank
Lack of Finance	3.02	3	3.65	3	3.82	4
Scarcity of Inputs	4.19	4	3.99	4	3.71	3
Inadequate price of milk	1.39	1	1	1	1	1
Low milk demand	0	0	0	0	0	0
Lack of Knowledge	4.59	5	4.29	5	5.4	6
Not commercial	5.13	6	8	7	7	7
High price of inputs	2.5	2	2	2	2	2
Lack of resources	5.73	7	5.99	6	5.03	5

4.8 REPRODUCTION AND PRODUCTION PARAMETERS

4.8.1 Reproduction

The details of some of the production and reproduction parameters are presented in table 4.8.1. The average peak yield in small farms ranged from 6 to 40 litres/ day, with an average 14.63 litres/day. In medium farms the range was 5-35 litres/day (average 14.80 litres/ day). In large farms the range and average was 6-40 and 18.64 litres/ day. The average peak yield was highest in large farms (18.64 litres/day) followed by medium (14.80 litres/day) and small farms (14.63 litres/day). The average lactation yield predicted from peak yield was 3152.14, 3189.15 and 4016.47 litres in small, medium and large farms respectively. The lactation yield predicted from test day milk yield was 2608.63, 2901.37 and 3219.50 litres in small, medium and large farms respectively. The average service period (days) was 190.65, 170.64 and 128.53 in small, medium and large farms respectively. The number of inseminations required was 2.29, 1.96 and 1.80 in small, medium and large farms respectively.

The inter calving period was 470.95, 450.64 and 408.53 days in small, medium and large farms respectively. The age at first successful service was 21.71, 23.87 and 19.23 months in small, medium and large farms. The number of AI required for first successful conception was 1.82, 2.08 and 2 in different farms respectively. The age at first calving was 30.71, 32.87 and 28.23 months in small, medium and large farms respectively.

4.8.2 Milk production

The details of milk production and production of the farms are presented in Table 4.8.2. The wet average (litres/day) was 8.98, 8.00 and 10.00 in small, medium and large farms respectively. The dry average (litres/day) was 8.13, 6.65 and 7.86 in small, medium and large farms respectively.

Table 4.8.1 Production and reproduction parameters

Parameters	Small			Medium			Large		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Peak yield (l/day)	6	40	14.63 (176)	5	35	14.80 (173)	6	40	18.64 (115)
Lactation yield 1(l)	1293	8620	3152.14 (176)	1078	7543	3189.15 (173)	1293	8620	4016.47 (115)
Lactation yield 2 (l)	0	6012	2608.63 (175)	0	6178	2901.37 (104)	1649	5723	3219.50 (36)
Service period (days)	0	1050	190.95 (130)	0	446	170.64 (74)	60	303	128.53 (33)
No. Of inseminations	0	10	2.29 (130)	0	5	1.96 (74)	1	3	1.80 (33)
Intercalving period(days)	340	1330	470.95 (130)	280	726	450.64 (74)	340	583	408.53 (33)
Age at first successful service (months)	12	39	21.71 (44)	15	46	23.87 (36)	12	42	19.23 (12)
Number of AI	1	5	1.82 (44)	1	7	2.08 (36)	1	6	2 (12)
Age at first calving (months)	21	48	30.71 (44)	24	55	32.87 (36)	21	51	28.23 (12)
Lactation yield 1- Predicted from peak yield Lactation yield 2 - Predicted from test day yield.						Figures in parenthesis indicate number of samples			

Table 4.8.2 Details of milk production under different farm sizes (litres/day)

Farm size	Morning	Evening	Total	Wet Average	Dry Average
Small	8.07	4.68	12.75	8.98	8.13
Medium	23.04	13.51	36.54	8.00	6.65
Large	96.60	67.83	164.43	10.00	7.86
Overall	31.32	20.73	52.05	8.92	7.65

4.8.3 Quality and price of milk

Table 4.8.3 shows the details of average fat, solids-not-fat (SNF) and price realized per litre from the cooperative society. The results showed that the

average fat content of morning milk was 3.89, 3.95 and 3.79 per cent in small, medium and large farms respectively. The average fat content of evening milk was 3.70, 4.31 and 4.45 per cent in respective farms. The average SNF content of morning milk was 8.14, 8.20 and 8.13 in small, medium and large farms respectively. The average SNF content of evening milk was 6.59, 7.62 and 8.04. The price realized in the morning was Rs. 29.26, Rs. 29.60 and Rs. 29.64 in small, medium and large farms respectively. The average price of evening milk was respectively Rs.24.65, Rs.29.13 and Rs.29.97. The average price/ litre of milk was Rs.29.43, Rs.29.79 and Rs.29.93 in daily basis in small, medium and large farms respectively. The overall values for the above parameters were 3.88 %, 4.04 %, 8.16 %, and 7.20 %, Rs.29.44, Rs.27.07 and Rs.29.64 respectively.

Table 4.8.3 Details of quality and price of milk obtained from society

Farm size	FAT % (AM)	FAT % (PM)	SNF % (AM)	SNF % (PM)	Price –Rs. (AM)	Price-Rs (PM)	Av. Price (Rs)
Small	3.89	3.70	8.14	6.59	29.26	24.65	29.43
Medium	3.95	4.31	8.20	7.62	29.60	29.13	29.79
Large	3.79	4.45	8.13	8.04	29.64	29.97	29.93
Total	3.88	4.04	8.16	7.20	29.44	27.07	29.64

4.8.4 Productivity of animals under different agro-climatic zones and farming systems

The details of productivity of animals under different agro-climatic zones are presented in Figure 4.19. The highest wet average was noticed in high ranges (10.29 l/day) and lowest in north zone (7.48 l/day). The wet average of animals in south, central, problem zone and overall were 8.29, 9.36, 9.91 and 8.92 l/day respectively. The dry average in different agro-climatic zones was 7.41, 8.56, 6.42, 8.98, 8.5 and 7.65 in south, central, north, problem zone, high range and overall respectively. The dry average was highest in problem zone and lowest in north zone.

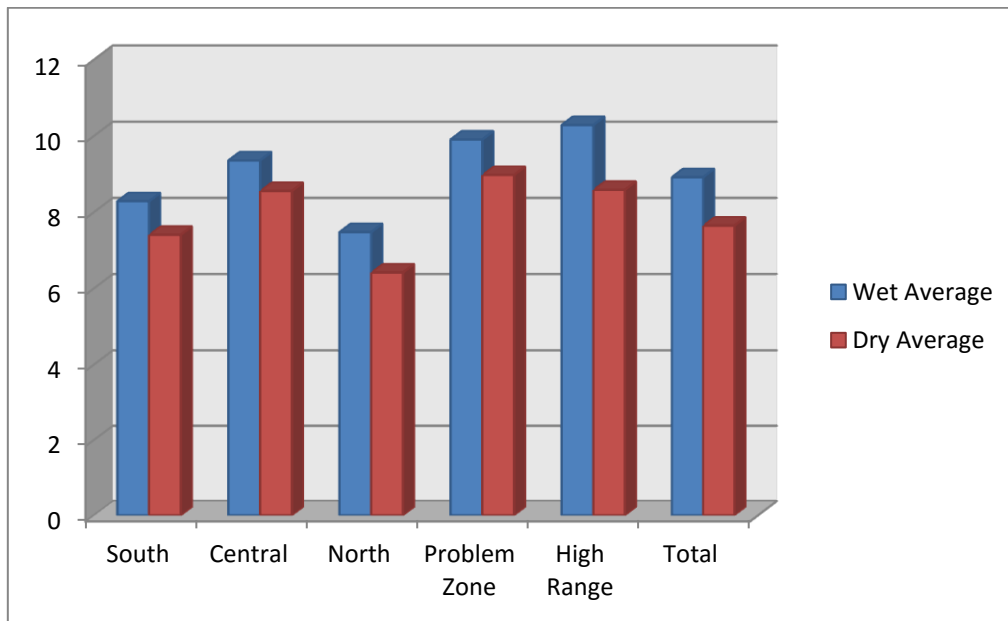


Figure 4.19 Details of average milk production (l/day) in different zones

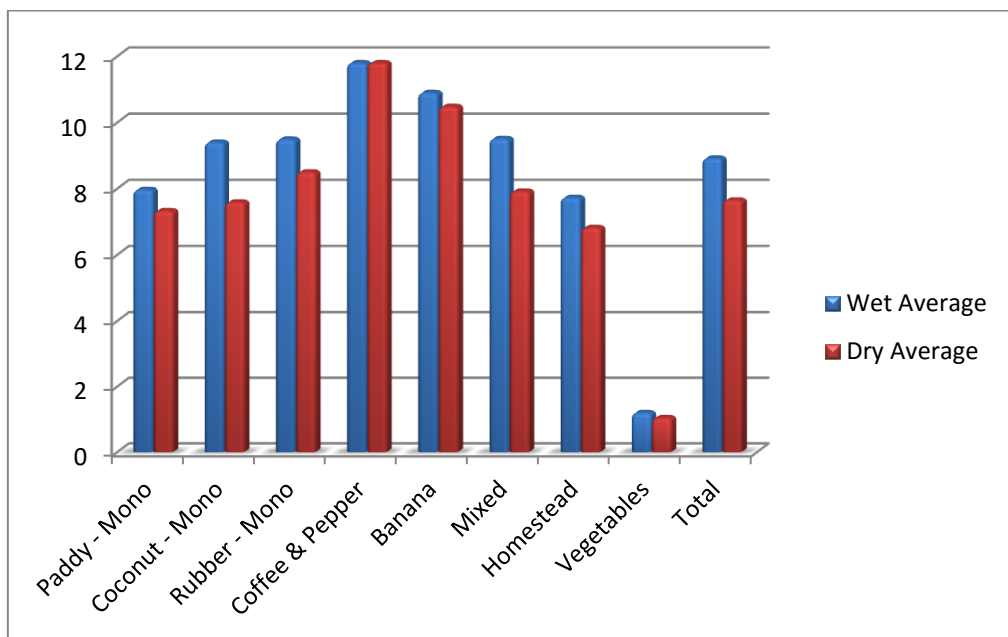


Figure 4.20 Details of average milk production (l/day) in different cropping systems

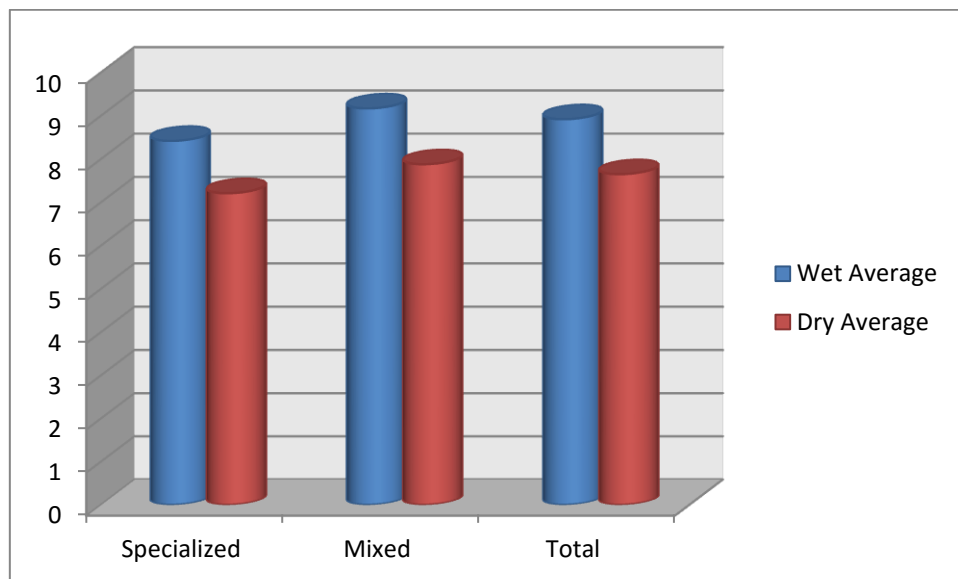


Figure 4.21 Average milk production in different income groups

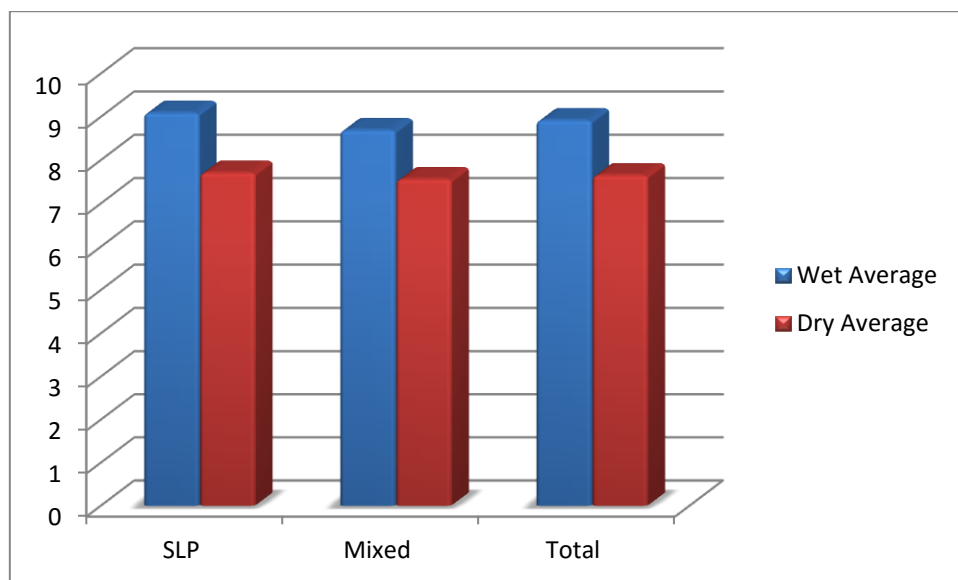


Figure 4.22 Average milk productions in different dry matter groups

The details of wet and dry average of milk production of animals in farming systems based on cropping system or major crop are presented in Figure 4.20. The wet average was highest (11.80) in farming system with coffee and pepper as the major crop. It was lowest in homestead farming system. The dry average was also highest (11.80) in coffee and pepper system and lowest in homestead system.

Figure 4.21 gives the details of wet and dry average in farming systems based on income. The wet (9.17 l/day) and dry average (7.88 l/day) was highest in mixed farming system.

Figure 4.22 details of average milk production in farming systems based on income

Table 4.8.4.4 gives the details of average milk production in farming systems based on dry matter. The wet average (9.09 l/day) and dry average (7.71 l/day) was highest in SLP system.

Table 4.8.4.4 Details of average milk production in farming systems based on dry matter

Farming system	Wet Average(l/day)	Dry Average (l/day)
SLP	9.09	7.71
Mixed	8.69	7.56
Overall	8.92	7.65

4.9 MARKETING AND DISPOSAL PATTERN

4.9.1 Disposal pattern of milk

The details of disposal pattern of milk are presented in the Table 4.9.1. The major share of milk produced in small, medium and large farms were sold to society. The respective values were 77.73, 81.83 and 84.76 per cent respectively. The share of direct selling in small, medium and large farms was 11.76, 13.14 and 13.41 per cent respectively. The share of house consumption was highest (10.43 per cent) in small farms followed by medium (5.06 per cent) and large farms (1.59

per cent). The overall disposal pattern was observed as 83.3 (society), 13.16 (direct) and 3.36 (home) per cent respectively.

Table 4.9.1 Disposal pattern of milk

Farm size	Total Production l/d	Quantity sold to society - Total	%	direct selling	%	home consumption	%
Small	12.75	9.91	77.73	1.5	11.76	1.33	10.43
Medium	36.54	29.9	81.83	4.8	13.14	1.85	5.06
Large	164.43	139.37	84.76	22.05	13.41	2.61	1.59
Overall	52.05	43.36	83.3	6.85	13.16	1.75	3.36

4.9.2 Marketing

4.9.2.1 Agency for marketing

Figure 4.23 gives the details of the agency for marketing of milk. In all farms major share of milk was sold to society. In small farms (72.6 per cent) medium farm (70.0 per cent) and large farms (85.3 per cent) was the share of milk sold to society. In small, medium and large farms 17.7, 26.0 and 14.7 per cent sold milk to neighbours respectively. The sale to hotels, society and neighbours, neighbours and hotel were in small or negligible proportion in all farms. The overall result showed that 74.6, 19.4, 2.6, 1.4, 1.7 per cent of milk was sold to society, only neighbours, hotels, both society and neighbours, and both neighbours and hotels respectively.

4.9.2.2 Distance to the society

Table 4.9.2.2 shows the average distance from the farms to society. The average distance from farm to society (km) was 1.08, 1.62, 2.67 and 1.58 in small, medium, large and overall farms respectively.

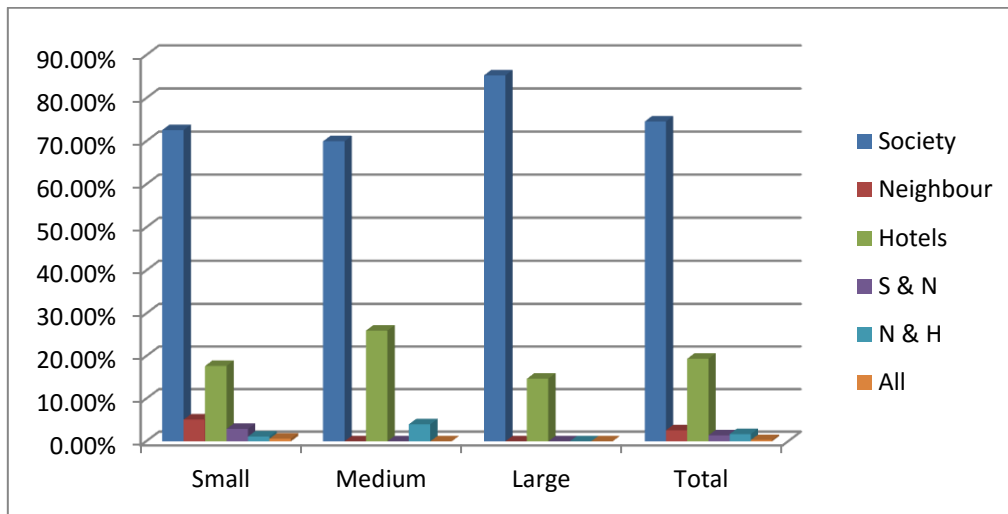


Figure 4.23 Marketing pattern of milk

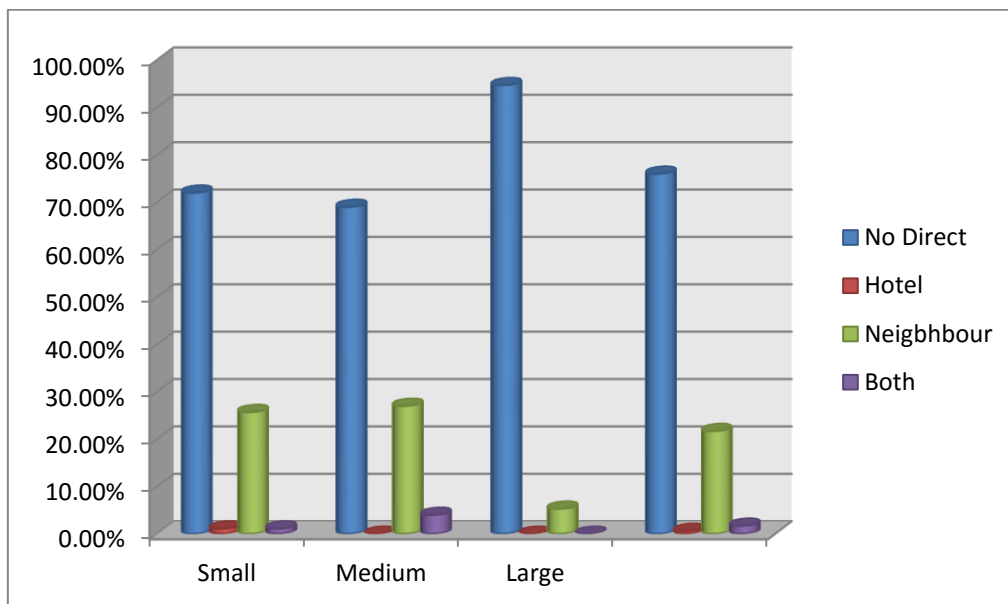


Figure 4.24 Disposal channel of directly sold milk

Table 4.9.2.2 Distance to the cooperative society

Farm size	Small	Medium	Large	Overall
Distance (km)	1.08	1.62	2.67	1.58

4.9.2.3 Mode of transport to market

Table 4.9.2.3 gives the details of the mode of transport to the society. In small farms, majority (78.9) per cent reached society on foot. In medium farms the major mode of transport was two-wheeler (64.0 per cent). In large farms also major mode was by two wheelers (70.7 per cent) followed by auto rickshaw (20.0 per cent). The overall result showed that 46.0, 39.7, 7.4, 0.9, 2.3 and 0.3 per cent used walk, two-wheeler, auto-rickshaw, milk vendor, bi-cycle and other vehicles for transporting milk.

Table 4.9.2.3 Mode of transport to market

Farm Type	Number / Per cent	MODE OF TRANSPORT					
		Walk	Two - wheeler	Auto - rickshaw	Vendor	Bi-cycle	Other vehicles
Small	Number	138	22	1	1	8	0
	Per cent	78.9%	12.6%	0.6%	0.6%	4.6%	0.0%
Medium	Number	21	64	10	2	0	0
	Per cent	21.0%	64.0%	10.0%	2.0%	0.0%	0.0%
Large	Number	2	53	15	0	0	1
	Per cent	2.7%	70.7%	20.0%	0.0%	0.0%	1.3%
Overall	Number	161	139	26	3	8	1
	Per cent	46.0%	39.7%	7.4%	0.9%	2.3%	0.3%

4.9.2.4 Selection of marketing channel (Reason)

Table 4.9.2.4 gives the reason for selecting a marketing channel by the farmers. The reason for selecting society as channel became only society was

available and direct marketing channels were absent. Direct marketing channels were selected because of the higher price realised.

Table 4.9.2.4 Details of reason for selecting a particular marketing agency

Farm Type	Number / Per cent	Reason	
		Only society available	High price
Small	Number	120	53
	Per cent	68.6%	30.3%
Medium	Number	68	29
	Per cent	68.0%	29.0%
Large	Number	69	6
	Per cent	92.0%	8.0%
Overall	Number	257	88
	Per cent	73.4%	25.1%

4.9.2.5 Agency for Direct sale

Figure 4.24 presents the details of agency used for direct sale of milk. In small, medium and large farms 72.0, 69.0 and 94.7 per cent of farmers were not having any direct sale of milk. The neighbours were the major target for direct sale in all types of farms. The sale to hotels and others were very few or negligible in all the farms. The overall result showed that 76.0, 0.6, 21.7 and 1.7 per cent was without direct sale, to hotels, neighbours and both hotels and neighbours respectively.

4.10 ROLE OF CO-OPERATIVES DAIRYING

4.10.1 Perceived benefits of participation in dairy co-operatives

The perceived benefits by the farmers regarding participation in co-operative societies are presented in Table 4.10.1. Irrespective of the farm size guaranteed market was the main benefit cited by the farmers.

Table 4.10.2 presents the complaints raised by the farmers regarding working of societies. The lower price realised for milk and low fat and SNF was the major complaints ranked as first and second by all types of farms.

Table 4.10.1 Farmers' perception regarding benefits of society (Ranking)

Parameter	Small		Medium		Large		Overall	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Guaranteed Market	3	1	3	1	3	1	3	1
Input purchase on credit	2.5	2	2.2	3	2.3	2	2.4	2
Assured supply of inputs	1.8	4	2.3	2	2	3	2	3
Personal relations	2	3	2.2	4	1.5	5	1.9	4
Bonus	1.5	7	2.1	5	1.6	4	1.7	5
Extension services	1.8	5	1.8	6	1.3	7	1.7	6
Less transaction cost	1.4	8	1.2	9	1.5	6	1.4	7
Availability of credit	1.7	6	1	10	1	10	1.3	8
AI Services	1.3	9	1.4	8	1.1	8	1.3	9
Others	0.8	11	1.5	7	1	9	1.1	10
Veterinary Services	1.1	10	1	11	1	11	1	11

4.10.2 Complaints regarding functioning of societies

Table 4.10.2 Complaints of farmers regarding functioning of DCS

Parameters	Small		Medium		Large		Overall	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Lower price of milk	2.9	1	3.0	1	3.0	1	3.0	1
No credit availability	2.3	2	2.9	2	2.0	3	2.4	2
Fat and SNF incorrect	2.1	3	2.1	4	2.5	2	2.1	3
No provision of input service	1.2	4	2.1	3	1.7	4	1.6	4
Defective weighing	1.1	5	1.5	5	1.3	5	1.3	5
Timing of collection	1.0	8	1.3	6	1.1	6	1.1	6
Lack of Bonus	1.0	6	1.0	7	1.0	7	1.0	7
Irregular payments	1.0	7	1.0	8	1.0	8	1.0	8
Others	0.7	9	0.7	9	1.0	9	0.8	9

4.11 INSTITUTIONAL ASSISTANCE

4.11.1 Level of assistance

The classification of farmers based on the extent of assistance (both fixed and recurring) received from government and other agencies. The results showed that medium level of assistance was received by all types of farms. In small farms the proportion of farmers received low, medium and high assistance was 20.0, 73.7 and 6.3 per cent respectively. In medium farms the level of assistance was 9.0, 76.0 and 15.0 per cent at low, medium and high level respectively. In large farms the respective values were 1.3, 80.0 and 18.7 per cent. The overall picture showed that 12.9, 75.7 and 11.4 per cent of farmers received low, medium and high level of assistance for dairying.

Table 4.11.1 Distribution of farmers into assistance classes based on level of assistance

Farm Type	Number / Per cent	Level of Assistance		
		Low	Medium	High
Small	Number	35	129	11
	Per cent	20.0%	73.7%	6.3%
Medium	Number	9	76	15
	Per cent	9.0%	76.0%	15.0%
Large	Number	1	60	14
	Per cent	1.3%	80.0%	18.7%
Total	Number	45	265	40
	Per cent	12.9%	75.7%	11.4%

4.11.2 Impact of level assistance on adoption of better management

The impact of level of assistance on adoption of better management is presented in the Table 4.11.2. The chi-square analysis revealed a significant association between revealed a significant association between adoption class and assistance class. In low adoption class 41.5 and 56.6 per cent of farms were in low and medium assistance class. In medium adoption class 81.2 and 10.3 per

cent were medium and high assisted farmers. In high adoption class 4.8, 71.4 and 23.8 per cent were in low, medium and high assistance classes.

Table 4.11.2 Impact of assistance on adoption score of farmers

Assistance class	Number and % within adoption class	Adoption class			Overall
		Low	Medium	High	
Low	Number	22 _a	20 _b	3 _b	45
	Per cent	41.5%	8.5%	4.8%	12.9%
Per cent	Number	30 _a	190 _b	45 _{a, b}	265
	Per cent	56.6%	81.2%	71.4%	75.7%
High	Number	1 _a	24 _a	15 _b	40
	Per cent	1.9%	10.3%	23.8%	11.4%

Numbers with different subscripts differ significantly

4.11.3 Farmers' perception regarding assistance

The farmers' perception regarding assistance is presented in Table 4.11.3. In small, medium and large farms 80.0, 73.0 and 70.7 per cent expressed very low satisfaction level regarding institutional assistance. In small, medium and large farms only 2.9, 8.0 and 5.3 per cent expressed fair satisfaction levels regarding assistance for dairying. The overall picture showed that 76.0, 19.1 and 4.9 per cent of farmers expressed very low, low and fair level of satisfaction respectively.

Table 4.11.3 Farmers perception regarding institutional assistance

Farm size	Number and per cent	Degree of satisfaction		
		Very low	Low	Fair
Small	Number	140	30	5
	Per cent	80.0%	17.1%	2.9%
Medium	Number	73	19	8
	Per cent	73.0%	19.0%	8.0%
Large	Number	53	18	4
	Per cent	70.7%	24.0%	5.3%
Overall	Number	266	67	17
	Per cent	76.0%	19.1%	4.9%

4.11.4 Farmers' perception of areas where government can assist

The farmers' perception regarding the area where government can help as ranked by the farmers is given in Table 4.11.4. In all farm types provision of subsidy for feed was the first demand raised by the farmers followed by increased rate of milk.

Table 4.11.4 Farmers' perception regarding the areas where government can interfere (Ranking)

Farm size	Small		Medium		Large	
Area	Score	Rank	Score	Rank	Score	Rank
Feed Subsidy	1.086	1.000	1.131	1.000	1.027	1.000
Rate of milk	1.971	2.000	1.929	2.000	2.000	2.000
Greed Fodder	3.840	3.000	3.848	3.000	5.000	5.000
Others	4.000	4.000	4.080	4.000	3.947	4.000
Finance	4.909	5.000	5.040	5.000	2.973	3.000
Quality of feed	5.131	6.000	7.330	8.000	7.000	7.000
Veterinary Service	5.217	7.000	6.060	7.000	7.973	8.000
Medicine	5.320	8.000	5.220	6.000	5.987	6.000
Training	7.160	9.000	7.606	9.000	9.000	9.000

4.12 DAIRY FARM PERFORMANCE

The 4.12.1 presents the Capacity Utilisation Index (CUI) in different farms. In small farms majority of the farmers (44.0 per cent) utilised only 26 to 50 per cent of the capacity whereas the proportion who used 75 to 100 per cent of the total capacity was 35 per cent. In medium farms majority (52.0 per cent) utilized 75 to 100 per cent of the total. In large farms 42.7 and 41.3 utilised 51 to 75 and 75 to 100 per cent of their total capacity.

4.12.1 Capacity Utilization Index (CUI)

Table 4.12.1 Classification of farmers based on capacity utilization index

Farm type	Number & Per cent	Capacity utilization index %				Total
		0-25	26-50	51-75	75-100	
Small	Number	18	77	45	35	175
	Per cent	10.3%	44.0%	25.7%	20.0%	100.0%
Medium	Number	0	19	29	52	100
	Per cent	0.0%	19.0%	29.0%	52.0%	100.0%
Large	Number	0	12	32	31	75
	Per cent	0.0%	16.0%	42.7%	41.3%	100.0%

4.12.2 Perceived profitability of the enterprise

The perceived profitability of the enterprise by the farmers is presented in Table 4.12.2. In small, medium and large farms, 76.0, 84.0 and 92.0 per cent perceived their profitability as somewhat profitable, while 21.7, 7 and 6.7 per cent of farmers in small, medium and large farms respectively expressed it as high loss only 2.3, 9.0 and 1.3 per cent of respective farms viewed it as more profitable.

Table 4.12.2 Classification based on perceived profitability of the enterprise

Farm type	Number & Percent	Perceived profitability				
		Very high loss	High loss	Somewhat profitable	More profitable	Most profitable
Small	Number	0	38	13	4	0
	Per cent		21.7%	76.0%	2.3%	
Medium	Number	0	7	84	9	0
	Per cent		7.0%	84.0%	9.0%	
Large	Number	0	5	69	1	0
	Per cent		6.7%	92.0%	1.3%	

4.12.3 Livestock Production Index

Table 4.12.3 presents the livestock production index under different farm sizes. The mean values were 0.88, 1.01 and 1.24 in small, medium and large farms respectively.

Table 4.12.3 Livestock production index under different farm sizes

Farm type	Mean
Small	0.8846
Medium	1.0145
Large	1.2497

4.12.4 Dairy Farm Production Index (DFPI)

The classification of farms based on – dairy farm performance index is presented in Table 4.12.4. In all farm types, farms showed medium dairy farm performance. The respective values in small, medium and large farms were 54.3, 56.0 and 45.3 per cent. Low dairy farm performance was shown by 32.0, 5.0 and zero per cent of small, medium and large farms. High performance was shown by 13.7, 39.0 and 54.7 per cent of the small, medium and large farms respectively.

Table 4.12.4 Classification of farmers based on dairy farm performance

Farm type	Number & Per cent	Dairy farm performance			Total
		Low	Medium	High	
Small	Number	56	95	24	175
	Per cent	32.0%	54.3%	13.7%	100.0%
Medium	Number	5	56	39	100
	Per cent	5.0%	56.0%	39.0%	100.0%
Large	Number	0	34	41	75
	Per cent	0.0%	45.3%	54.7%	100.0%

4.13 CONSTRAINTS EXPRESSED BY THE FARMERS

4.13.1 Feeding constraints

Table 4.13.1 presents the constraints expressed by the farmers regarding feeding of dairy animals. Each constraint was given a within group rank and an overall rank after considering all problems in different types of farms. In feeding, in all types of farms high price of concentrate feed was the major constraint. The non availability of green fodder and price of paddy straw were the other major constraints in feeding as expressed by farmers.

4.13.2 Breeding constraints

Table 4.13.2 presents constraints in breeding as expressed by the farmers. In all types of farmers, infertility was the major constraint.

4.13.3 Animal health constraints

Table 4.13.3 shows animal health care constraints as perceived by the farmers. In small farms diseases was cited as the major constraint while in medium and large farms, high cost of veterinary medicine was the major constraint.

4.13.4 Policy, social and finance related constraints

Table 4.13.4 presents the policy, social and finance related issues raised by the farmers. Low price for milk was ranked first in all types of farms and raised as the overall major constraint.

4.13.5 Marketing constraints

Table 4.13.5 shows constraints regarding marketing of milk in the farms. Inadequate price from society and low fat and SNF in milk were ranked first and second in this category. The non-availability of market for milk was not at all a concern for any farms in any seasons.

Table 4.13.1 Feeding Constraints

Small farms				Medium farms				Large farms				Overall			
Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group
1	Price of Concentrate feed	2.977	1	4	Price of Concentrate feed	2.98	1	8	Price of concentrate feed	2.96	1	5	Price of Concentrate feed	2.851	1
11	Green fodder availability	2.24	2	15	Price of Paddy Straw	2.74	2	25	Green fodder availability	1.733	2	15	Price of Paddy Straw	2.08	2
13	Price of Paddy Straw	2.177	3	19	Quality of feed	2.67	3	27	Price of Paddy Straw	1.547	3	19	Quality of feed	1.653	3
18	No grazing land	1.829	4	20	No grazing land	2.63	4	31	No grazing land	1.253	4	20	No grazing land	1.671	4
25	lack of knowledge in ration balancing	1.617	5	22	Green fodder availability	2.51	5	35	Dry Fodder	1.027	5	22	Green fodder availability	1.751	5
26	Quality of feed	1.617	6	36	Dry Fodder availability	1.23	6	36	lack of knowledge in ration	1.027	6	36	Dry Fodder availability	1.418	6
30	Dry Fodder availability	1.451	7	43	Lack of knowledge in ration balancing	1	7	38	Quality of feed	1.013	7	43	lack of knowledge in ration balancing	1.017	7

Table 4.13.2. Breeding Constraints

Small farms				Medium farms				Large farms				Overall			
Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group
7	Infertility	2.611	1	11	Infertility	2.880	1	12	Infertility	2.773	1	11	Infertility	2.431	1
31	Distant location of AI centre	1.429	2	35	Non availability of AI service in time	2.880	2	14	Distant location of AI centre	2.453	2	35	Non availability of AI service in time	1.683	2
34	Non availability of AI service in time	1.406	3	37	Distant location of AI centre	1.190	3	22	Calving problems	1.987	3	37	Distant location of AI centre	2.029	3
40	Cost of AI	1.166	4	42	Calving problems	1.010	4	24	Non availability of AI service in time	1.893	4	42	Calving problems	1.494	4
41	Calving problems	1.057	5	44	Cost of AI	1.000	5	37	Cost of AI	1.027	5	44	Cost of AI	1.023	5

Table 4.13.3 Animal health constraints

Small farms				Medium farms				Large farms				Overall			
Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group
15	Diseases	1.971	1	6	High cost of medicine	2.940	1	3	High cost of medicine	3.000	1	6	High cost of medicine	2.797	1
17	High cost of medicine	1.857	2	13	High cost of veterinary service	2.940	2	18	High cost of veterinary service	2.187	2	13	High cost of veterinary services	2.340	2
24	High cost of veterinary services	1.623	3	18	Diseases	2.670	3	26	Disease	1.707	3	18	Disease	2.031	3
27	Distant location of vet. Hospital	1.589	4	23	Non availability of vet. service in time	2.030	4	33	Lack of knowledge about diseases	1.027	4	23	Non availability of veterinary service in	1.811	4
32	Lack of knowledge about diseases	1.423	5	30	Lack of knowledge about diseases	1.820	5	39	Distant location of vet. hosp.	1.013	5	30	Lack of knowledge about diseases	1.297	5
33	Outbreak of diseases	1.417	6	33	Outbreak of diseases	1.720	6	40	Outbreak of diseases	1.013	6	33	Outbreak of diseases	1.417	6
38	Non availability of veterinary service in time	1.263	7	39	Distant location of vet. Hospital	1.020	7	41	Non availability of veterinary service in time	1.000	7	39	Distant location of vet. Hospital	1.417	7
43	Non availability of vaccine in time	1.023	8	45	Non availability of vaccine in time	1.000	8	45	Non availability of vaccine in time	1.000	8	45	Non availability of vaccine in time	1.000	8

Table 4.13.4 Policy, social and finance related constraints

Small farms				Medium farms				Large farms				Overall			
Overall Rank	Constraint	Mean	Rank with In group	Overall Rank	Constraint	Mean	Rank With in group	Overall Rank	Constraint	Mean	Rank with in group	Overall Rank	Constraint	Mean	Rank with in group
14	Change in cropping pattern	1.98	8	14	Low social participation	2.76	8	13	High Labour cost	2.733	8	14	Family health	2.361	8
16	Climate change	1.87	9	16	Land shortage for fodder	2.72	9	15	High Interest rates	2.307	9	16	Lack of credit	2.249	9
19	Non avail. of family labour	1.83	10	17	Lack of credit	2.69	10	16	Non avail. of hired labour	2.253	10	17	Non avail. of family labour	2.163	10
20	Lack of training and knowledge	1.82	11	21	Family health	2.53	11	17	Lack of credit	2.240	11	20	Non avail. of hired labour	2.110	11
21	Non avail. of quality animals	1.79	12	24	Non avail. Of hired labour	2.02	12	19	Waste management	2.067	12	21	Low social participation	1.963	12
22	Lack of Interest of young generation	1.78	13	25	Policy to purchase animals from outside states	2.01	13	20	Socio-psychological constraints	2.013	13	24	Land shortage for fodder	1.926	13

23	Family health	1.75	14	26	Climate change	1.960	14	21	Land shortage for fodder	2.000	14	25	Climate change	1.849	14
28	Waste management	1.52	15	27	Change in cropping pattern	1.920	15	23	Low social participation	1.987	15	27	Waste management	1.654	15
29	Lack of credit	1.5	16	28	Lack of mechanisation	1.900	16	28	Policy to purchase animals from	1.493	16	28	Lack of training and knowledge	1.503	16
35	Non avail. Of hired labour	1.4	17	29	Non avail. Of family labour	1.830	17	29	Climate change	1.293	17	29	Socio-psychological constraints	1.486	17
36	Socio-psychological constraints	1.38	18	31	Socio-psychological constraints	1.780	18	30	Lack of training and knowledg	1.267	18	31	Outside state purchase	1.414	18
37	High Labour cost	1.34	19	32	Lack of training and knowledge	1.730	19	31	Change in cropping pattern	1.253	19	32	Lack of Interest of young generation	1.394	19
39	Policy to purchase animals from outside states	1.25	20	34	Lack of Interest of young generation	1.710	20	32	Lack of mechanisation	1.040	20	34	Lack of mechanisation	1.317	20
42	Lack of mechanisation	1.05	21	38	Waste management	1.170	21	34	Lack of Interest of young generation	1.027	21	38	Change in cropping pattern	1.300	21

Table 4.13.5 Marketing constraints

Small farms				Medium farms				Large farms				Overall			
Over-All Rank	Constraint	Mean	Rank with In Group	Overall Rank	Constraint	Mean	Rank with In Group	Over-All Rank	Constraint	Mean	Rank with in group	Over-all Rank	Constraint	Mean	Rank with in group
3	Milk price from society	2.960	1	2	Milk price from society	3.000	1	2	Milk price from society	3.000	1	2	Milk price from society	2.986	1
5	Low Fat & SNF	2.766	2	7	Low Fat & SNF	2.920	2	9	Low Fat & SNF	2.933	2	7	Low Fat & SNF	2.757	2
47	No society	1.000	3	41	Low demand during flush	1.020	3	44	No society	1.000	3	41	Low demand during flush	1.031	3
48	Poor marketing facilities	1.000	4	46	Poor marketing facilities	1.000	4	46	Low demand during flush	1.000	4	46	Poor marketing facilities	1.006	4
49	Low demand during flush	1.000	5	47	No society	1.000	5	47	Poor marketing facilities	1.000	5	47	No society	1.000	5

4.14 Economics of milk production

4.14.1 Cost of production

4.14.1.1 Cost of milk production per litre on milk animal basis

The cost of milk production per milk animal per day basis is presented in the Table 4.14.1.1. The average total maintenance cost of a lactating or milk animal per day was Rs. 229.81, 203.04 and 249.51 in small, medium and large farms respectively. The average daily maintenance cost was Rs. 226.38 on overall basis. The average cost of production per litre of milk (cost B) was 28.09, 28.49, 25.68 and 27.69 respectively in small, medium, large and overall farms respectively. The average cost/litre of milk after deduction of imputed family labour (cost A) was 19.93, 22.78, 24.93 and 21.81 in small, medium large and over all farms respectively. The cost of concentrate constituted 43.43, 34.7, 40.85 per cent of total maintenance cost in small, medium and large farms respectively.

Table 4.14.1.1 Cost of milk production per litre on milk animal basis under different farm sizes

Cost parameter (Rs)	Small		Medium		Large		Overall	
	Mean	% of gross cost	Mean	% of gross cost	Mean	% of gross cost	Mean	% of gross cost
Average cost/ l of milk on milk animal basis(Cost B)								
Interest on milk animal	13.03	5.67	13.92	6.86	16.74	6.71	14.08	6.22
Depreciation on milk animal	8.44	3.67	9.36	4.61	12.3	4.93	9.53	4.21
Interest on shed	7.66	3.33	6.08	3	10.43	4.18	7.8	3.45
Depreciation on shed	6.53	2.84	6.4	3.15	6.36	2.55	6.46	2.85
Interest on equipments	0.37	0.16	1.2	0.59	2.55	1.02	1.08	0.48
Depreciation on equipments	0.31	0.13	0.97	0.48	1.64	0.66	0.78	0.34
Cost of green fodder	35.28	15.35	25.45	12.54	47.32	18.97	35.05	15.48
Cost of dry fodder	5.91	2.57	8.58	4.23	5.24	2.1	6.53	2.88
Cost of total roughage	41.18	17.92	34.03	16.76	52.56	21.07	41.58	18.37
Cost of concentrate	105.3	45.82	87.88	43.29	107.2	42.98	100.7	44.5

AI cost	0.82	0.36	0.54	0.27	0.5	0.2	0.67	0.3
Cost of Veterinary Services	2.93	1.28	3.21	1.58	3.37	1.35	3.1	1.37
Total cost on veterinary services	3.75	1.63	3.75	1.85	3.87	1.55	3.78	1.67
Labour cost	39.97	17.39	35.97	17.72	31.71	12.71	37.06	16.37
Insurance premium	3.26	1.42	3.48	1.71	4.12	1.65	3.51	1.55
Total maintenance cost	229.81		203.04		249.51		226.38	
Average cost/ l of milk (Cost B)	28.09		28.49		25.68		27.69	
Average cost/l of milk after deduction on milk animal basis (Cost A)								
Family labour for fodder	26.35	16.08	9.01	5.41	1.32	0.55	16.03	8.84
Family labour	39.55	24.13	27.59	16.58	6.78	2.81	29.11	16.06
Total imputed cost for family labour	65.9	40.2	36.59	21.98	8.1	3.36	45.14	24.91
Total maintenance cost	163.91		166.45		241.42		181.24	
Average cost/l of milk (Cost A)	19.93		22.78		24.93		21.81	

4.14.1.2 Cost of milk production per litre on milch animal basis under different farms

The details of cost of milk production per milch animal basis in the farms are presented in Table 4.14.1.2. The total maintenance cost (Rs.) in small, medium, large and overall farms was 226.01, 198.14, 219.6 and 216.68 respectively. The average cost/litre of milk (cost B) was 32.51, 34.29, 29.08 and 32.29 in small, medium, large and overall farms respectively. The average cost per litre of milk after deduction of imputed family labour cost (cost A) was 22.02, 26.33, 27.08 and 24.34 (Rs/litre) in small, medium, large and overall farms respectively. The major share of maintenance cost was contributed by the cost of concentrate which was 43.43, 34.7, 40.85 and 40.38 per cent respectively in small, medium, large and overall farms. The total roughage cost constituted 18.22, 15.08, 14.12 and 16.44 per cent respectively. The share of labour was 19.17, 17.91, 16.54 and 18.24 per cent in small, medium, large and overall farms respectively.

Table 4.14.1.2 Cost of milk production per litre on milch animal basis under different farm sizes

Cost parameter (Rs)	Small		Medium		Large		Overall	
	Mean	% of gross cost	Mean	% of gross cost	Mean	% of gross cost	Mean	% of gross cost
Average cost/ l of milk on milch animal per day basis (Cost B)								
Interest on milch animals	13.03	5.77	13.92	6.16	16.74	7.41	14.1	6.23
Depreciation on milch animals	8.44	3.73	9.36	4.14	12.3	5.44	9.53	4.22
Interest on shed	7.66	3.39	6.08	2.69	10.43	4.62	7.8	3.45
Depreciation on shed	6.53	2.89	6.4	2.83	6.36	2.81	6.46	2.86
Interest on equipments	0.37	0.16	1.2	0.53	2.55	1.13	1.08	0.48
Depreciation on equipments	0.31	0.14	0.97	0.43	1.64	0.73	0.78	0.35
Cost of green fodder	35.28	15.61	25.49	11.28	26.66	11.8	30.6	13.55
Cost of dry fodder	5.91	2.62	8.58	3.8	5.24	2.32	6.53	2.89
Cost of total roughage	41.18	18.22	34.07	15.08	31.9	14.12	37.2	16.44
Cost of concentrate	98.15	43.43	78.42	34.7	92.33	40.85	91.3	40.38
AI cost	0.82	0.36	0.55	0.24	0.5	0.22	0.67	0.3
Cost of Veterinary Services	2.94	1.3	3.21	1.42	3.37	1.49	3.11	1.38
Total cost on veterinary services	3.76	1.66	3.75	1.66	3.87	1.71	3.78	1.67
Labour cost	43.32	19.17	40.48	17.91	37.37	16.54	41.2	18.24
Insurance premium	3.26	1.44	3.48	1.54	4.12	1.82	3.51	1.55
Total maintenance cost	226.01		198.14		219.6		216.68	
Average cost/ l of milk (Cost B)	32.51		34.29		29.08		32.29	
Average cost/l of milk after deduction on milch animal basis (Cost A)								
Family labour for fodder	26.35	16.81	9.01	5.77	1.32	0.65	16	0.65
Family labour	42.9	27.36	33.03	21.16	14.05	6.88	33.9	0.65
Total imputed cost for family labour	69.25	44.17	42.03	26.92	15.37	7.53	49.9	0.65
Total maintenance cost	156.77		156.11		204.22		166.75	
Average cost/l of milk (Cost A)	22.02		26.33		27.08		24.34	

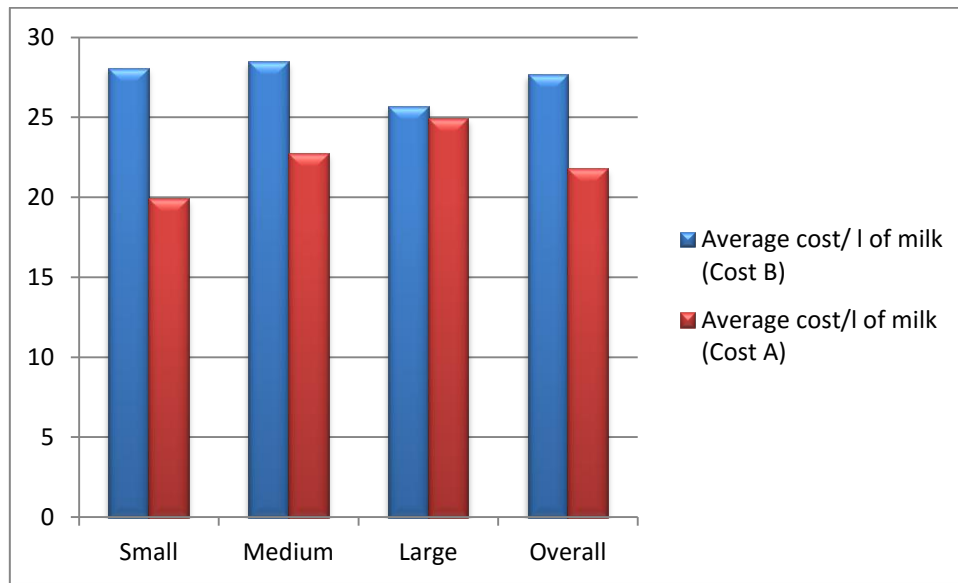


Figure 4.25 Average cost per litre of milk on milk animal basis (Rs.)

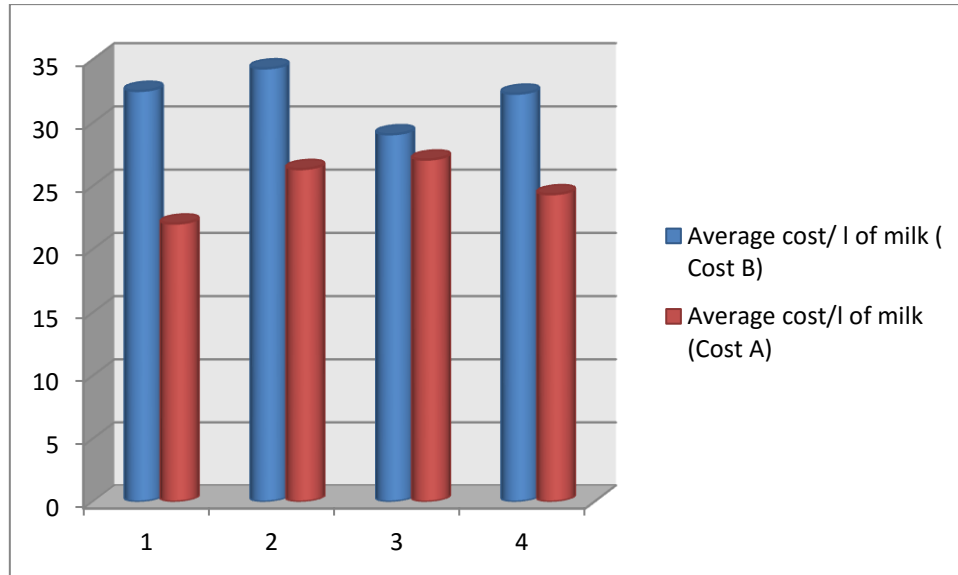


Figure 4.26 Average cost of milk per litre on milch animal basis (Rs.)

4.14.2 Cost –Returns from milk production

4.14.2.1 Cost and Returns of milk production per milk animal per day basis

The details of cost and returns from milk production per day were calculated per milk animal basis and are presented in Table 4.14.2.1. The total fixed cost was 15.81, 16.51, 21.77 and 17.29 per cent of the total gross cost/milk animal/day. The total variable cost 84.19, 81.31, 79.96 and 82.45 per cent of gross cost in small, medium, large and overall farms respectively. The gross cost/milk animal/day was Rs.229.81, Rs.203.04, Rs.249.51 and Rs.226.38 in small, medium and large farms respectively. The net return from milk animal/day was Rs.44.46, Rs.45.31, Rs.62.02 and Rs.48.46 in small, medium, large and overall farms respectively. The net return after deduction of imputed cost was Rs.110.36, Rs.81.9, Rs.70.12, and Rs.93.61 respectively.

4.14.2.2 Costs and returns of milk production per milch animal per day basis

The cost and returns per day per milch animal is presented in Table 4.14.2.2. The total fixed cost was 16.08, 19.15, 22.78 and 18.34 per cent of gross cost in small, medium, large and overall farms respectively. The total variable cost was 83.92, 90.55, 77.22 and 81.69 per cent in small, medium, large and over all farms. The net return per day per milch animal was Rs.23.34, Rs.10.39, Rs.27.74 and Rs.20.58 respectively in small, medium, large and overall farms respectively. The net return after deduction of imputed family labour cost was Rs.92.59, Rs.52.42, Rs.43.12 and Rs.70.51 in small, medium, large and overall farms respectively.

Table 4.14.2.1 Cost and Returns of milk production per milk animal per day under different farm sizes

Cost parameter (Rs)	Small	Medium	Large	Overall
	Mean	Mean	Mean	Mean
Interest on fixed capital investment	21.06	21.2	29.72	22.96
Depreciation on fixed capital	15.28	16.74	20.3	16.77
Total fixed cost	36.34 (15.81)	37.94 (18.69)	50.02 (21.77)	39.73 (17.29)
Green fodder cost	35.28	25.45	47.32	35.05
Dry fodder cost	5.91	8.58	5.24	6.53
Total roughage cost	41.18	34.03	52.56	41.58
Concentrate cost	105.3	87.88	107.23	100.74
Total feed cost	146.49	121.91	159.8	142.32
Medicine and veterinary care	3.75	3.75	3.87	3.78
Labour cost	39.97	35.97	31.71	37.06
Insurance	3.26	3.48	4.12	3.51
Total variable cost	193.47 (84.19)	165.1 (81.31)	199.5 (79.96)	186.66 (82.45)
Total variable cost after deduction of imputed cost	127.57	128.51	191.4	141.51
Gross cost	229.81	203.04	249.51	226.38
Gross cost after deduction of imputed cost	163.91	166.45	241.42	181.24
Net cost	217.81	191.04	237.51	214.38
Net cost after deduction of imputed cost	151.91	154.45	229.42	169.24
Gross return	262.27	236.34	299.53	262.85
Net returns	44.46	45.31	62.02	48.46
Net Return after deduction of imputed cost	110.36	81.9	70.12	93.61

Table 4.14.2.2 Costs and returns of milk production per milch animal per day under different farm sizes

Cost parameter (Rs)	Small	Medium	Large	Overall
	Mean	Mean	Mean	Mean
Interest on fixed capital investment	21.07	21.2	29.72	22.96
Depreciation on fixed capital	15.28	16.74	20.3	16.77
Total fixed cost	36.35 (16.08)	37.94 (19.15)	50.02 (22.78)	39.73 (18.34)
Green fodder cost	35.28	25.49	26.66	30.63
Dry fodder cost	5.91	8.58	5.24	6.53
Total roughage cost	41.18	34.07	31.9	37.16
Concentrate cost	98.15	78.42	92.33	91.26
Total feed cost	139.33	112.49	124.22	128.42
Medicine and veterinary care	3.76	3.75	3.87	3.78
Labour cost	43.32	40.48	37.37	41.23
Insurance	3.26	3.48	4.12	3.51
Total variable cost	189.66 (83.92)	160.2 (90.55)	169.58 (77.22)	176.94 (81.69)
Total variable cost after deduction of imputed cost	120.41	118.17	154.21	127.01
Gross cost	226.01	198.14	219.6	216.67
Gross cost after deduction of imputed cost	156.76	156.11	204.22	166.75
Net cost	214.01	186.14	207.6	204.67
Net cost after deduction of imputed cost	144.76	144.11	192.22	154.75
Gross return	237.35	196.53	235.34	225.26
Net returns	23.34	10.39	27.74	20.58
Net Return after deduction of imputed cost	92.59	52.42	43.12	70.51

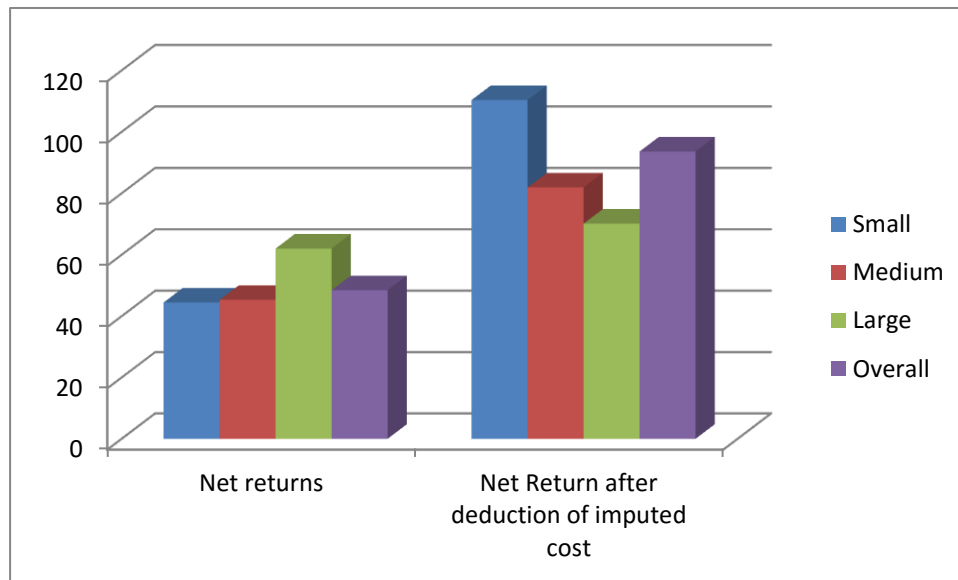


Fig.4.27 Net Returns from milk production per milk animal per day under different farm sizes

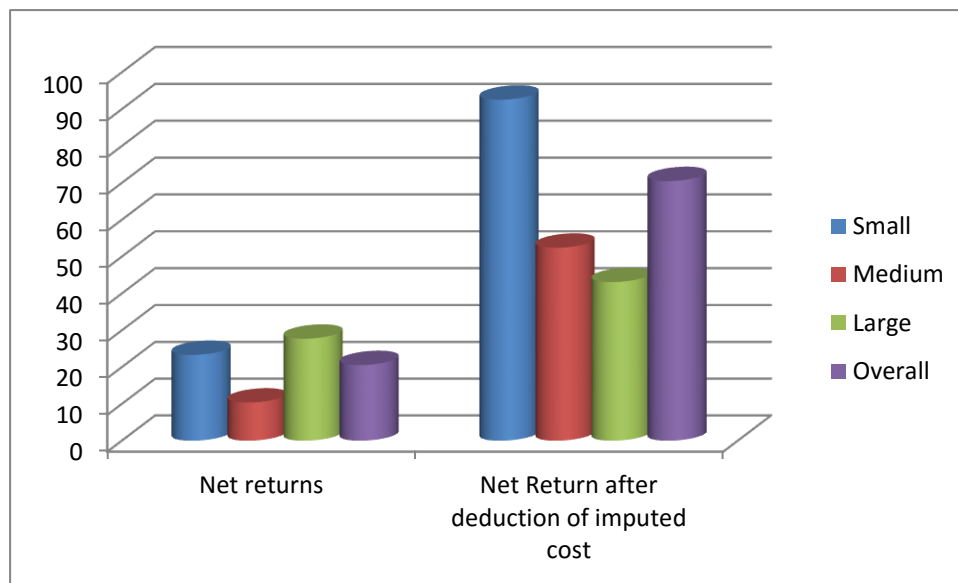


Fig.4.28 Net returns from milk production per milch animal per day under different farm sizes

4.14.2.3 Cost and Returns from milk production in different agro-climatic zones

Table 4.14.2.3 presents the cost and returns per milch animal/day in different agro- climatic zones. The net return after deduction of family labour was Rs.68.03, Rs.83.87, Rs.53.24, Rs.92.58 and Rs.82.8 in south, central, north problem zone and high range respectively. The cost B was and high range respectively.

4.14.2.4 Cost and Returns from milk production in farming system based on cropping pattern

Cost and return of milk production in farming systems based on cropping pattern per milch animal per day is presented in table 4.14.2.4. The net return after deduction of imputed cost was Rs.81.46, Rs.52.82, Rs. 80.87, Rs.117, Rs.113.8, Rs.68.6, Rs. 67.38 and Rs.93.61 in different farming systems. Cost A was Rs.22.91, Rs.25.32, Rs.23.18, Rs.18.3, Rs.18.68, Rs.24.53, Rs.25.46 and Rs.21.27 respectively

4.14.2.3 Cost and Returns from milk production in different agro-climatic zones per milch animal per day

Parameters	South	Central	North	Problem Zone	High Range
COST B (Rs/l)	31.8	29.17	34.02	28.66	31.77
COST A (Rs/l)	23.8	23.09	26.28	22.73	22.94
Gross Cost (Rs)	218.13	223.19	189.87	230.91	240.55
Gross cost after deduction of family labour (Rs)	164.22	176.37	151.69	185.86	177.92
Gross returns (Rs)	220.25	248.25	192.93	266.44	248.72
Net returns (Rs)	14.12	37.06	15.07	47.53	20.18
Net returns after deduction of family labour (Rs)	68.03	83.87	53.24	92.58	82.8

4.14.2.4 Cost and Returns from milk production in farming system based on cropping pattern per milch animal per day.

Parameters	Paddy mono	Coconut mono	Rubber mono	Spices	Banana mono	mixed cropping	homestead farming	vegetables
COST B (Rs/l)	31.96	27.61	31.08	22.5	23.48	32.45	34.84	25.91
COST A (Rs/l)	22.91	25.32	23.18	18.3	18.68	24.53	25.46	21.27
Gross Cost (Rs)	204.4	200.1	247.28	265	247.8	226.12	199.93	246.3
Gross cost after deduction of family labour (Rs)	149.8	185.89	184.25	216	202.8	173.88	149.4	199.9
Gross returns (Rs)	219.3	226.71	253.12	321	304.5	229.94	204.78	281.5
Net returns (Rs)	26.86	38.61	17.84	67.8	68.7	15.82	16.85	47.23
Net returns after deduction of family labour (Rs)	81.46	52.82	80.87	117	113.8	68.06	67.38	93.61

4.14.2.5 Cost and Returns from milk production in farming system based on income

Table 4.14.2.5 gives the details of cost and returns from milk production in farming systems based on income. The net return after deduction of family labour was Rs.69.28 and Rs.71.02 in specialized and mixed daily farming systems respectively. Cost B (Rs/litre) was 33.13 and 31.88 and cost A (Rs./litre) was 24.63 and 24.19 respectively in specialized and mixed daily systems.

4.14.2.5 Cost and Returns from milk production in farming system based on income per milch animal per day

Parameter	Specialized dairy farming	Mixed dairy farming
COST B (Rs/l)	33.13	31.88
COST A (Rs/l)	24.63	24.19
Gross Cost (Rs)	207.07	221.91
Gross cost after deduction of family labour (Rs)	158.64	171.01
Gross returns (Rs)	215.92	230.03
Net returns (Rs)	20.85	20.12
Net returns after deduction of family labour (Rs)	69.28	71.02

4.14.2.6 Cost and Returns from milk production in farming system based on dry matter

Table 4.14.2.6 shows the cost and return milk production in farming system based on dry matter. The cost B was Rs. 31.76 and Rs.33.01 and cost A was Rs.24.08 and Rs.24.68 respectively in SLPS and CLS systems. The net return after deduction of family labour was Rs.71.25 and Rs. 69.5 respectively in SLPS and CLS.

4.14.2.6 Cost and Returns from milk production in farming system based on dry matter per milch animal per day

Parameter	SLPS	CLS
COST B (Rs/l)	31.76	33.01
COST A (Rs/l)	24.08	24.68
Gross Cost (Rs)	216.71	216.63
Gross cost after deduction of family labour (Rs)	168.27	164.66
Gross returns (Rs)	227.52	222.17
Net returns (Rs)	22.82	17.54
Net returns after deduction of family labour (Rs)	71.25	69.5

4.14.3 Cost-Return traits

Table 4.14.3 shows various cost return traits. The return over feed cost (ROFC) was 110.02, 96.04 and 123.84 per milch animal per day in small, medium, large farms. The feed cost efficiency (per cent) was 80.53, 87.55 and 110.67 in small, medium, and large farms respectively. The return over variable cost (ROVC) was 59.69, 48.33 and 78.65 in small, medium and large farms. The break even output (litre) per milk animal was 6.56, 2.34 and 2.89 and per milch animal was 5.25, 3.66 and 7.32 respectively. The input output ratio excluding unpaid labour per milch animal/day was 1.51, 1.26 and 1.17 in small, medium and large farms respectively.

4.14.4 Measures of farm efficiency

Table 4.14.4 presents some of the measures of farm efficiency. The net farm income was Rs. 27.6, Rs.62.7 and Rs.391.83 in small, medium and large farms respectively. The net cash income (Rs.) was 139.09, 271.36 and 684.71 respectively. Net income per hectare (Rs) was 189.51, 185.53 and 1497.69 respectively. Net farm income per adult unit (Rs) was 10.08, 5.79 and 17.28 in small, medium and large farms. The net return per Rs. Hundred worth feed fed to livestock (per cent) was 59.84, 56.06 and 50.08. The capital per Rs.100 gross return was 27.42, 43.82 and 43.53 respectively. The rate of turnover (per cent) was 7.84, 3.04 and 14.27 per cent in small, medium and large farms respectively.

Table 4.14.4 Measures of farm efficiency

Sl no	Cost Return traits	Small	Medium	Large
1	Net farm income (Rs)	27.6	62.7	391.83
2	Net cash income (Rs)	139.09	271.36	684.71
3	Net income per hectare (Rs)	189.51	-185.53	1497.69
4	Net farm income per adult unit (Rs)	10.08	5.79	17.28
5	Net return per Rs hundred worth feed fed to livestock (%)	59.84	56.06	50.08
6	Capital per Rs 100 gross return	47.42	43.82	43.53
7	Rate of turnover (%)	7.84	3.04	14.27

Table 4.14.3 Means of cost and return traits in milk production in different farm sizes.

Sl no	Parameters	Milk animal			Milch animal		
		Small	Medium	Large	Small	Medium	Large
1	Gross return per day (Rs)	274.27	248.34	310.6	249.35	208.53	245.96
2	Total feed cost per day (Rs)	146.49	121.91	158.44	139.33	112.49	122.12
3	Return over feed cost (ROFC)	127.78	126.44	152.16	110.02	96.04	123.84
4	Feed cost efficiency (%)	91.04	106.09	130.69	80.53	87.55	110.67
5	Returns from milk (Rs)	262.27	236.34	298.6	237.35	196.53	233.96
6	Average milk yield (litres)	8.98	8	9.98	8.13	6.65	7.82
7	Total fixed cost per animal (Rs)	36.34	37.94	49.98	36.35	37.94	49.98
8	Total variable cost per animal (Rs)	193.47	165.1	197.94	189.66	160.2	167.31
9	Return over variable cost (ROVC)	80.8	83.24	112.66	59.69	48.33	78.65
10	Variable cost: fixed cost	1: 5.61	1:4.6	1:4.27	1:5.5	1:4.48	1:3.5
11	Total cost per animal including unpaid labour (Rs)	229.81	203.04	247.91	226.01	198.14	217.29
12	Total cost excluding unpaid labour (Rs)	163.91	166.45	240.28	156.76	156.11	202.32
13	Variable cost per litre (Rs)	23.34	22.79	20.26	26.85	27.33	22.12
14	Price per litre of milk (Rs)	29.43	29.79	29.91	29.43	29.79	29.91
15	Break even output (litre)	6.56	2.34	2.89	5.25	3.66	7.32
16	Per cent break even output to total out put	90.7	25.31	23.49	111.73	33.33	38.27
17	Input output ratio including unpaid labour	1.12	1.14	1.29	1.02	0.97	1.09
18	Input output ratio excluding unpaid labour	1.61	1.42	1.34	1.51	1.26	1.17

4.14.5 Milk production function

The Cobb. Douglas production function was estimated for different types of farms and overall. The estimated determinants of milk production and coefficient of multiple determinations (R^2) of the function is presented in Table 4.14.5.

The estimated milk production function for different farms revealed that coefficients of concentrate total roughage and different farms revealed that coefficients of concentrate, total roughage and adoption index were positive and statistically highly significant ($P < 0.01$) in small farms with R^2 as 63.0 per cent, indicating the importance these input in increasing a milk production. The labour cost was positive and significant ($P < 0.05$) in small farms. In medium farms the coefficient of concentrate was highly significant and roughage was significant at 5% level. In large farms the coefficient of concentrate was highly significant. The overall results showed positive and highly significant effects of concentrate and adoption index and significant effect of total roughage ($P < 0.05$) with R^2 value as 67.0 per cent.

4.14.6 Resource use efficiency of milk production

Table 4.14.6 shows the estimation of resources use efficiency in milk production. The ratio of MVP to factor prices provides a measure of Resource Allocative Efficiency. The marginal value product (MVP) of inputs in milk production for different farms are given in table 4.14.6. The results showed that in small farms the MVPs of two inputs viz. roughages and labour was significantly less than unity, signifying over utilization of these inputs. The MVP value of concentrate was significantly higher than unity indicating their under utilization in milk production process.

In medium farms, the MVP of concentrate was positive and significantly greater than unity indicating their under utilisation. In large farms the MVP value of concentrate was positive and significantly greater than unity indicating their under utilization.

Table 4.14.5 Estimated Coefficients of milk production function

Farm size/ (Observations)	Parameter	Regression coefficient		R ² (%)
		B	Std. Error	
Small (175)	(Constant)	-0.958	0.922	63
	Concentrate	0.619**	0.051	
	Roughage	0.191**	0.045	
	Veterinary Service	-0.008	0.029	
	Labour cost	0.088*	0.04	
	Adoption Index	0.589**	0.218	
Medium (100)	(Constant)	0.153	1.229	81.4
	Concentrate	0.734**	0.058	
	Roughage	0.091*	0.046	
	Veterinary Service	-0.045	0.045	
	Labour cost	0.018	0.08	
	Adoption Index	0.377	0.31	
Large (75)	(Constant)	4.224	0.94	65.7
	Concentrate	0.585**	0.056	
	Roughage	0.018	0.024	
	Veterinary Service	-0.007	0.061	
	Labour cost	-0.039	0.064	
	Adoption Index	-0.262	0.227	
Overall (350)	(Constant)	-0.126	0.599	67.0
	Concentrate	0.671**	0.032	
	Roughage	0.053*	0.022	
	Veterinary Service	0.002	0.023	
	Labour cost	0.031	0.032	
	Adoption Index	0.512**	0.141	

** Significant at 1% level

* Significant at 1% level

Table 4.14.6 Marginal value products of various inputs under different farm sizes

Farm size	Inputs	MVP
Small	Conc.	1.54**(0.13)
	Roughages	0.59** (0.14)
	Labour	0.21** (0.1)
Medium	Conc.	2.02** (0.16)
	Roughages	0.63(0.32)
Large	Conc.	1.68**(0.16)

Figures in the parenthesis are standard errors of regression coefficients

** Significant at 1% level

4.14.7 Technical efficiency of milk production

Farm specific technical efficiencies were worked out from the stochastic frontier production function. The results are presented in Table 4.14.7. The mean technical efficiency in small, medium and large farms was 99.80, 83.22 and 99.96 per cent respectively.

4.14.7 .1 Determinants technical efficiency in milk production

Estimates of determinants of Cobb-Douglas function of farms – specific technical efficiency has been estimated for farm types and is presented in table 4.14.7.1. In small farms, the adoption index and herd size was having significant ($P > 0.05$) influence on farm specific technical efficiency. In large farms education index was having significant ($P > 0.05$) influence and overall level farming experience index had significant ($P > 0.05$) and herd size was having highly significant influence on technical efficiency of farms.

Table 4.14.7 Technical efficiency of milk production under different farm sizes

Sl no	Variables	N=172			N=99			N=73		
		Small			Medium			Large		
		Regression coefficient	Std Error	Significance	Regression coefficient	Std Error	Significance	Regression coefficient	Std Error	Significance
A	<u>Frontier Production function</u>									
1	Constant	1.419	0.419	3.381	1.902	0.331	5.748	3.207	0.373	8.601
2	Concentrate cost/ Animal/Day (Rs)	0.653	0.0485	13.466	0.772	0.0374	20.651	0.571	0.052	11.049
3	Total Roughage cost/ Animal /Day (Rs)	0.221	0.0443	4.993	0.0959	0.0412	2.33	0.00069	0.021	0.329
4	Total Veterinary Cost /Animal /Day (Rs)	-0.001	0.028	-0.037	-0.0521	0.041	-1.127	-0.0234	0.572	-0.0408
5	Total Labour Cost/Animal/Day	0.0785	0.04	1.949	0.008	0.0707	0.1135	-0.053	0.0612	-0.8213
B	<u>Diagnosis Statistics</u>									
1	Sigma -Square (σ^2)	0.067	0.0076	80874	0.0769	0.0185	4.1517	0.025	0.0042	5.889
2	Gamma (γ)	0.00007	0.0282	0.0026	0.7811	0.1205	6.48	7E-06	0.0116	6.6E-05
3	Log-likelihood	-11.77			22.146			31.606		
4	Mean Technical Efficiency (%)	99.80%			83.22%			99.96%		

Note: N= Number of samples ** Significant at 1% level, * Significant at 5% level, NS=Not Significant

Table 4.14.7.1 Determinants of Technical Efficiency in different farm sizes

Particulars	Type of farms			
	Small	Medium	Large	Overall
No. Of observation	175	100	75	350
Constant	-.002**	-.763	0.000**	.323 (.248)
Education index	2.070×10^{-7} (0.0)	-.014 (.031)	2.396×10^{-7} (0.0)*	.007 (.15)
Farming experience index	1.314×10^{-6} (0.0)	-.004 (.025)	1.171×10^{-7} (0.0)	-.025* (.10)
Adoption index	-3.610×10^{-6} (0.0)*	.014 (.039)	-1.397×10^{-7} (0.0)	-.019 (.006)
Herd size	1.211×10^{-5} (0.0)*	.124 (.141)	-3.935×10^{-7} (0.0)	-.075** (0.057)
R ²	.075	.015	.118	.049

Figures in parenthesis indicate standard error of the co-efficients

* Significant at 5% level

** Significant at 1% level

4.15 CORRELATION BETWEEN VARIOUS SOCIO-ECONOMIC, ADOPTION, PRODUCTION AND COST-RETURN PARAMETERS

4.15.1 Correlation between socio-economic production and net return of the farmers and adoption index

Table 4.15.1 shows the correlation between socio-economic production and net return of the farmers and adoption index of their farms. Education of the farmer family education index, family size, attendance, extension, programmes, land holding motivation level, gross return from milch animals, wet average and dry average are positively correlated with adoption index. Adoption index was negatively correlated with age and experience.

Table 4.15.1 Correlation between socio-economic parameters and adoption index

Sl no	Parameters	Correlation Coefficient
1	Age	-0.09
2	Education of the farmer	0.271**
3	Family Education Index	0.194**
4	Family size	0.149**
5	Family participation in dairying	0.043
6	Extension programmes attended	0.174**
7	Land holding	0.220**
8	Experience in dairying	-0.058
9	Family experience	-0.043
10	Motivation	0.353**
11	Mass media exposure	0.381**
12	Social participation	0.09
13	Cost A per liter for milch	-0.011
14	Net return from milch animals	0.158**
15	Gross return from milch animals	0.381**
16	Wet average	0.448**
17	Dry average	0.356**

** Significant at 1% level

4.15.2 Correlation between dairy farm performance index, production, cost and adoption index

Table 4.15.2 describes the correlation between dairy farm performance index, production, cost and adoption index. The results revealed that dairy farm performance index was negatively correlated with cost/litre of milk and positively correlated with wet, dry average and adoption index.

Table 4.15.2 Correlation between dairy farm performance index, production, cost and adoption index

Parameter	Cost / l of milk	Wet average	Dry average	Adoption score
Dairy farm performance index	-0.328**	0.474**	0.315**	0.426**

** Significant at 1% level

4.15.3 Correlation between the physiological state of animals in the farm and productivity, cost and return parameters

Table 4.15.3 presents the details of correlation between the physiological state of animals in the farm and productivity, cost and return parameters. The results showed that per cent of animals in milk is positively correlated with wet average, dry average and gross return and negatively with cost/litre. The per cent of dry animals was negatively correlated with wet, dry averages and gross return but positively with cost. The per cent of animals in the first 100 days of lactation was positively related with wet, dry averages and gross return but negatively with cost. The per cent of animals in first three lactation numbers out of total milch animals was not significantly correlated with any of productivity, cost – return parameters.

4.15.3 Correlation between the physiological state of animals in the farm and productivity, cost and return parameters

Parameter	Wet average	Dry Average	Cost/l per milch	Gross return per milch animal
% of animals in milk of total milch animals	-.121*	.409**	-.465**	.409**
% of dry animals of total milch animals	.121*	-.409**	.465**	-.409**
% of pregnant animals of total milch animals	-.090	-.202**	.188**	-.185**
% of animals in first three lactations of total milch animals	.026	.032	.036	.024
% of animals in first 100 days of lactations of total milch animals	.320**	.339**	-.179**	.317**

** Correlation is significant at the 0.01 level

4.16 MILK PRICING

In Kerala the Co-operative Dairy sector is handling around 18-19 per cent of total milk production of the state. At present there are 3683 number of primary dairy co-operatives (as on 31.03.2016) of which 3235 are APCOS and 448 are Non-APCOS. Dairy Development Department, Govt. of Kerala is the administrative department for the Dairy Co-operatives of the state and the Director, Dairy Development is the registrar for the DCS of the state.

Presently the DCS procures 15.3 lakh litre of milk per day .Considering a total population of 348 lakh (census, 2011, Ministry of Home Affairs, Government of India) the requirement of milk is 36.073 lakh tones per annum whereas the total milk production of the state is only in the tune of 31.02 LT/annum showing a gap of 5.05 LT/annum.

The Dairy Co-operatives of the state are at present following a two time milk collection pattern. AM Collection (usually between 5 am to 7 am) and PM collection (2.30 pm to 6 pm). The KCMMF is providing the milk price chart to the Dairy Co-operatives. The price paid for milk received in Dairy is based on Dairy to Society Chart and the prices due to dairy farmers are calculated based on Society to Producer Price Chart.

4.16.1 Price determination of milk

The price of milk poured in the DCS by the producers is based on a two axis pricing policy method in which the Fat Value and SNF value are the parameters. The Fat value is determined in the DCS by conventional methods like Gerber method (IS: 1224 (part 1), 1977), Milk O Tester or advanced methods like Ultrasonic Milk Analysers.

SNF value is determined using the formula

$$(\text{CLR}/4) + 0.2 \times F + 0.5$$

Where, CLR = Corrected Lacto Meter Reading at 290 C

F = Per cent of Fat in milk analyzed

Knowing the CLR Value, the SNF value can even be directly read from the Milk Chart published by KCMMF(Appendix V). The fat per cent is given in the first Column (Y axis) and SNF and rate for a particular Corrected Lactometer Reading (CLR) is in the top row (X axis). In the chart published by KCMMF, the minimum and maximum per cent for Fat is 3.0 and 10.0 respectively whereas the minimum and maximum values for SNF are 6.9 and 9.1. The CLR ranges from 23 to 32. Knowing the values of Fat and SNF or CLR the price of the analysed sample of milk can be directly read from the chart. The price due to the farmer can be calculated as.

Total Milk Price due to a Producer = Milk price / litre as shown in milk chart X Total Quantity of milk poured by farmer in litre

The above prices were arrived at taking in to consideration the value of Fat @ Rs. 211.46 and SNF @ Rs.258.46. (The rates were taken as per the price revision w.e.f 21-07-14)

4.16.2 Critical appraisal of the two-axis milk chart followed by KCMMF

07. No Thrust on Organoleptic and Microbiological Quality of milk.

The quality of milk is a sum total of the Organoleptic quality, physico-chemical Quality and Microbiological Quality of Milk. As per the milk chart published by KCMMF over the years, the significant parameters viz organoleptic and Microbiological quality of milk has been totally ignored. These parameters especially the microbiological quality is having public health implication and hence needs thrust. A three axis pricing pattern with due preference to microbial quality of raw milk will be a scientific approach to the proposed modification in price chart.

08. Non Proportionate penalty factor for inferior quality of milk and incentive for premium milk

As per the price chart of KCMMF revised and published on 28.06.2010 and 05.09.2011, it has been remarked as footnote that for milk poured with quality of TS less than 12 % (with SNF less than 8%), the producer will be penalized @ Rs

0.20 per point, and for TS above or equal to 12%, the penalty shall be Rs 0.10 per point.

But in the same footnote, it is recorded that for premium quality of milk poured (with SNF above 8.1% and TS less than 12%), an incentive of mere Rs 0.02 per point is included.

This is injustice to the farmers pouring premium quality milk without any adulterations. This sounds a negative approach and unjustifiable means to promote farmers to pour superior quality milk.

09. Significant factors that contribute to the production cost of milk being ignored in the present price chart.

There are many factors that significantly contribute to the cost of production of milk. The dairying sector of Kerala is unique and is different from the situation that prevails in other states of the country. Among the different factors that significantly contribute to the cost of milk production, certain factors viz. cost of compound feed, cost for infrastructure development etc. has shown steep positive hike / inclination throughout the year. It is evident that the hike in price paid to farmer for a particular quality of milk over the years is not in par with the per cent hike for compound / concentrated feed, general cost of living , labour cost and interest rates etc. Hence it is recommended to give due consideration to the parameters that significantly contributes to the cost of milk production while fixing the procurement price of milk along with the cost of fat and SNF contained in the milk.

10. Time bound revision of price chart not implemented

As per the WP (C) No. 13468, 13483 and 16764 of 2011 of the Hon. High Court of Kerala, had upheld the full autonomy of KCMMF, with democratically elected representatives to decide the procurement and consumer price of milk. The court reminded the original agreement with the National dairy development board (NDDB) regarding this while the co-operative structure was formed in the state.

At present there is no time bound revision of the price chart. During the period from 2007-08 to 2015-16, the milk price chart of KCMMF have been revised on 13.11.2007, 03. 10. 2008, 28. 06. 2010, 05.09.2011, 14.10.2012 and 21.07.2014 (till date).It has been noted that there is no special pattern followed for revision of price chart which is not scientific. The primary farmers who suffer due to hike in variable factors such as compound cost, feed cost, labour cost, interest rates etc are hence socio economically affected.

11. Unscientific revision of price charts published by KCMMF on 14.10.2012 and 21.07.14

As per KCMMF, the Fat value and SNF value per kg are the indices for milk price computation. But as per price chart revised and published by KCMMF on the above mentioned dates, it can be observed that at each and every point of Fat and SNF combinations in the chart, there has been a flat increase of price as follows

- 13.11.2007 (+ 61 paisa flat in all points)
- 03. 10. 2008 (+ 90 paisa flat in all points)
- 28. 06. 2010 (+ Rs . 2.76 flat in all points)
- 05.09.2011 (+ Rs. 4.20 flat in all points)
- 14.10.2012 (+ Rs. 4.60 flat in all points)
- 21.07.2014 (+ Rs. 2.40 flat in all points) till date

This act of flat increase in price has violated the two axis price fixation pattern so far followed by KCMMF.

12. Zero Value for milk in the Price chart of KCMMF.

As per the KCMMF Price chart, implemented from 21.07.2014 and being followed till date, there is no price for the milk sample poured with the following set of quality parameters

- For milk with fat per cent ranging from 3.0 to 3.4 % and SNF per cent less than 8.2 (Total Solids - 11.2 to 11.6)
- For milk with fat per cent ranging from 3.5 to 4.7 % and SNF per cent less than 7.7 (Total Solids - 11.2 to 12.4)
- For milk with fat per cent ranging from 4.8 to 5.9 % and SNF per cent less than 7.7 (Total Solids – 12.5 to 13.6)

The milk produced by high yielding cross bred cattle population of the state with a varying germplasm is often low in fat and SNF content. Moreover the stage of lactation also affects these parameters in milk. The milk poured in by the farmers with the above combinations are considered as substandard and only fat value is paid to them.

4.16.3 Suggestions for the existing pricing policy

1. Three axis pricing policy

A three axis pricing pattern with due preference to microbial quality of raw milk will be a scientific approach to the proposed modification in price chart.

2. Same rates for penalty to sub standard milk and premium for high quality milk

In case of penalty implied to inferior quality of milk, the same rate shall apply as incentive to basic price of premium quality milk poured. This will be a motivation to farmers for pouring in good quality milk.

3. Timely revision of Milk Pricing Chart strictly based on fat and SNF rates

The milk price chart shall be reviewed and revised at a timely interval (within 60 days of start of each financial year) strictly based on the fat and SNF rates.

4. Including a fixed “factor” in accordance with the parameters that significantly affect the cost of milk production

It is recommended to give due consideration to the parameters that significantly affects the cost of milk production in fixing the procurement price along with the cost of fat and SNF contained in the milk. A factor-‘*Farmer Comfort Factor*’ (FCF) shall be calculated on the basis of factors that contribute significantly to the cost of milk production such as cost of compound / concentrated feed, general cost of living , labour cost and interest rates etc. Irrespective of revision of primary KCMMF Chart, the FCF factor shall be calculated every year within 60 days of start of each financial year and included as a fixed value to be paid to the farmers for every point of fat - SNF combinations

4.16.4 Milk pricing – New Formula

It is the need of the hour to modify the formula for fixing the price of milk. While fixing the price of milk due consideration must be given to the factors significantly contributing to the cost of production along with the quality parameters of milk.

Being the significant contributors, the external factors viz.

- Hike in Cost of compound feed (over a period of previous four years from the date of revision of price chart)
- The labour cost calculated as on 1st April of the current year
- The Consumer Price Index of Kerala as on 1st April of the current year
- Existing bank repo rate as on 1st April of the current year

As per Table 4.14.1.1 it has been observed that cost of compound feed and cost of labour are the significant contributors of the cost of milk production. They are in the proportion as cited below

Table 4.16.4.1 Contribution of various factors contributing to the cost of milk production

Factors affecting total cost of milk production	% contribution
Compound Feed Cost	44.5
Labour Cost	16.37

Hence the price fixed as per Fat value and SNF value (TS Index Value) in the present KCMMF Chart shall be revised as

Price of Milk per Litre = TS Index + FCF (Farmer Comfort Factor)

TS Index = The price per litre of milk based on Fat and SNF alone as indicated in present milk price chart by KCMMF .

Farmer Comfort Factor (FCF) = Feed Cost Index (FCI) + Labour Cost Index (LCI) + Consumer Price Index (CPI) + Bank Repo Rate Index (BRI)

Feed Cost Index (FCI) in Rupees

FCI = 44.5 % of average hike in price of compound feed over a period of last 4 years. *e.g.* For FCI fixation to be done during 2016-17, the compound feed cost during the year 2012-13 shall be taken as the index

Table 4.16.4.2 Hike in the price of compounded cattle feed over the years

Year	Price / 50 Kg	% HIKE
2012-13	900	0
2013-14	910	1
2014-15	960	7
2015-16	990	11
Average Hike		3.8

Therefore the FCI (in Rs) = 44.5 % of 3.8 =Rs 1.69

Labour cost Index (in paise) - LCI

LCI (in paise) = 16.37 % of labour cost as on 1st April of current year as published in wages act of Govt. of Kerala . eg. As on 01.04.2016, the minimum wages act published by GOK is Rs 373

Therefore the LCI in paise = 16.37 % of 373 = 61.00 paise

Consumer Price Index factor (in paise) - CPI

CPI Factor (in paise) = 25 % of CPI (with Base : 2011-12 = 100) on 1ST April of current year (2016)

Therefore the CPI in paise = 25 % of 141 = 35.25 paise

Bank Repo Rate Factor – BRI

BRI (in paise) = Repo rate in per cent as on 1st April of current year as published by RBI. BRI as on 01.04.2016 is 7% (in paise) = 7 paise

Therefore the Farmer Comfort Factor (FCF) for the year 2016 will be

FCF (in Rs) = 1.69 + 0.61 + 0.35 + 0.07 = Rs 2.72

The FCF shall be common to all the points of Fat and SNF in the price chart

Table 4.16.4.3 Comparison between existing KCMMF chart and proposed chart with inclusion of Farmer Comfort Factor

Milk Quality		Price per litre as per existing Chart	Price as per proposed chart					
			TS Index	FCI	LCI	CPI	BRI	Total Price / Litre
FAT %	SNF %	(Rs)	(Rs)	(Rs)	(Rs)	(Rs)	(Rs)	(Rs)
1	2	3	4	5	6	7	8	9 = 4+5+6+7+8
3.6	8.5	29.58	29.58	1.69	0.61	0.35	0.07	32.3
3.4	8.4	28.9	28.9	1.69	0.61	0.35	0.07	31.62
3.9	8.5	30.22	30.22	1.69	0.61	0.35	0.07	32.94
4.1	8.3	30.12	30.12	1.69	0.61	0.35	0.07	32.84
4.6	8.4	31.44	31.44	1.69	0.61	0.35	0.07	34.16

5. DISCUSSION

This section deals with critical discussion of the results of the present study to draw meaningful conclusions.

5.1 AGRO-CLIMATIC ZONES

For the present study, the state of Kerala was identified into five agro-climatic zones. The study of any production system would be meaningful only on the backdrop of specific agro-ecological situation which formed the basis for distinct production system in that area. Most of the studies on the economics of milk production attempted earlier considered the agro-climatic back ground of the study area. Several agencies and authors attempted to classify the geographical area of their interest into different zones based on several criteria to make the research and development efforts more meaningful (NARP, 1989; Sastry, 2000; KAU, 2011; SREP, ATMA, 2013). Sastry (2000) pointed out that such zoning is a pre-requisite for regional planning for livestock development and integration of such regional plans into state and national plans.

5.2 IDENTIFICATION OF DAIRY FARMING/PRODUCTION SYSTEMS

The present study attempted to understand the economics of milk production from a systems approach method. Various researchers identified different dairy production systems based on many criteria like herd size, ownership pattern, income sources, dry matter availability, cropping pattern, peculiarity of geographical area, peculiarity of cattle keepers, method of cattle keeping, type of animal and feeds used etc.(Thomas and Sastry,1991;Prasad,1997; Ghosh,2007; KAU,2010). The importance of such studies and the need for livestock development programme to be best applied through some form of Farming Systems Research/Extension approach (FSR/E) was highlighted by Sastry and Thomas (2015). The present study first identified dairy production systems based on number of milch cows (farm size). Within each farm size category, more production systems based on major crop/cropping pattern, income

from different farming activities and dry matter availability to animals were identified.

The details of distribution of small, medium and large farms are presented in Table 4.2.1. The results indicated that small sized farms with one or two milch cows were predominant with a share of nearly 80 per cent in all the selected blocks. The details of distribution dairy farming systems based on the major crop / cropping pattern of the household is presented in Table 4.2.2. The result indicated, out of the eight farming systems identified the overall picture showed that, mixed farming was the dominant type followed by homestead farming. The Table 4.2.3 showed the distribution of farming systems based on the share of income from different farming activities. The majority of the farms under small medium and large farms were following mixed type of farming system. The proportion of specialized farms was comparatively higher in large farms and least in small farms. The classification of dairy farming system based on the availability of the source of dry matter to livestock is presented in the Table 4.2.4. The SLP (Sole Livestock Production) farmers were 56.0 per cent, 51.0 per cent and 70.7 per cent in small, medium and large farms respectively.

The results confirmed the following facts regarding the dairy farming systems in Kerala. The vast majority of the farmers were small holders with one or two milch cows. The medium dairy farms with 3-10 milch cows also had notable presence which shows the tendency for taking dairying as a commercial venture. The presence of large farms with more than 10 milch cows was less than one percent in the present study. This may be due to the more investment required in starting such enterprises and the need for labour beyond family work. One point should be noted regarding the present study is that, it included only farmers who were the members of the society and DBT scheme. Many of the small and large farms in many blocks might not be the members of this scheme as they prefer to sell milk directly to market, not to society. The predominance of mixed farmers and homestead farmers are typical features of agriculture and dairying in Kerala, confirmed again in the present study. Some sort of specialization was observed in

large dairy farms that were more commercial and demand more income from dairying. The slight majority of SLP farmers indicate that the availability of dry matter to livestock from farmers' own field is dwindling because of the decrease in area of paddy cultivation. In Kerala scenario we cannot expect any other significant source of dry matter to livestock from agriculture crops and have to depend on purchased feeds.

The strength, weakness, opportunities and threats (SWOT) of each system of farming was analysed in detail by many authors like Devendra (2001) who discussed about the small holder production systems,. Balaraman (2003) who described the dairy scenario in India with emphasis on milk production systems and Rao and BIRTHAL (2005) who reviewed the crop-livestock systems in India. Taneja and BIRTHAL (2005) reviewed the experiences and development prospects of small holder dairying in India. Ghosh (2007) narrated the trends and issues of livestock production systems. Suresh *et.al* (2008) and Shah and Dave (2010) also made similar observations regarding different production systems.

4.3. SOCIO –PERSONAL AND ECONOMIC DATA OF FARMERS

Table 4.3.1 revealed the age of the farmers (the person who leads the dairy activities) under different farm sizes. The results showed that majority of farmers in small, medium and in large farms fell in the age group of 40-60 years. In large farms the proportion of farmers within age group of 39 or below was comparatively higher, while in small farms the proportion of farmers in the age group of 61 or above was higher. The result clearly indicates that the dairy farmers in the state belong to middle or old age. The proportion of young aged group in the dairy activities was very low. Only in large farm category, the young generation showed their presence significantly. This results revealed the fact that, the traditional farmers are still continuing in this field and young generation are least interested in maintaining this tradition because of many reasons.

The results presented in table 4.3.2 showing the sex/gender of the person who leads the dairy activities in the household revealed that in small, medium and large groups 58.9, 73.0 and 96.0 per cent farms were having a male leader. The

result indicated that even though in majority farms, the male had the leading role, the contribution of female labour in the back ground was not negligible. The contribution of female as the leader of the farm decrease as the farm size increase. It might be due to the changing dependence from family labour to paid labour from small to large farms.

Table 4.3.3 and 4.3.3.1 showed the educational status and level of education of farm heads. Overall picture showed the predominance of secondary school education. Irrespective of farm size, majority of farmers had medium level of education. Very few farmers in the small and medium farms had high level of education. The result revealed the fact that the dairy sector fails to attract best talent or highly educated people into its fold. The presence of majority of the people with low or medium level of education will hinder the attempts for better extension services. The presence of comparatively higher level of education in medium and large farms is hopeful as it indicates the interest of educated people to take dairying as a serious enterprise for income generation.

The level of participation of family members in dairy activities is depicted in Table 4.3.6. It revealed that irrespective of the farm size, majority of the farms had medium level of family participation. The proportion of family participation was highest in medium farms and was least in large farms. The small holder dairying was considered as a family oriented activity traditionally. But the present study reveals the fact that the traditional concept of whole family participation was absent and instead the old aged members are mainly participating in dairy activities. As the farm size increases, the role of family participation decreases.

As per table 4.3.7 showing distribution of farmers as per whether a special training in dairying received. It was clearly indicated that in all farm sizes 70-80 per cent of the farmers had not received any special training in dairying. The result was surprising as even in medium and large farms who were considered to be entrepreneurs, the farmers did not attend a special training in dairying. This points to the lacunae in the present extension system in dairying which fails to reach to majority of farmers. Table 4.3.8 show the details of farmers' participation

in extension programmes. The results showed that 41.1, 67.0 68.0 per cent of farmers in three farm sizes did not participate in any extension programmes during the previous year of study. The low participation of farmers in the extension programmes could be discussed from two points of view. One was the present extension programmes either failed to attract or beneficial to real farmers. The second reason might be the factor that, dairying was a daylong job where the farmers were not having time for participation. This point to the need to revamp of present extension system so that it would reach the farmers.

The distribution of farmers according to the criteria whether dairying is their major occupation showed that the proportion of farmers who considered dairying as their major occupation was 20.6, 41.0 and 49.3 per cent respectively in small, medium and large size farms. The results show that the dependence of dairying as major occupation increases as farm size increases. The traditional farmers may be considering dairying as part of their life and agriculture and has to depend on many sources for income for their livelihood which is presented as figure 2, which shows the dependence of farmers on different sources for income as the income or dependence on single source is not viable. In medium and large farms, there is a tendency for specialization.

Table 4.3.11 shows the distribution farm house holds according to their land holding. Irrespective of farm size, majority of farmers (45.7%) were having a land holding between 101- 500 cents. Even though the average land holding of a Keralite was near to 30 cents, in the present study the per capita land holding was 101-500 cents for majority farmers. This might be due to the fact the major share of farmers selected for the present study were from Wayanad and Palakkad districts where per capita land holding was more. But the fact remain relevant that the fragmented land holding in Kerala is an impediment in dairy and agriculture development in majority of the areas.

The table 4.3.12 shows the experience of farmers in dairying. The results indicated that in all farm sizes majority of the farmers were having medium level of experience in dairying. Table 4.3.13 shows the family experience index of the

dairy households under different farm sizes. Irrespective of farm sizes medium level of experience was dominant. The small dairy farmers are traditional farmers with long period of experience in dairying, while in large farms, the farmers are new entrants. The fact is that even with the long experience, the adoption level remains low.

Table 4.3.15 shows the distribution of farmers according to the level of motivation in dairying. The results indicated a comparatively lower motivation level in small farms and highest in large farms. The higher motivation level of farmers in large farms clearly indicated their entrepreneurial level at a higher level than traditional farmers without much commercial attitude.

The previous job in which the farmers were engaged before starting dairying was shown in Figure 4.3. The result showed that majority if the farmers were engaged in agriculture, animal husbandry and allied works as traditional farmers. Figure 4.4 shows the shift of farmers from other sectors to dairy sector. The results revealed that, in small farms zero per cent were shifted from other sectors, in medium farms 11.0 per cent and in large farms 22.7 per cent of farmers were shifted to dairy sector from other sectors. The overall picture showed presence of 8.0 per cent shifted and 92.0 per cent traditional farmers. The result revealed the fact that very few farmers are selecting dairying as their profession shifting from other sectors because of many social and economic reasons.

Table 4.3.18 shows the extent of information utilisation by the farmers from different communication or mass media sources. Medium level of information utilisation was observed in all types of farms. Table 4.3.19 shows the extent of social participation of dairy farmers. The overall picture showed that 70.3, 23.4 and 6.3 per cent of farmers were having low, medium and high level of social participation. The results of the study regarding the above factors are disappointing as majority of farmers are using communication sources and social participation only at medium level. This also results in low awareness and adoption level of new technologies in dairying. Table 4.3.20 shows the distribution of farmers according to their credit orientation. In all farm types and

in overall, majority of the farmers were having medium level of credit orientation. The credit orientation is a clear indication of the attitude of farmers towards credit utilization. The present study showed comparatively higher level of credit orientation in large farms that are comparatively socio-economically progressive. Vedamurthy and Sirohi (2016) studied the factors responsible for default of credit.

The results of the present study on the socio-personal and economic data were well supported by findings of a few authors who investigated the same among the dairy farmers of Kerala. George and Nair (1990) studied the livestock economy of Kerala and socio-economic profile of the farmers and reported similar results as were reported by Varghese *et al.* (2000), Pradeep and Rajkamal (2009) and Vidya *et al.* (2009). In other states also similar studies were conducted which supported the present findings except for some regional variations. Feroze *et al.* (2011) studied the microfinance through SHGs and its impact income from dairying in Haryana wherein it was revealed that the variable credit had significant impact on gross income from dairy. Shinde (2011) carried out a study on socio - economic profile of farmers in Maharashtra State. It was found that there was a striking difference in primary sources of occupation across the different categories. Datta and Singh (2013) investigated the communication behaviour of innovative dairy farmers in Haryana and concluded that the innovative farmers were regularly using mass media as the source of communication. Naik *et al.* (2013) analysed the existing dairy farming in Goa and reported that majority (74%) of the farmers had agriculture or horticulture as the primary source of income and only eight per cent had dairying as major job. Prasad *et al.* (2013) studied the socio personal profile of farmers of Jind district of Haryana. Rathod *et al.* (2013) investigated the personal and socio-economic characteristics of dairy farmers in Western Maharashtra. Rani *et al.* (2013) studied the socio economic traits of farmers in Kurukshetra district of Haryana.. Roy *et al.* (2013) reported that majority of farmers in Andaman Islands belonged to small family size followed by medium and large.

4.4 HERD PROFILE

The details of composition of the herd in different farms were given in table 4.4.1. All the farms showed almost same pattern of distribution of different categories of cattle. The overall picture showed in composition of in milk animals (25.92 per cent), dry (6.81 per cent), milch (32.74 per cent), heifer (7.37 per cent), female calf (9.17 per cent) male calf (4.41 per cent) and total calves (13.58 per cent). In small, medium and large farms, the herd size was 3.13 ± 0.08 , 9.52 ± 0.3 and 36.38 ± 3.65 respectively. The overall herd size was 12.08 ± 1.05 .

The mode of replacement of animals in the farm was presented in the Figure 4.6. Irrespective of farm size the preferred mode of replacement was purchase.

Table 4.4.3.4.1 showed the details of type of purchase in the farms. The result indicated that irrespective of the size, direct purchase was the dominant type. Table 4.4.3.4.2 showed the source of purchase of animals. In small and medium farms majority of animals were purchased from within district. In case of large farms, outside state purchase was more. The source of finance for purchase of animals in the farms was described in Table 4.4.3.4.3. Using own finance was found to be the dominant source of finance in all types of farms as per the results of the present study.

Table 4.4.3.4.4 showed the details of the breed purchased in the farms. The overall picture showed that 31.7 and 68.3 per cent of purchased animals were CBJ and CBHF respectively. The detail of production level of animals is presented in Table 4.4.3.4.5. In small and medium farms majority of the animals belonged to the production level of 10-15 litres/day. In large farms, the majority of the animals purchased were having a production level of 15-20 litres/day. Table 4.4.3.4.6 showed the details of stage of purchase of animals in the farms. Majority of animals purchased in all farms were lactating animals. The purchase of heifers and calves were very few in all types of farms. Details of the lactation number of the purchased animals were given in the Table 4.4.3.4.7. In small, medium and large farms, the majority of the animals purchased, were belonging to first order lactation followed by second and third

The details of farmers preference in type of purchase of animals was presented in table 4.4.3.5.1. The overall values were 46.0, 51.4 and 2.6 per cent for direct, scheme linked and combination purchases. Table 4.4.3.5.2 showed the details of preferred source of purchase of animals in the farms. The overall result showed that the preference for within district, within state, outside state and combination purchase was 62.0, 6.6, 29.7 and 1.7 per cent respectively. Table 4.4.3.5.3 showed the details of preference of farmers for finance for purchase of animals. The overall picture showed that 41.4, 4.0, 0.3, 52.0 and 2.6 per cent preferred own finance, loan own + loan, own + subsidy and loan + own + subsidy as source of finance of purchase of animals. The details of preference for a particular breed by farmers during purchase were given in Table 4.4.3.5.4.

The overall picture showed that 37.7, 48.6, 0.3 and 13.4 per cent of farmers preferred CBJ, CBHF, local and combination of CBJ and CBHF respectively. Table 4.4.3.5.5 showed the preference for production level of animals purchased. Majority of small and medium farms preferred 15-20 litres/day production level. In large farms, majority preferred more than 20 litres/day production level. The details of stage of lactation of animals preferred by farmers for purchase were described in table 4.4.3.5.6. Irrespective of farm size, the farmers preferred lactating animals for purchase. Table 4.4.3.5.7 showed the details of preferred lactation number for purchase. Irrespective of farms, majority of farmers preferred first three lactation orders.

The results of the present study regarding the herd building, herd size, various aspects of purchase and preference for purchase are well supported by earlier studies conducted both in the state and in other states. The selection of the way of herd building by the farmers is based on their need and past experience. George and Nair (1990), in their study titled livestock economy of Kerala analyzed the data on the method of herd building by sample households and reported that, in the case of crossbreds 60 per cent of the stock was purchased. George and Nair (1990) reported that the composition of animals indicated a tendency among small holdings to keep relatively higher proportion of young

stock. George and Nair (1990) in their study of livestock of economy of Kerala reported the preference of farmers regarding the production level of crossbred animals, breed preference, stage of purchase etc. The findings of the above study were almost in agreement with the present study except for the periodical changes. The results of the present study were in agreement with Varghese *et al.* (2000) who conducted a detailed investigation on herd profile of dairy farmers of Pathanamthitta district, Kerala.

Table 4.4.4.1 showed the lactation number or order of lactation of animals present in the farms. The results showed that irrespective of farm size, almost 90 per cent of animals were in the first five lactation orders. The distribution of animals based on stage of lactation and pregnancy were detailed in Table 4.4.4.2. The results indicated that, irrespective of farm size majority of animals in small, medium and large farms were in the first 100 days of lactation. The proportion of dry animals was 7.9, 12.2 and 16.8 per cent in small, medium and large farms respectively. The proportion of pregnant animals was 27.44, 24.43 and 24.6 respectively in small, medium and large farms. Table 4.4.4.3 gave details of per cent of animals in milk, dry, pregnant, in first three lactations and in first 100 days of lactation. The overall picture showed that 86.58 per cent of animals were in milk out of total milch animals, 13.42 per cent were dry, 33.37 per cent were pregnant, and 82.22 per cent were in first three lactation order and 36.58 per cent in first 100 days of lactation.

Table 4.4.4.4 shows the average age, per cent of pregnant heifers in the farms. The age-wise distribution of male calves was given in the Table 4.4.4.5. Irrespective of farm size majority of male calves were below three months of age. The age-wise distribution of female calves in different farms was given in Table 4.4.4.6. The results indicated that majority of the female calves were below three months of age irrespective of farm size.

The results of the present study regarding the physiological status of various categories of animals were supported by earlier studies conducted on

same. Ghule (2010) reported the physiological status of animals in commercial farms of Maharashtra and shared similar results.

The results as in table 4.4.5.1 showed the details of purchase of animals and value of purchase. The results revealed that irrespective of farm size, the majority of animals purchased were milch cows and purchase of heifers and calves was in negligible numbers. The details of sale of animals in the farm in the preceding year of present study were described in Table 4.4.5.2. The results showed that majority of the sale were of milch animals and male calves. Table 4.4.6.1 and Table 4.4.6.2 showed the disposal pattern of female and male calves in different farms. Irrespective of farms size, majority of female calves were retained in the farm. While majority of male calves were sold out. The details of mortality pattern of animals in the farms in the previous year if the present study is presented as Figure 4.7. The results revealed that irrespective of farm size the higher rate of mortality was observed in male calves.

The results of the present study regarding cattle transactions, the reason for transactions, calf disposal pattern and mortality were in agreement with the earlier studies conducted in the state. George and Nair (1990) and Varghese *et al.* (2000) shared similar findings in this area.

4.5 FARM INVENTORY

Table 4.5.1 showed the type of land used by the farmers for constructing animal sheds. It showed that 100 per cent of farmers irrespective of farm size used own land for building/cattle shed construction. The details of type of land used for fodder cultivation were given the table 4.5.2. Table 4.5.3 showed the details of area used for cattle shed and fodder cultivation. Table 4.5.4 showed the pattern of investment on capital assets in different farms. The results revealed that the major share of capital expenditure was on milch animals followed by buildings. The investment on equipments was comparatively small. Ghule (2010) investigated the investment pattern in commercial farms and shared almost similar findings.

The level of mechanisation in different farms was presented as Figure 4.9. Irrespective of farms, low level of mechanisation was observed. The finding of the present study on the mechanization level in farms is very important. Many authors highlighted the importance of mechanization in dairy farms. The mechanisation sector had undergone a revolution in terms of many machines which are highly sophisticated designed for cattle houses. There was an urgent need to enhance the awareness and availability of these technologies and equipments through direct farmers' education (Government of Kerala, KPP, 2014). The scope of reducing the cost of production and drudgery of farm operations by mechanisation in dairy farming like utilisation of modern milking machines, chaff cutters, water sprinklers and slurry pumping units etc. were included as important item in the plan schemes of the state (GoK, Dairy Department, 2014). Hazarika(2015)also observed mechanisation as one of the critical inputs to increase the yield of crops

4.6 EXISTING MANAGEMENT PROFILE OF THE FARM

Figure 4.10 showed the details of type of housing followed in different farms. In small farms 88.0 and 12.0 per cent of houses were permanent and temporary respectively. Classification of cattle houses based on building pattern was presented in Table 4.6.1.2. Eleven types of building pattern were observed, based on the position of cattle shed (related to human house) floor and roof.

The level of heat stress alleviation measures followed in the farms were presented in the table 4.6.1.3. In small and medium farms majority of the farmers were at low level and in large farms 64.0 per cent were at medium level.

The findings of the present study present housing system followed in Kerala was supported by earlier works and the housing pattern and importance of heat stress alleviation measures to be followed for cross bred animals in the climate change threat was highlighted by many authors like Kochewad *et al.* (2013), Maiti *et al.* (2014 and Das and Singh, (2014).

Figure 4.11 presented the system of feeding followed by farmers under different farm size. In small and medium farms majority were following stall

feeding along with grazing (54.3 and 57.0 per cent) respectively. In large systems the major system was stall feeding (90.7 per cent). The type of feeds fed to animals in the farms was given in Table 4.6.2.2. Irrespective of farm size, majority of the farmers fed a combination of green fodder dry fodder and concentrate. Table 4.6.2.3 showed the nature of grazing area used by the farmers. Table 4.6.2.4 showed the type of concentrate fed to animals in different farms. Irrespective of farm size, vast majority of farmers used a combination of branded compounded cattle feed and other concentrate feed ingredients. The source of green grass in different farms is given in the Table 4.6.2.5. In small, medium and large farms 6.3, 1.0 and 5.3 per cent had not practised green grass feeding. In small and medium farms, combination of fodder cultivation and collection of local grass was the major source of green grass with proportions 39.4 and 45 per cent respectively. In large farms cultivation of green fodder was the major source (68%) of green grass. Table 4.6.2.6 presented the type of fodder cultivation in the farms. In small, medium and large farms 45.1, 26.0 and 8.0 per cent of the farms were not having any fodder cultivation. In small and medium farms intercropping was dominant with a share of 27.4 and 29.0 per cent respectively. In large farms majority (84.0 per cent) were practicing pure cropping of both respectively.

The details of type of fodder cultivation in different farms were presented in Table 4.6.2.7. In small, medium and large farms majority of farmers cultivated grass fodder the cultivation of legume and cereal fodder were in negligible number in all farms. Table 4.6.2.8 shows the details of variety of fodder cultivated in different farms. It showed that Hybrid Napier was the major variety cultivated in all farms (52.0, 69.0 and 44.0 per cent respectively). The cultivation of Congo signal and Maize were practised in a very few farms.

Figure 4.12 showed the details of source of straw in farms. In small, medium and large farms 10.9, 3.0 and 5.3 per cent were not using paddy straw in their farms. In all types of farms purchase was the source of paddy straw. The reason cited by the farmers as the reason for non-cultivation of fodder was presented in Table 4.6.2.10. Lack of suitable land and preferred for cash crops

were the major reasons given by farmers for not cultivating fodder irrespective of farm size.

Table 4.6.2.11 had given the details of feeding schedule followed in different farms. In small, medium and large farms average quantity of green fodder (kg) fed to milch animals were 25.48, 19.14 and 18.65 respectively. The average amount of concentrate feed fed (kg) to milking animal was 5.44, 4.65 and 5.81 in small, medium and large farms respectively. The amount for dry animals was 0.38, 1.01 and 1.81.

The present findings on the feeding pattern in dairy farms are almost in agreement with earlier studies both in the state and outside. George and Nair (1990), Varghese *et al.* (2000), Singh *et al.* (2007), Sinha *et al.* (2009), Unnithan *et al.* (2010), Sreedhar (2011), Kochewad *et al.* (2013), Roy *et al.* (2013) and Kad *et al.* (2014) shared almost similar results in their respective study areas. The importance of feeding management was highlighted in many development programmes of the state. Kerala produced only 60 per cent of the roughages required for cattle in Kerala, one of the major constraints for increasing milk production in Kerala. Marginal and small farmers who were the major cattle owners of the state had limited space for fodder development (GoK, Dairy Department, 2014).

Figure 4.13 presented the details of agency providing artificial insemination services (AI) in the farms. Irrespective of size, majority of the farms used the service of Animal Husbandry Department (AHD). Table 4.6.3.2 showed the details of the person providing AI service in the farms. Table 4.6.3.3 showed the details of place where AI is being done. The overall picture revealed that 92.3, 4.6 and 2.9 per cent of farmers carried out AI at farm premises ICDP centre and veterinary hospital respectively. The details of distance to the next AI centre were presented in the table 4.6.3.3. The results showed that majority of the farmers were having AI centre within a distance of three kilometres from their farm. Figure 4.14 presents the farmers' perception regarding the availability of AI service. Majority of farmers had given 'good' response to availability of service

in small and medium farms with respective values 68.6 and 79.0. In large farms 42.7, 48.0, 9.3 per cent of farmers gave good, satisfactory and poor response.

Saseendran *et al.* (2008) studied the role of government sponsored institutions for breeding support by conducting a survey in Thiruvananthapuram and Ernakulum milk union areas covered by Milma. They found that A.I. per conception rate was least in the group where distance to nearest veterinary service station was highest. Unnithan *et al.* (2010) investigated the dairy production situation in Kerala and reported that cattle breeding and health care services were not cost effective. The AI services when home delivered were not free. Although the pricing of semen was withdrawn, the farmers continued to pay as before. The on-call service in rural areas was far from satisfactory and was expensive.

The details of method of milking followed in the farms were presented in Figure 4.15. Irrespective of farm size most of the farmers resorted to hand milking. In large farms the comparative proportion of machine milking was more (44.0 per cent) but still 54.7 and 1.3 per cent followed hand milking and combination of both. Figure 4.16 presented the details of persons engaged in milking in the farm. Irrespective of the farm size, in majority of farms the farmers themselves were engaged in milking. The frequency of milking adopted in different farms presented in the table 4.6.4.3. This showed that irrespective of farm size all the farmers followed two times milking daily. Table 4.6.4.4 showed the milking interval followed in different farms. Irrespective of farm size, majority of the farms kept an interval of 8-12 hours between two milking.

Similar studies on milking management were presented by Daisy *et al.* (2007) and Filipovic and Kokaj (2009). Kochewad *et al.* (2013) studied the milking management practices in upper Gangetic plains of India. They reported that all the farmers performed milking twice daily.

The details of type of labour used in different farms were presented in Table 4.6.5.1. The small (99.4 per cent) and medium (70.9 per cent) were dependent mainly on family labour. While in large farms, there was more (52.0 per cent) dependence on paid labour. Table 4.6.5.3.1 presented the details of family labour

utilization in farms. The results clearly showed more dependence of small and medium farms on family labour. Both male and female members were involved with a significant contribution from female labour. Table 4.6.5.3.2 showed the details of family labour used for collection of green grass in different farms.

The following were the findings of the earlier workers and their observations which will be helpful in understanding the relevance of the results of the present study. George and Nair (1990) investigated the labour use pattern in dairying in Kerala and revealed that it was carried out mostly with the utilization of family labour. Andrews and Poole (2004) pointed out the importance of good labour. In many farms this was supplied by family but for large farms paid labour was common. Unnithan et al. (2010) reported that all the daily activities related to cattle keeping with the exception of milking in a few households were contributed by family members as of now in Kerala, but the availability of family labour would be a major challenge in the years to come in the wake of rapid urbanization and fast changing living conditions of rural and semi urban Kerala. Chayal et al. (2009) and Oberoi and Sharma (2013) reported the role performed by the women in farm activities. Sabu et al. (2013) found that women labour participation was maximum in feeding (66.25 per cent) and health care (61.25 per cent). The supporting role was high in marketing and processing (49.68 per cent) and breeding (39.5 per cent). Bara *et al.* (2013) recorded the average time (minute/labour unit/animal unit/day) for various categories of animal was 40.76 for milch cow, 28.16 for heifer, 48.94 for calf and 43.76 for advance pregnant cows. Hazarika (2015) gave a picture and reasons for labour scarcity in India.

The classification of farms based on waste management system was presented in the table 4.6.6. The overall results showed that 46.3, 28.6 and 25.1 per cent of farms were having poor satisfactory and good waste management system. The importance of waste management system was well highlighted by many authors and in different development plans. Devendra (2007) also opined that in the future, the major issue to be addressed would be waste disposal. Better management of nutrients, waste and water might be one of the practical policy

options in the better environmental management in case of livestock farms especially in intensive ones(Government of Kerala,KPP,2014).

Figure 4.17 showed the information regarding provision of veterinary services in the farms. The results showed that in all types of farms majority of farmers were dependent mainly on government veterinarian for the service. Table 4.6.7.2 showed the details of place where animals are taken for treatment. In all types of farms majority of farmers carried out treatment in farm premises itself. Table 4.6.7.3 presented the details of distance to the nearest veterinary hospital. Irrespective of farm size, majority of the farms had presence of a veterinary hospital within a distance of five kilometres. The farmers' perception regarding the availability of veterinary services is presented in figure 4.18. Majority of farmers in small (65.1 per cent) and medium (66.0 per cent) expressed the service availability as good. In large farms, majority (72.0 per cent) expressed satisfaction on availability of veterinary service.

The results of the investigation on health care management are discussed in agreement with earlier studies. George and Nair (1990) investigated the attitude of dairy farmers towards veterinary services and reported following tendencies. In general, vaccination was carried out by both doctors and livestock inspectors. Varghese *et al.* (2000) investigated the veterinary service availability of Pathanamthitta district of Kerala and reported that among the farmers 59.82 per cent had a veterinary dispensary or hospital within 2km. of their home and 73.21 per cent had a veterinary institute within 3 km of their home. Unnithan *et.al.* (2010) in their study in Kerala reported that the high price of Veterinary medicines was unbearable to an average dairy farmer.

4.7 EXTENT OF ADOPTION OF RECOMMENDED DAIRY FARMING PRACTICES

Table 4.7.1 showed adoption index of various management practices in different farms. The overall adoption score was highest (90.04 per cent) followed by medium (89.40 per cent) and small farms (84.36 per cent). The classification of

farms based on adoption level into classes was presented in Table 4.7.2. In all types of farms majority farms were in medium adoption class with 64.6, 68.0 and 70.7 per cent for small, medium and large farms respectively. Table 4.7.3 showed the reasons perceived and ranked by the farmers as the reason for deviation from recommended practices. In all types of farms inadequate price for milk and high price of inputs were ranked first and second. Low demand for milk was not considered as a reason for any of the farmers in any farms.

Maousam *et al.* (2014) and Manhas (2015) analysed the extent of adoption of improved dairy farming practices in UP and Jammu respectively and revealed that majority of the respondent farmers (62%) were having medium level of adoption. Maximum level of adoption was found in case of feeding practices, where as minimum in case of housing practices.

4.8 REPRODUCTION AND PRODUCTION PARAMETERS

The details of some of the production and reproduction parameters were presented in table 4.8.1. The details of milk production and production of the farms were presented in table 4.8.2. The wet average (litres/day) was 8.98, 8.00 and 10.00 in small, medium and large farms respectively. The dry average (litres/day) was 8.13, 6.65 and 7.86 in small, medium and large farms respectively. The details of milk production and production of the farms were presented in table 4.8.2. The wet average (litres/day) was 8.98, 8.00 and 10.00 in small, medium and large farms respectively. The dry average (litres/day) was 8.13, 6.65 and 7.86 in small, medium and large farms respectively. Table 4.8.3 showed the details of average fat solids-not-fat (SNF) and price realized per litre from the cooperative society.

The results are discussed considering earlier findings in the area. The present study revealed that the large farms showed better performance regarding various production and reproduction parameters. The wet average was 8.98, 8 and 10 litres per day in small, medium and large farms respectively. The dry average was 8.13, 6.65 and 7.86 litres per day in small, medium and large farms respectively. Regarding the wet average, large farms performed well and in dry

average, small farms were better. The results showed that the average overall values were 3.88 (AM), 4.04 (PM), 8.16(AM), 7.20 (PM) and Rs.29.64 were the respective values.

Similar studies on production and reproduction of animals in Kerala were conducted earlier George and Nair ,Iype *et al.* (1994) Ibraheem kutty C. and Ramachandran, K. (2000) and Stephen *et al.* (2009). According to Abe *et al.* (2009) days from calving to first service was favourable to genetic selection for reproductive traits because of relatively high heritability and because it can be available earlier than the days open. Unnithan *et al.* (2010) reported that the milk yield of cows (litres per day) in Kerala was 7.39, 9.2 and 9.46 in Malabar, Ernakulum and Thiruvananthapuram regions. A study in Kerala Agricultural University based on more than 30,000 samples of milk from crossbred cows had revealed that two third of the cows in the early lactation produce milk with less than 3.5% the minimum fixed as per PFA act. Study on SNF revealed that around 47% percentage of cows irrespective of the stage of lactation and time of milking recorded SNF percentage below the legal standards of 8.5 per cent. From a field study covering the entire state of Kerala, it was found that the average SNF content in the milk of cross bred cattle was only 8.2 per cent. About 82 per cent of the samples collected were showing SNF below the legal level of 8.5. The present average daily milk production of cross bred cows of Kerala was around 7.50 kg (KAU, 2010).As milk recording by Government agencies would be very expensive, the literacy of farmers of Kerala could be utilized for this purpose. Owners could record the milk production monthly and there could be supervision by an authorized agent. These records could be utilized to predict the standard lactation milk yield accurately. Daily milk records at 6 weeks interval were also found to be suitable for prediction with accuracy. (KAU, 2010) .Radhika *et al.* (2012) conducted a study in the Wayanad district of Kerala and reported similar results.

4.9 MARKETING AND DISPOSAL PATTERN

The details of disposal pattern of milk were presented in the Table 4.9.1. The major share of milk produced in small, medium and large farms were sold to society. Figure 4.23 had given the details of the agency for marketing of milk. In all farms major share of milk was sold to society. Table 4.9.2.2 showed the average distance from the farms to society. The average distance from farm to society (km) was 1.08, 1.62, 2.67 and 1.58 in small, medium, large and overall farms respectively. Table 4.9.2.3 presented the details of the mode of transport to the society. In small farms, majority (78.9 per cent) reached society on foot. In medium farms the major (64.0 per cent) mode of transport was two-wheeler. In large farms also major mode (70.7 per cent) was by two wheelers followed by auto rickshaw (20.0 per cent). Table 4.9.2.4 had given the reason for selecting a marketing channel by the farmers. The reason for selecting society as channel became only society was available and direct marketing channels were absent. Direct marketing channels were selected because of the higher price realised. Figure 4.24 presented the details of agency used for direct sale of milk. In small, medium and large farms 72.0, 69.0 and 94.7 per cent of farmers were not having any direct sale of milk. The neighbours were the major target for direct sale in all types of farms.

The results of the present study on milk marketing are discussed in light of earlier findings. George and Nair (1990) as part of their study of livestock economy of Kerala studied the production and disposal pattern of milk of the total daily milk production from all animals 66.3 per cent at noon and 24.4 per cent in the evening. Of the total daily milk production, about 37 per cent was consumed at home and 63 per cent was sold. George and Nair (1990) investigated the marketing avenues for milk producers in Kerala. The farmers used four avenues for selling milk, direct to consumers in the village, tea shop, middle men and cooperatives. Direct sale to consumers in the village was the most popular outlet (38 percent), cooperatives (30 percent) tea shops (27 per cent). The share of middle man was about 4 per cent of the total sale. The prices realised was

maximum from direct sale to the consumers and the least price from sale to the middle men. Varghese *et al.* (2000) studied the status of rural dairying in Kerala and reported that, of the farmers studied in Pathanamthitta district 86.61 per cent were selling milk, but majority (54.29 per cent) were selling milk in unorganized sector.

4.10 ROLE OF CO-OPERATIVES DAIRYING

The perceived benefits by the farmers regarding participation in co-operative societies were presented in Table 4.10.1. Irrespective of the farm size guaranteed market was main benefit cited by the farmers. Table 4.10.2 presented the complaints raised by the farmers regarding working of societies. The lower price realised for milk and low fat and SNF was the major complaints ranked as first and second by all types of farms.

The results of the present study could be discussed in the light of the earlier works in the area. Rajendran and Samarendu (2004) stressed the role of dairy co- in rural poverty alleviation. Lopoyetum and Selvamani (2006) studied whether dairy co-operative marketing business organizations are sustainable in the new economic environment and to evolve strategies for the same. They found out that sustainability of dairy co-operative marketing business organizations in the new economic environment demand a lot of marketing efforts and adoption of new strategies. Sulaiman and Pillai (2006) found that even though dairy co-operatives were rendering services to member farmers, the working of the societies is not up to the expectation. The farmers were facing problems like low procurement price of milk, partial collection of milk, indifferent attitude of the staff, lack of transparency in the quality of inspection and delay in getting sales proceeds. Khan and Jagatap (2007) examined the working of dairy societies in Karnataka. It was observed that the schemes of the society have enabled the downtrodden and weaker sections of the society to meet their minimum and daily expenditures. Nishi *et al.* (2011) in her study titled “Dairy Farmer’s Satisfaction with Dairy Societies: A case Study”. The survey revealed that more the farmers are motivated towards economic accomplishment, they utilizes the services of the

societies to a great extent for their economic benefit. Meena *et al.* (2013), Wani *et al.* (2013) and Rathod *et al.* (2013) conducted studies on impact of dairy cooperatives in different parts of the country.

4.11 INSTITUTIONAL ASSISTANCE

The classification of farmers based on the extent of assistance (both fixed and recurring) received from government and other agencies showed that medium level of assistance was received by all types of farms. The impact of level of assistance on adoption of better management was presented in the Table 4.11.2. A significant association between adoption class and assistance class was observed. The farmers' perception regarding assistance was presented in Table 4.11.3. In small, medium and large farms 80.0, 73.0 and 70.7 per cent expressed very low satisfaction level regarding institutional assistance. The farmers' perception regarding the area where government can help as ranked by the farmers was given in table in table 4.11.4. In all farm types provision of subsidy for feed was the first demand raised by the farmers followed by increased rate of milk.

The results of the present study regarding institutional assistance in dairying are almost in agreement with earlier studies in the area. George and Nair (1990) in their study on livestock economy of Kerala reported that among the sample households, 88 had received subsidy from the government for purchase of milch animals. When asked whether availability of subsidy had influenced the decision to keep animals, of the 93 respondents, 39 reported that their decision was influenced by the amount of subsidy. Chauhan and Kundu (2005) conducted a study in Haryana state covering three districts where intensive cattle development project were functioning. They reported that the beneficiary households enjoyed on an average 3.77 times higher level of net income than non beneficiary households. They also found that new technology had exerted a favourable impact on several socio-economic parameters like productivity per animal, employment generation especially for women income generation and also an income distribution. Kumar *et al.* (2008) conducted a study at two Institute

Village Linkage Programme (IVLP) centres. The overall impact of IVLP on herd size had shown 23-28 per cent increase. There were 15.9, 26.72 and 33.87 per cent increase in milk yield of cross bred cows. The overall increase in average milk production and milk sale was 5.62 and 5.15 litres/day respectively. Sinha *et al.* (2012) observed a very favourable response of micro credit to the tribal farmers of Jharkhand.

4.12 DAIRY FARM PERFORMANCE

The 4.12.1 presented the Capacity Utilisation Index (CUI) in different farms. The perceived profitability of the enterprise by the farmers was presented in table 4.12.2. In small, medium and large farms, 76.0, 84.0 and 92.0 per cent perceived their profitability as somewhat profitable, while 21.7, 7.0 and 6.7 per cent of farmers in small, medium and large farms respectively expressed it as high loss only 2.3, 9.0 and 1.3 per cent of respective farms viewed it as more profitable. Table 4.12.3 presented the livestock production index under different farm sizes. The mean values were 0.88, 1.01 and 1.24 in small, medium and large farms respectively. The classification of farms based on – dairy farm performance index was presented in Table 4.12.4. In all farm types, farms showed medium dairy farm performance.

The results of the dairy farm performance index was discussed taking into account the observations made regarding this index by early workers. Yang (1980) measured milk production of animals using livestock production index. It was calculated by dividing the individual cow's milk production by the region average. The value above unity meant better performance of the animal than area average. Senthilvinayagam (1999) conceptualized the dairy farm performance in the form of Dairy Farm performance Index (DFPI) which was totality of three dimensions viz. capacity utilization of the farm, perceived profitability of the farm and dairy Production Index (DPI). Performance was a function of ability and motivation of the entrepreneurs and was the explicit behaviour exhibited by the entrepreneur in running the enterprise. (Senthilkumar, 2003).

4.13 CONSTRAINTS EXPRESSED BY THE FARMERS

Table 4.13.1 presented the constraints expressed by the farmers regarding feeding of dairy animals. In feeding, in all types of farms high price of concentrate feed was the major constraint. The non availability of green fodder and price of paddy straw were the other major constraints in feeding as expressed by farmers. Table 4.13.2 presented constraints in breeding as expressed by the farmers. In all types of farms, infertility was the major constraint. Table 4.13.3 showed animal health care constraints as perceived by the farmers. In small farms diseases was cited as the major constraint while in medium and large farms, high cost of veterinary medicine was the major constraint. Table 4.13.4 presented the policy, social and finance related issues raised by the farmers. Low price for milk was ranked first in all types of farms and raised as the overall major constraint. Table 4.13.5 showed the constraints regarding marketing of milk in the farms. Inadequate price from society and low fat and SNF in milk were ranked first and second in this category. The non-availability of market for milk was not at all a concern for any farms in any seasons.

The results of the present study were in agreement with earlier studies in the field conducted in different parts of the country like Singh *et al.* (2015) in Ranchi district of Jharkhand, Nagrale *et al.* (2015) in Vidarbha region of Maharashtra,

Jha and Singh (2015) in Odisha, Kant *et al.* (2015) in Western dry region of India and Payasi and Poonia (2015) in Varanasi district of U.P.

4.14 Economics of milk production

4.14.1 Cost of production

4.14.1.1 Cost of milk production per milk animal per day basis

The cost of milk production per milk animal per day basis was presented in the table 4.14.1.1. The average cost of production per litre of milk (cost B) was 28.09, 28.49, 25.68 and 27.69 respectively in small, medium large and over all farms respectively. The average cost/litre of milk after deduction of imputed family labour (cost A) was 19.93, 22.78, 24.93 and 21.81 in small, medium large and over all farms respectively. The cost of concentrate constituted 43.43, 34.7,

and 40.85 per cent of total maintenance cost in small, medium and large farms respectively.

4.14.1.2 Cost of milk production per milch animal basis under different farms

The details of cost of milk production per milch animal basis in the farms were presented in table 4.14.1.2. The average cost/litre of milk (cost B) was 32.51, 34.29, 29.08 and 32.29 in small, medium, large and overall farms respectively. The average cost per litre of milk after deduction of imputed family labour cost (cost A) was 22.02, 26.33, 27.08 and 24.34 (Rs/litre) in small, medium, large and overall farms respectively. The major share of maintenance cost was contributed by the cost of concentrate which was 43.43, 34.7, 40.85 and 40.38 per cent respectively in small, medium, large and overall farms.

4.14.2 Cost –Returns from milk production

4.14.2.1 Cost and Returns of milk production per milk animal per day basis

The details of cost and returns from milk production per day were calculated per milk animal basis and were presented in table 4.14.2.1. The net return from milk animal/day was Rs.44.46, 45.31, 62.02 and 48.46 in small, medium, large and overall farms respectively. The net return after deduction of imputed cost was Rs.110.36, 81.9, 70.12, and 93.61 respectively.

4.14.2.2 Costs and returns of milk production per milch animal per day basis

The cost and returns per day per milch animal was presented in Table 4.14.2.2. The net return per day per milch animal was Rs.23.34, 10.39, 27.74 and 20.58 respectively in small, medium, large and overall farms respectively. The net return after deduction of imputed family labour cost was Rs.92.59, 52.42, 43.12 and 70.51 in small, medium, large and overall farms respectively.

The result of the present study on cost and returns of milk production showed that the cost of milk production per litre of milk per milk animal with

imputed family labour was lower in large farms. It was almost equal in small and medium farms. The overall value was 27.69. All these values indicated that they are almost close to the price realized from the society. The cost after deduction of imputed labour was much better and was lower in small farms signalling the major contribution of family labour in small farms. It could be concluded that the margin or return obtained from milk production is only valuable to the level of their labour value. The net returns were positive in all farms and a significant value obtained only if the imputed value of family labour was not considered. If we are analysing the cost and return per milch animal basis, the cost per litre milk with imputed family labour was higher than or equal the average price obtained from the society. The value was higher in medium and lower in large farms. When the imputed family labour cost was reduced, the cost was lower in small farms and margin was positive in all types of farms. The net returns were positive in all farms with a considerable margin only if family labour is not considered. In all cases cost of concentrate was the major factor in cost. The results of the present study were in agreement with similar studies in the country. But depending on the production system and method of estimation some were contrary.

As per Unnithan *et al.* (2010) average gross cost of production of milk in the state of Kerala was Rs. 26.75. They also reported that the corresponding net cost of production cost was Rs. 26.27. This actual production was higher than the procurement price (Rs. 18.63) fixed for cow milk with 3.5 per cent fat and 8.5 per cent SNF at that time in the state. They also reported that nearly 48 per cent of the overall cost was on feeding 32 per cent on labour, 12 per cent on maintenance of dry cows and loss in value of cows comprised remaining 8 per cent. The study also identified variation in cost among different herd size. The net cost of production was Rs. 29.65 and 18.88 among single cow holder and medium sized farms owning ten or more cows respectively. Unnithan *et al.* (2010) reported that the three geographical zones of Kerala viz. coastal mid and high lands were having variations in cost of milk production. The net cost of milk production was Rs. 27.14, 26.09 and 24.84 in coastal mid land and high land zones respectively.

They also reported a seasonal variation in net cost of production as Rs. 25.67, 29.71 in flush and lean seasons respectively.

4.14.3 Cost-Return traits

Table 4.14.3 showed the various cost return traits. The pattern of values obtained in the present study are in almost agreement with Baruah and Sarker (1997) who studied about profitability in milk production in operation flood areas of Assam, used various cost and return traits like return over feed cost, feed cost efficiency, return over variable cost, fixed cost : variable cost, variable cost per litre of milk, price per litre of milk, break even output, percent break even output to total output and input-output ratio.

4.14.4 Measures of farm efficiency

Table 4.14.4 presented some of the measures of farm efficiency. The pattern of results of the present study is almost in agreement with Thomas and Sastry (1991) described certain parameters for analyzing the business in a dairy farm. The very soundness of the enterprise can be analyzed by these measured. Some of the measures of farm efficiency were as followed. Net farm income, Net cash income, net income per hectare, net farm income per adult unit, net return per Rs. 100 worth feed fed to livestock, capital per Rs. 100 gross return and rate of turnover .

4.14.5 Milk production function

The estimated milk production function for different farms revealed that coefficients of concentrate total roughage and different farms revealed that coefficients of concentrate, total roughage and adoption index were positive and statistically highly significant ($P < 0.01$) in small farms with R^2 as 63.0 per cent, indicating the importance these input in increasing a milk production. The labour cost was positive and significant ($P < 0.05$) in small farms. In medium farms the coefficient of concentrate was highly significant and roughage was significant at 5% level. In large farms the coefficient of concentrate was highly significant. The overall results showed positive and highly significant effects of concentrate

and adoption index and significant effect of total roughage ($P < 0.05$) with R^2 value as 67.0 per cent. The results were in agreement with the earlier works of Khan (2006) and Saseendran *et al.* (2008).

4.14.6 Resource use efficiency of milk production

Table 4.14.6 showed the estimation of resources use efficiency in milk production. The ratio of MVP to factor prices provides a measure of resource allocative efficiency. The marginal Value Products (MVP) of inputs in milk production for different farms are given in table 4.14.6. The results showed that in small farms the MVPs of two inputs viz. roughages and labour was significantly less than unity, signifying over utilization of these inputs. The MVP value of concentrate was significantly higher than unity indicating their under utilization in milk production process. In medium farms, the MVP of concentrate was positive and significantly greater than unity indicating their under utilisation. In large farms the MVP value of concentrate was positive and significantly greater than unity indicating their under utilization.

If an input is over utilized, the quantity of that input can be reduced without affecting output of milk and if an input is underutilized its amount can be increased to improve production of milk. As per results of the present study, the quantity of concentrate can be increased for improving milk production. Similar works on resource use efficiency of milk was conducted in different parts of the country showing supporting and contrary results. Kumar and Singh (2004) conducted a study in Tamil Nadu to analyze the input-output relationship, productivity of inputs and resource use efficiency of milk production in crossbred cows in Villupuram district. The estimated Cobb-Douglas function explained about 70 per cent variation in returns from milk yield of crossbred cows. In case of crossbred cows, the expenditure on concentrate and dry fodder had positive and significant impact on returns, but green fodder was non- significant. For crossbred cows, MVPs of dry fodder and concentrates were significantly more than unity indicating their underutilization, but MVPs of green fodder and labour were non significantly different from unity, indicating their optimal use.

Mahajan and Chauhan (2011); Kumar *et al.*(2012);Bardhan and Sharma (2013);Sharma *et al.* (2014);Rangnath *et al.* (2015) and . Prusty and Tripathy (2016) also made investigations on resource use efficiency with similar results

4.14.7 Technical efficiency of milk production

Farm specific technical efficiencies were worked out from the stochastic frontier production function. The results are presented in Table 4.14.7. The mean technical efficiency in small, medium and large farms was 99.80, 83.22 and 99.96 per cent respectively.

The results of the present study indicated that in small and large farms the farm specific technical efficiency reached almost its frontier level and in medium farms, it was 83.22 percent still leaving space for reaching optimum production. The values of small and large farms are in disagreement with earlier works but that of small farms was in agreement with earlier works of Battese and Coeli (1988); Manohar *et al.* (2004); Saravanakumar and Jain (2008); Pandian *et al.* (2012) ;Kumar (2012);Bhardhan and Sharma (2013) ;Sharafat (2013) and Umamageswari *et al.* (2016).

4.14.7 .1 Determinants technical efficiency in milk production

Estimates of determinants of Cobb-Douglas function of farms – specific technical efficiency has been estimated for farm types and is presented in table 4.14.7.1. In small farms, the adoption index and herd size was having significant ($P > 0.05$) influence on farm specific technical efficiency. In large farms education index was having significant ($P > 0.05$) influence and overall level farming experience index had significant ($P > 0.05$) and herd size was having highly significant influence on technical efficiency of farms. The results were in agreement with Khan (2006) and Umamageswari *et al.* (2016).4.15

4.15 CORRELATION BETWEEN VARIOUS SOCIO-ECONOMIC, ADOPTION, PRODUCTION AND COST-RETURN PARAMETERS

Table 4.15.1 showed the correlation between socio-economic, production and net return of the farmers and adoption index of their farms. Table 4.15.2 described the correlation between dairy farm performance index, production, cost and adoption index. Table 4.15.2 showed correlation between dairy farm performance index, production, and cost and adoption index. Table 4.15.3 presented the details of correlation between the physiological state of animals in the farm and productivity, cost and return parameters. The results of the present study showed highly significant correlation between socio-economic, adoption, farm performance parameters as expected.

4.16 MILK PRICING

A critical analysis to reach at a new formula for pricing was carried out in the present study. Many early researchers had investigated and attempted for developing a model for milk pricing. Saravanakumar and Jain (2009) attempted to develop a model for milk pricing in Tamil Nadu. Unnithan *et al.* (2010) opined that Kerala paid the highest procurement price in cow milk segment. Considering the various findings of the study they recommended a procurement price for milk recommended a procurement price for milk having 3.5 per cent fat and 8.5 per cent SNF should be fixed as Rs. 26/- per litre of milk during the period of the study (2010). Bardhan and Sharma (2012) opined that to make dairying more remunerative price was a very important factor to consider as it often acts as an incentive for farmers to scale up their production.

6. SUMMARY

Profitability is the key word which drives any enterprise. The estimation of cost of production is the prerequisite for formulating the pricing policy of milk. The present study was designed to study the management practices, trends and issues of various dairy production systems in Kerala, to study the variation in cost and profitability of milk production under different dairy production systems, to assess the influence of various assistance schemes in the economy of milk production and to evaluate the present milk pricing policy of Kerala and suggest modifications.

A stratified multistage random sampling procedure was used to select the area of study and respondents. In the first stage, the state of Kerala was stratified into five agro-climatic zones. In the second stage one district from each zone was randomly selected. In the third stage, from each district two blocks were randomly selected. The farmers/farm households were categorized into small or subsistence farms (1-2 cows), medium (3-10 cows) and large farms (more than 10 cows). Out of 350 farmers selected for the study the numbers of small, medium and large farms were fixed as 175, 100 and 75 respectively. The sample size for each category of farms in each block was determined in proportion to the number of farmers belonging to each category (Probability proportion to size technique).

The objectives of the study were accomplished through the collection, processing and analysis of primary and secondary data. For collection of primary data, triangulation- a multi method- was used. Five methods of data collection were used. These included observations, focus group discussions, measurements, in-depth interviews and questionnaires. The data pertained to the year 2015-16. The season of the study period included those months excluding rain and summer (August- January).

The identification of various dairy farming systems based on farm size and within different farm sizes production systems based on major crop, income and dry matter availability to animals was attempted. The details of distribution of small, medium and large farms indicated that small sized farms were predominant with a share of 78.80 per cent, followed by medium farms (20.40 per cent). Large farms were having mere 0.70 per cent share to total. The same pattern of

predominance of small farms was observed in all the selected blocks. Based on the major crop or cropping pattern of the household eight farming systems were identified in three farm size groups. The results showed that the mixed and homestead farming systems was dominant type. The distribution of farming systems based on the share of income from different farming activities showed that mixed farming was dominant (64.86 per cent) than specialized dairy farming system (34.86 per cent) in overall. The classification of dairy farming system based on the availability of the source dry matter to livestock in overall showed that 57.7 per cent of farming system was SLP type and 42.3 per cent was CL type (Crop-Livestock mixed).

The present study investigated the socio-personal and economic data of the farmers in detail. The study of the age of the farmers under three farm sizes showed that, 65.7 per cent, 69.0 per cent and 50.7 per cent fell in the age group of 40-60 years. The overall picture also showed that majority of the farmers (63.4 per cent) fell under the age group of 40-60 years. The study of the gender of the person who led the dairy activities in the household revealed that, at overall level male (70.9 per cent) had lead role in dairy activities and female had leadership in 29.1 per cent dairy farms.

The investigation on educational status and level of education revealed that in small farms, majority of the farmers (44.0 per cent) had completed secondary education followed by middle school education (27.4 per cent). Overall picture showed the predominance of secondary school education (38.0 per cent). Irrespective of farm size, majority of farmers had medium level of education. The size of family of the dairy farmers under different farm sizes showed that medium sized families were in majority in all farm size groups. The level of participation of family members in dairy activities revealed that irrespective of the farm size, majority of the farms had medium level of family participation.

In all farm sizes, 70-80 per cent of the farmers had not received any special training in dairying. In overall 92.3 per cent of the training were organized by government and only 8.3 per cent by non-government organizations. The investigation on farmers' participation in extension programmes revealed that 41.1,

67.0, 68.0 per cent did not participate in any extension programmes during the previous year of study. The proportion of farmers who considered dairying as their major occupation was 20.6, 41.0, 49.3 per cent respectively in small, medium and large size farms respectively. Majority of the farmers irrespective of farm size had either dairying agriculture or allied fields as their major sources of income. The distribution of farm households according to their land holding in overall showed that 16.9 per cent of farmers with less than 30 cents, 25.1 per cent (30-100 cents), 45.7 per cent (101-500) and 12.3 per cent (>500 cents).

In all the farm sizes, majority of the farmers were having medium level of individual and family experience in dairying. The distribution of farmers according to the level of motivation in dairying revealed that, comparatively the motivation level was lowest in small farms and highest in large farms. The results showed that majority of the farmers were engaged in agriculture, animal husbandry and allied works traditionally. The overall picture showed presence of 8.0 per cent shifted and 92.0 per cent traditional farmers. The extent of information utilization by the farmers from different communication or mass media sources indicated medium level of information utilization in all types of farms. The overall picture showed that 70.3, 23.4 and 6.3 per cent of farmers were having low, medium and high level of social participation. In all farm types, majority of the farmers were having medium level of credit orientation.

The investigation on herd profile showed that in all the farms, almost the same pattern of distribution of different categories of cattle. The overall picture showed composition of herd as lactating animals (25.92 per cent), dry (6.81 per cent), heifer (7.37 per cent), female calves (9.17 per cent) male calves (4.41 per cent). In small, medium and large farms, the herd size was 3.13 ± 0.08 , 9.52 ± 0.3 and 36.38 ± 3.65 respectively.

The results of herd building pattern showed, irrespective of farm size, the preferred mode of replacement was by purchase. The preference for purchase was highest in large farms and lowest in small farms. The details of type of purchase in the farms indicated that irrespective of the size, direct purchase was the dominant type. The government scheme linked purchase was only 21.1, 25.0 and 10.7 per

cent in small, medium and large farms respectively. The proportion of direct purchase was 78.9, 75.0 and 89.3 per cent respectively in three types of farms. In small and medium farms, majority of animals were purchased from their district, whereas in large farm majority came from outside the state. The study of source of finance for purchase of animals in the farms showed that using own's finance was the dominant source of finance in all types of farms. In small farms 37.7 and 62.3 per cent of last purchased animals were crossbred Jersey and Crossbred Holstein Friesian respectively. In medium farm the respective figures were 35.0 and 65.0 per cent. The large farms showed a high proportion of CBHF (86.7 per cent) and CBJ with only 13.3 per cent proportion of the purchase.

The details of production level of animals purchased revealed that in small and medium farms, majority of the animals belonged to the production level of 10-15 l/day. In large farms, the majority were having a production level of 15-20 l/day. Majority of animals purchased in small (65.1 per cent), medium (63.0 per cent) and large (78.7 per cent) farms were lactating animals. The purchase of heifers and calves were very few in all types of farms. In small, medium and large farms, the majority of the animals purchased, were belonging to first order lactation followed by second and third.

The actual preference of the farmers in the purchase was investigated in detail in the present study. The preference for direct purchase was 52.0, 25.0 and 60.0 per cent in small, medium and large sized farms respectively. The preference for scheme linked purchase was 47.4, 67.0 and 40.0 per cent in respective farms. The preference for within district purchase was 77.7, 69.0 and 16.0 per cent in small, medium and large farms respectively. In large farms 66.7 per cent of farmers preferred outside state purchase. The subsidy based purchase was preferred by 52.0, 69.0 and 29.3 per cent in small, medium and large farms respectively. The preference for CBJ animals was 56.0, 28.0 and 8.0 per cent in small, medium and large farms. The preference for CBHF was 40.6, 56.0 and 57.3 per cent in respective farms. Majority of small (31.4 per cent) and medium farms (38.0 per cent) preferred 15-20 l/day production level. In large farms majority (40.0 per cent) preferred more than 20l production per day. Irrespective of farm size, the

farmers preferred lactating animals for purchase. Majority of the farmers preferred animals in first three orders of lactation.

The physiological status of animals in the farms was studied in detail. Irrespective of farm size, almost 90 per cent of animals were in the first five lactation orders. Irrespective of farm size, majority of animals in small (23.33 per cent), medium (23.57 per cent) and large farms (20.15 per cent) were in the first 100 days of lactation. The proportion of dry animals was 7.9, 12.2 and 16.8 per cent in small, medium and large farms respectively. The proportion of pregnant animals was 27.44, 24.43 and 24.6 respectively in small, medium and large farms. In small farms average age of heifers was 20.11 months and 33.05 per cent were pregnant. In medium farms age and per cent of pregnancy was 21.65 and 31.54. In large farms the respective figures were 19.73 and 31.2. Irrespective of farm size majority of male calves were below three months of age. In small farms the female calves below three months, between three and six months and between six and twelve months were 43.12, 35.72 and 21.1 per cent respectively. In medium farms the respective figures were 35.62, 38.36 and 26.03. In large farms it was 46.01, 30.75 and 23.23 per cent respectively.

The investigation of cattle transactions in the farms during the previous year of the present study revealed that irrespective of farm size, the majority of animals purchased was milch cows and purchase of heifers and calves was in negligible numbers. In small, medium and large farms the average purchase value of milch animals was Rs. 41,523, 42,441 and 48,827 respectively. Majority of the sale was of milch animals and males calves. The number of heifers and female calves sold were comparatively lower in number. In small, medium and large farms the average sale value of milch animals were Rs. 22,493, 20,985 and 23,947 respectively. Irrespective of farms size, majority of female calves were retained in the farm. While majority of male calves were sold out. But in large farms the proportion of females retained was comparatively low. The results revealed that irrespective of farm size the higher rate of mortality was observed in male calves.

The results of the present study showed that only 43.3, 45.8 and 54.0 per cent of animals were insured in small, medium and large farms respectively. The

overall value it was 44.4 per cent. The major reasons cited by the farmers for not insuring their animals were high premium and delay in claim receipt.

The results regarding the use of land for farm buildings and fodder cultivation showed that 100 per cent of farmers irrespective of farm size used own land for building/cattle shed construction. In small, medium and large farms 48.0, 22.0 and 8.0 per cent had not cultivated any fodder. Overall 32.0 per cent was not having fodder cultivation. In small, medium and large farms, majority of the farmers used own land for fodder cultivation. In small, medium and large farms, 3.4, 7.0 and 8.0 per cent had leased land for fodder cultivation. The proportion of farmers who used both own and leased land farmers were 1.7, 2.0 and 5.3 per cent in small, medium and large farms respectively. The average area for cattle sheds in small, medium and large farms was 199.07 sq.ft. (0.5 cents), 518.35 sq.ft. (1.3 cents) and 2024.8 sq.ft. (5.06 cents) respectively. In small farms used 20.33, 2.43, 10.92 and 11.44 cents of own land, lease land, pure cropping and intercropping for fodder cultivation. In medium farms the respective values were 64.23, 12.85, 35.07 and 35.07 cents. In large farms 217.53, 58, 165.06, 110.46 cents were the area respectively

The investigation on investment on capital assets showed that, the major share of capital expenditure was on milch animals followed by buildings. The investment on equipments was comparatively small. The share on milch animals was 56.19, 59.81 and 56.14 per cent of total capital expenditure in small, medium and large farms respectively. The share of building cost on total capital investment was 41.7, 33.44, 37.65 and 37.28 per cent in small, medium and large and overall farms. The share of cost of equipments was 2.12, 6.75, 6.21 and 5.93 per cent in small, medium, large and for overall farms. Irrespective of size of farms, low level of mechanization was observed. In small farms 83.4, 16.0 and 0.6 per cent of farms had low, medium and high level of mechanization. In medium farms 53.0, 23.0 and 24.0 per cent of farms had low, medium and high level of mechanization. In large farms 10.7, 25.3 and 64.0 per cent were the respective values

The results of the housing profile revealed that, in small farms 88.0 and 12.0 per cent of houses were permanent and temporary respectively. In medium

farms the respective figures were 94.0 and 6.0 per cent. In large farms 100 per cent of cattle sheds were permanent type. Eleven types of building pattern were observed, based on the position of cattle shed (related to human house) floor and roof. In small, medium and large farms a separate house with metal sheet roof and concrete floor was the predominant type of building. In small farms 60.0, 39.4 and 0.6 per cent of farmers followed low, medium and high level of heat alleviation measures. In medium farms 53.0, 38.0 and 9.0 per cent followed low, medium and high level of heat stress alleviation measures. In large farms the respective figures were 1.3, 64.0 and 34.7 per cent respectively.

The results of feeding profile of the farms indicated that in small and medium farms, majority were following stall feeding along with grazing. In large systems the major system was stall feeding (90.7 per cent). Irrespective of farm size, majority of the farmers fed a combination of green fodder, dry fodder and concentrate. Many farmers were not allowing/not having land for grazing (42.3, 32.0, and 90.7 per cent respectively in small, medium and large farms). In small, medium and large farms 38.3, 50.0 and 2.7 per cent of the farmers depended on common land for grazing. Irrespective of farm size, majority of farmers used a combination of branded compounded cattle feed and other concentrate feed ingredients. In small, medium and large farms 13.7, 13.0 and 5.3 per cent of farmers used only branded feed.

Regarding the green grass feeding and fodder cultivation profile, the results showed that, in small, medium and large farms 6.3, 1.0 and 5.3 per cent had not practiced green grass feeding. In small and medium farms, combination of fodder cultivation and collection of local grass was the major source of green grass. In large farms, cultivation of green fodder was the major source (68%) of green grass. The farmers who were purchasing green grass were in negligible numbers.. In small, medium and large farms majority of farmers cultivated grass fodder .The cultivation of legume and cereal fodder was in negligible in number in all farms. The Hybrid Napier was the major variety cultivated in all farms. The cultivation of Congo signal and Maize were practiced in a very few farms.

In small, medium and large farms 10.9, 3.0 and 5.3 per cent were not using paddy straw in their farms. In small, medium and large farms 47.4, 52.0 and 77.3 per cent purchased paddy straw. The proportion with own cultivation of paddy was 23.4, 24.0 and 4.0 per cent in small, medium and large farms. While 18.3, 21.0 and 13.3 per cent of farms respectively in small, medium and large category depended on both purchase and own cultivation.

In small, medium and large farms average quantity of green fodder (kg) fed to milch animals were 25.48, 19.14 and 18.65 respectively. In small farms proportion of locally collected green grass was more. In medium farms the amount was almost equal, but in large farms the proportion of cultivated green fodder was dominant. In all farms proportion of purchased grass was comparatively less. The average amount of dry fodder fed (kg) was 1.19, 2.20 and 1.33 in small, medium and large farms respectively. The average amount of concentrate feed fed (kg) to milking animal was 5.44, 4.65 and 5.81 in small, medium and large farms respectively. The amount for dry animals was 0.38, 1.01 and 1.81.

Regarding reproduction management, irrespective of farm size, majority of the farms used the service of Animal Husbandry Department (AHD for AI service). The overall picture revealed that 92.3, 4.6 and 2.9 per cent of farmers carried out AI at farm premises, ICDP centre and veterinary hospital respectively. Majority of the farmers were having AI centre within a distance of three kilometres from their farms. Majority of farmers had given 'good' response to availability of service in small and medium farms with respective values 68.6 and 79.0. In large farms 42.7, 48.0, 9.3 per cent of farmers gave good, satisfactory and poor response.

The study of milking management revealed that, irrespective of farm size most of the farmers resorted to hand milking. In large farms the comparative proportion of machine milking was more (44.0 per cent) but still 54.7 and 1.3 per cent followed hand milking and combination of both. Irrespective of the farm size, in majority of farms, the farmers themselves were engaged in milking. Irrespective of farm size all the farmers followed two times milking daily. Irrespective of farm size, majority of the farms kept an interval of 8-12 hrs between two milking.

The labour use pattern in the small (99.4 per cent) and medium (70.9 per cent) farms were dependent solely on family labour. While in large farms, there was more (52.0 per cent) dependence on paid labour. In small farms 99.4 per cent had not used any paid labour. In medium farms 74.0 per cent had no paid labour, while 20.8 and 5.2 per cent used labour from within state and from outside state respectively. In large farms 13.5 per cent had no paid labour use, but in 52.7 and 33.8 per cent used labour from inside and outside state. Large sized farms comparatively used labour from outside state compared medium and small farms.

The average family labour in hours per day in small farms (excluding time for local grass collection) was 1.74, 3.55 in medium and 2.15 hrs in large farms. The male labour in hrs/day was 0.92, 2.03 and 1.24 respectively in small, medium and large farms. The respective values for female labour were 0.82, 1.52 and 0.9. The average family time spent for a milk animal (hrs/day) was 0.83, 0.58 and 0.14 in small medium and large farms respectively. The family time used for milch animals in the farms (hrs/day) was 1.46, 3.5 and 5.81 in small, medium and large farms respectively. In small average family labour (hrs/day) for collection of local grass rendered by male, female and total were 0.39, 0.64 and 1.04 respectively. In medium farms, the respective values were 0.41, 0.62 and 1.03. In large farms the same was 0.23, 0.17 and 0.41.

The analysis of waste management system revealed that, in small farms 33.1, 45.1 and 21.7 per cent of farms were classified under poor, satisfactory and good waste management system. In medium farms majority (58.0%) were with poor management system followed by medium (14.0 per cent) and good (28.0%). In large farms 61.3 per cent farms were having poor waste management system followed by satisfactory (9.3 per cent) and good (29.3 per cent).

Regarding the health care profile of the farms, in all types, majority of farmers were dependent mainly on government veterinarian for the service. In all types of farms majority of farmers carried out treatment in farm premises itself. Irrespective of farm size, majority of the farms had presence of a veterinary hospital within a distance of five kilometres. In small, medium and large farms only 12.6, 16.0 and 13.3 per cent were having a veterinary hospital farther than five

kilometres. The overall picture showed that 86.3 per cent of farms, were having a veterinary hospital within five kilometres and rest had a hospital at a distance more than five kilometers Overall picture showed that 56.9, 34.3 and 8.9 per cent expressed good, satisfactory and poor response in case of availability of veterinary service.

The adoption index of recommended management practices was highest (90.04 per cent) in large farms followed by medium (89.40 per cent) and small farms (84.36 per cent). The overall adoption index was 87.02 per cent. In all types of farms majority farms were in medium adoption class with 64.6, 68.0 and 70.7 per cent for small, medium and large farms respectively. In all types of farms inadequate price for milk and high price of inputs were ranked first and second reason for non-adoption. Low demand for milk was not considered as a reason for any of the farmers in any farms.

The production and reproduction performance of animals in different farm sizes revealed that the average peak yield in small farms (14.63 l/day), medium farms (14.80) and in large farms (18.64 l/day). The average lactation yield predicted from test day milk yield was 2608.63, 2901.37 and 3219.50 litres in small, medium and large farms respectively. The average service period (days) was 190.65, 170.64 and 128.53 in small, medium and large farms respectively. The number of inseminations required was 2.29, 1.96 and 1.80 in small, medium and large farms respectively. The intercalving period was 470.95, 450.64 and 408.53 days in small, medium and large farms respectively. The age at first successful service was 21.71, 23.87 and 19.23 months in small, medium and large farms. The number of AI required for first successful conception was 1.82, 2.08 and 2 in different farms respectively. The age at first calving was 30.71, 32.87 and 28.23 months in small, medium and large farms respectively. The wet average (l/day) was 8.98, 8.00 and 10.00 in small, medium and large farms respectively. The dry average (l/day) was 8.13, 6.65 and 7.86 in small, medium and large farms.

The details of average fat, solids-not-fat (SNF) and price realized per litre from the cooperative society showed that the average fat content of morning milk was 3.89, 3.95 and 3.79 per cent in small, medium and large farms respectively.

The average fat content of evening milk was 3.70, 4.31 and 4.45 per cent in respective farms. The average SNF content of morning milk was 8.14, 8.20 and 8.13 in small, medium and large farms respectively. The average SNF content of evening milk was 6.59, 7.62 and 8.04. The average daily price/litre realized from society was Rs.29.43, 29.79 and 29.64 in small, medium and large farms respectively. The major share of milk produced in small, medium and large farms were sold to society. The respective values were 77.73, 81.83 and 84.76 per cent respectively. The average distance from farm to society (km) was 1.08, 1.62, 2.67 and 1.58 in small, medium, large and overall farms respectively. Irrespective of the farm size, guaranteed market was main benefit cited by the farmers in participating in co-operative societies. The lower price realized for milk and low fat and SNF was the major complaints ranked as first and second by all types of farms.

The chi-square analysis revealed a significant association between adoption class and assistance class. The overall picture showed that 76.0, 19.1 and 4.9 per cent of farmers expressed very low, low and fair level of satisfaction respectively regarding assistance.. In all farm types, provision of subsidy for feed was the first demand raised by the farmers followed by increased rate of milk.

In all farm types, farms showed medium dairy farm performance. The respective values in small, medium and large farms were 54.3, 56.0 and 45.3 per cent. Low dairy farm performance was shown by 32.0, 5.0 and zero per cent of small, medium and large farms. High performance was shown by 13.7, 39.0 and 54.7 per cent of the small, medium and large farms respectively.

The constraints expressed by the farmers regarding feeding of dairy animals showed that high price of concentrate feed was the major constraint. The non availability of green fodder and price of paddy straw were the other major constraints in feeding as expressed by farmers. In all types of farms, infertility was the major breeding constraint. In small farms diseases was cited as the major constraint, while in medium and large farms, high cost of veterinary medicine was the major constraint. In policy, social and finance related issues raised by the farmers, low price for milk was ranked first in all types of farms and raised as the overall major constraint. Regarding marketing of milk in the farms, inadequate

price from society and low fat and SNF in milk was ranked first and second in this category. The non-availability of market for milk was not at all a concern for any farms in any seasons.

The average total maintenance cost of a lactating or milk animal per day was Rs. 229.81, 203.04 and 249.51 in small, medium and large farms respectively. The average cost of production per litre of milk (cost B) was 28.09, 28.49, 25.68 and 27.69 respectively in small, medium, large and overall farms respectively. The average cost/litre of milk after deduction of imputed family labour (cost A) was 19.93, 22.78, 24.93 and 21.81 in small, medium large and over all farms respectively. The cost of concentrate constituted 43.43, 34.7, and 40.85 per cent of total maintenance cost in small, medium and large farms respectively. , low price for milk was ranked first in all types of farms and raised as the overall major constraint.

The total maintenance cost (Rs.) in small, medium, large and overall farms was 226.01, 198.14, 219.6 and 216.68 respectively. The average cost/litre of milk (cost B) was 32.51, 34.29, 29.08 and 32.29 in small, medium, large and overall farms respectively. The average cost per litre of milk after deduction of imputed family labour cost (cost A) was 22.02, 26.33, 27.08 and 24.34 (Rs/litre) in small, medium, large and overall farms respectively. The major share of maintenance cost was contributed by the cost of concentrate which was 43.43, 34.7, 40.85 and 40.38 per cent respectively in small, medium, large and overall farms. The total roughage cost constituted 18.22, 15.08, 14.12 and 16.44 per cent respectively. The share of labour was 19.17, 17.91, 16.54 and 18.24 per cent in small, medium, large and overall farms respectively.

The total fixed cost was 15.81, 16.51, 21.77 and 17.29 per cent of the total gross cost/milk animal/ day. The total variable cost was 84.19, 81.31. 79.96 and 82.45 per cent of gross cost in small, medium, large and overall farms respectively. The net return from milk animal/day was Rs.44.46, 45.31, 62.02 and 48.46 in small, medium, large and overall farms respectively. The net return after deduction of imputed cost was Rs.110.36, 81.9, 70.12, and 93.61 respectively.

The total fixed cost was 16.08, 19.15, 22.78 and 18.34 per cent of gross cost in small, medium, large and overall farms respectively. The total variable cost was 83.92, 90.55, 77.22 and 81.69 per cent in small, medium, large and over all farms. The net return per day per milch animal was Rs.23.34, 10.39, 27.74 and 20.58 respectively in small, medium, large and overall farms respectively. The net return after deduction of imputed family labour cost was Rs.92.59, 52.42, 43.12 and 70.51 in small, medium, large and overall farms respectively.

The return over feed cost (ROFC) was 110.02, 96.04 and 123.84 per milch animal per day in small, medium, large farms. The feed cost efficiency (per cent) was 80.53, 87.55 and 110.67 in small, medium, and large farms respectively. The return over variable cost (ROVC) was 59.69, 48.33 and 78.65 in small, medium and large farms. The break even output (litre) per milk animal was 6.56, 2.34 and 2.89 and per milch animal was 5.25, 3.66 and 7.32 respectively. The input output ratio excluding unpaid labour per milch animal/day was 1.51, 1.26 and 1.17 in small, medium and large farms respectively.

The net farm income was Rs. 27.6, 62.7 and 391.83 in small, medium and large farms respectively. The net cash income (Rs.) was 139.09, 271.36 and 684.71 respectively. Net income per hectare (Rs) was 189.51, 185.53 and 1497.69 respectively. Net farm income per adult unit (Rs) was 10.08, 5.79 and 17.28 in small, medium and large farms. The net return per Rs.100 worth feed fed to livestock (per cent) was 59.84, 56.06 and 50.08. The capital per Rs.100 gross return was 27.42, 43.82 and 43.53 respectively. The rate of turnover (per cent) was 7.84, 3.04 and 14.27 per cent in small, medium and large farms respectively.

The estimated milk production function for different farms revealed that coefficients of concentrate, total roughage and adoption index were positive and statistically highly significant ($P < 0.01$) in small farms with R^2 as 63.0 per cent, indicating the importance these input in increasing milk production. The labour cost was positive and significant ($P < 0.05$) in small farms. In medium farms the coefficient of concentrate was highly significant and roughage was significant at 5% level. In large farms the coefficient of concentrate was highly significant. The overall results showed positive and highly significant effect of concentrate and

adoption index and significant effect of total roughage ($P < 0.05$) with R^2 value as 67.0 per cent.

The marginal Value Product (MVP) of inputs in milk production for different farms showed that, in small farms the MVPs of two inputs viz. roughages and labour were significantly less than unity, signifying over utilization of these inputs. The MVP value of concentrate was significantly higher than unity indicating their under utilization in milk production process. In medium farms, the MVP of concentrate was positive and significantly greater than unity indicating their under utilization. In large farms the MVP value of concentrate was positive and significantly greater than unity indicating their under utilization.

The mean technical efficiency in small, medium and large farms was 99.80, 83.22 and 99.96 per cent respectively. Estimates of determinants of Cobb-Douglas function of farm-specific technical efficiency had been estimated for farm types. In small farms, the adoption index and herd size was having significant ($P > 0.05$) influence on farm specific technical efficiency. In large farms education index was having significant ($P > 0.05$) influence and overall level farming experience index had significant ($P > 0.05$) and herd size was having highly significant influence on technical efficiency of farms.

Education of the farmer, family education index, family size, attendance in extension programmes, land holding, motivation level, and gross return from milch animals, wet average and dry average were positively correlated with adoption index. Adoption index was negatively correlated with age and experience. The results revealed that dairy farm performance index was negatively correlated with cost/litre of milk and positively correlated with wet, dry average and adoption index. The correlation between the physiological state of animals in the farm and productivity, cost and return parameters showed that per cent of animals in milk was positively correlated with wet average, dry average and gross return and negatively with cost/litre. The per cent of animals in the first 100 days of lactation was positively correlated with wet, dry averages and gross return but negatively with cost.

The critical appraisal of the two axis milk chart followed by KCMMF revealed certain limitations like no thrust on organoleptic and microbiological quality of milk, non proportionate penalty factor for inferior quality of milk and incentive for premium milk, ignorance of many significant factors that contribute to the production cost of milk in the present price chart, no time bound revision of price chart, unscientific revision of price charts published by KCMMF on 14.10.2012 and 21.07.14 and zero value for milk in the Price chart of KCMMF.

Certain modifications were suggested in the present study after analysing the existing pricing system which included three axis pricing policy, fixing the same rates for penalty to sub standard milk and premium for high quality milk, timely revision of milk pricing chart strictly based on fat and SNF rates and including a fixed “factor” in accordance with the parameters that significantly affect the cost of milk production. The price fixed as per Fat value and SNF value (TS Index Value) in the present KCMMF Chart shall be revised as,

Price of Milk per Litre = TS Index + FCF (Farmer Comfort Factor)

TS Index = The price per litre of milk based on Fat and SNF alone as indicated in present milk price chart by KCMMF.

Farmer Comfort Factor (FCF) = Feed Cost Index (FCI) + Labour Cost Index (LCI) + Consumer Price Index (CPI) + Bank Repo Rate Index (BRI)

The following conclusions, recommendations and strategies can be drawn from the present study

1. It is essential to prepare strategies and action plan for each agro-ecological system and dairy production system to make any development programme sustainable. Formulating a strategic research and extension plan with a farming system research and extension approach is needed as the resources and opportunities vary in different agro-climatic and production systems.
2. The present predominance of small subsistence farmers and emergence of mini and commercial dairy farmers in the field is challenging as we have to satisfy the livelihood needs and entrepreneurial aspirations of the both groups.

3. The results of the present study showed that, the present production structure was dominated by smallholders who were traditional farmers or agricultural labourers with low level of socio-economic status for adoption of new technologies or amenable to extension efforts. The sector had to attract the best talented youth with high motivation and entrepreneurial behavior to make the sector grow in the future. The livelihood need of the smallholders could be protected by supportive measures.
4. The present study revealed that majority of the animals in all the farms were purchased and were without any production and reproduction records hindering the basic pillar of dairy development in the state-the genetic improvement of our crossbred animal base- in the future. The purchase of high producing animals as milking machines and selling them after production without any breeding concern over rebreeding them with premium semen and care of elite calves were alarming situations which should be approached in a strategic manner.
5. The adoption level of breeding, feeding, reproduction and health care management practices were not at all encouraging even in large farms especially in selection, breeding and feeding. Even the basic management practices like feeding quality roughage throughout the year, optimum feeding of concentrates, provision of *ad libitum* drinking water and provision of proper microclimate in the shed were ignored in many of the farms. The awareness and adoption of practices like use of ration balancing system, bypass nutrients, hoof care, premium bull semen etc. were almost nil in the selected farms. The poor socio-economic status, non-remunerative price, poor resource base, lack of entrepreneurial attitude and failure of the present research and extension system can be the reasons which should be addressed on war foot basis.
6. One of the most important findings of the present study was the low level of mechanization, low level of heat alleviation measures and poor waste management systems in majority of the farms which were supposed to be improved in the present state, national and global scenario of labour scarcity and drudgery of dairy operations, climate change issues and livestock waste management problems.

7. The present study revealed the economic, resource use and technical efficiency of different types of farms. The results will be useful in formulating strategies more efficient utilization of inputs economically, technically and resource use friendly.
8. The cost and returns from milk production estimated in the present study in different farm sizes and in different systems of production on milk and milch animal basis was not encouraging for the farmer. In true sense what he is getting may be the value of his labour as income even after much investment of time, labour and other capital assets. The price realized from the society is almost near to his production cost if the value of the family labour is imputed to the total cost.
9. The present pricing policy needed timely revisions and modifications protecting the interest of the producers and consumers who are the sides of the same coin in any production system. The findings of the study can be useful in this direction.
10. The economic, entrepreneurial and environmental sustainability of dairying can be achieved by interventions at two points. Minimizing the cost of production by adopting frontier technologies and assuring remunerative price to the producers while keeping consumers also satisfied. The variables like the price of concentrate feed which was the highly significant factor in the milk production function, the cost of labour, consumer price index and bank interest rates should be considered in milk pricing along with the genetic potential of our crossbred animals to produce the legal requirement of minimum fat and SNF in their milk while discussing the two-axis policy.

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Abstract

The present study was conducted to study the management practices, trends and issues of various dairy production systems in Kerala, to study the variation in cost and profitability of milk production under different dairy production systems, to assess the influence of various assistance schemes in the economy of milk production and to evaluate the present milk pricing policy of Kerala and suggest modifications. The study was carried out selecting 350 farm households belonging to three groups based on number of milch animals. The study covered five agro climatic regions, five districts and 10 blocks to represent the state. The stratified random sampling method was used for selection of study area and samples.

In small, medium and large farms, the herd size was 3.13 ± 0.08 , 9.52 ± 0.3 and 36.38 ± 3.65 respectively. The investigation on investment on capital assets showed that, the major share of capital expenditure was on milch animals followed by buildings. The labour use pattern in the small (99.4 per cent) and medium (70.9 per cent) farms were dependent solely on family labour. While in large farms, there was more (52.0 per cent) dependence on paid labour. The adoption index of recommended management practices was highest (90.04 per cent) in large farms followed by medium (89.40 per cent) and small farms (84.36 per cent). The wet average (l/day) was 8.98, 8.00 and 10.00 in small, medium and large farms respectively. The dry average (l/day) was 8.13, 6.65 and 7.86 in small, medium and large farms. The average daily price/litre realized from society was Rs.29.43, 29.79 and 29.64 in small, medium and large farms respectively.

The major share of milk produced in small, medium and large farms were sold to society. A significant association was observed between adoption class and assistance class. In all farm types, majority of the farms showed medium level dairy farm performance. High price of concentrate feed was the major constraint in feeding. In all types of farms, infertility was the major breeding constraint. On milch animal basis, the average cost/litre of milk (cost B) was 32.51, 34.29, 29.08 and 32.29 in small, medium, large and overall farms respectively. The average cost per litre of milk after deduction of imputed family labour cost (cost A) was 22.02,

26.33, 27.08 and 24.34 (Rs/litre) in small, medium, large and overall farms respectively. On milch animal basis, the net return per day per milch animal was Rs.23.34, 10.39, 27.74 and 20.58 respectively in small, medium, large and overall farms respectively. The net return after deduction of imputed family labour cost was Rs.92.59, 52.42, 43.12 and 70.51 in small, medium, large and overall farms respectively. The estimated milk production function for different farms revealed that overall farms showed positive and highly significant effect of concentrate and adoption index and significant effect of total roughage ($P < 0.05$) with R^2 value as 67.0 per cent. The marginal Value Products (MVP) of inputs in milk production for different farms showed that, in small farms the MVPs of two inputs viz. roughages and labour were significantly less than unity, signifying over utilization of these inputs. The MVP value of concentrate was significantly higher than unity indicating their under utilization in milk production process. The mean technical efficiency in small, medium and large farms was 99.80, 83.22 and 99.96 per cent respectively. A critical analysis of present milk pricing policy was done suggesting modifications and derived a new formula for pricing of milk considering significant factors.

Curriculum Vitae

Name : Sabin George
Date of birth : 10-10-1977
Place of birth : Kozhuvanal
Marital status : Married
Permanent Address : Kochumannur H, Thodanal PO, Kottayam Dist, Kerala
India . Pincode: 6686573
Major field of specialisation : Livestock Production Management
Educational status : MVSc (LPM)

Experience

Sl No	Designation	Period
1	Assistant Professor , Kerala Agricultural University and Kerala Veterinary and Animal Sciences University	11 years

Recent Publications

1. Sabin George, Binoj Chacko, Justin D, Pramod S, Nisanth P and Muhammad Aslam M K (2010), Performance of Vigova duck under farm conditions in Kerala, *JIVA*, **8**(2):27-29
2. Smitha ,S.Kannan,A.and Sabin,G.(2014) Growth response of Newzealand White Rabbits to dietary probiotic and vitamin C under tropical humid climate. *Journal of Animal Research*. **4**(2)273-281.
3. Biya Ann Joseph.,Joseph Mathew and Sabin George (2014) Effect of environmental stress on the growth performance of NewZealand White rabbits.*J.Vet.Anim.Sci.*(4,5) :15-19

Membership of Professional bodies

Indian Association of Animal Production Management, Indian Association of Veterinary Medicine, Indian veterinary Association, Association of Food

Scientists and Technologists(India), Indian Dairy Association and Aviculture
Association Of India

Appendix I

INTERVIEW SCHEDULE

KERALA VETERINARY AND ANIMAL SCIENCES UNIVERSITY
COLLEGE OF VETERINARY AND ANIMAL SCIENCES, MANNUTHY,
THRISSUR

DEPARTMENT OF LIVESTOCK PRODUCTION MANAGEMENT

PROJECT TITLE-“ECONOMICS OF DAIRY FARMING SYSTEMS
IN KERALA”

RESPONDENT NO..... DISTRICT..... BLOCK.....
PANCHAYAT..... VILLAGE.....

AGRO-CLIMATIC ZONE: South zone / Central zone /North zone / High range
/ Kuttanad

HERD SIZE: Small/Medium/Large

PRODUCTION SYSTEM: Specialised / Mixed

FEEDING SYSTEM: 1. Concentrate / Fodder / Paddy straw 2. Paddy
cultivation based (Crop-livestock mixed)

Name of farmer		Phone no	
Permanent Address			

PART A

1. SOCIO PERSONAL AND ECONOMIC DATA

1.1. Age:.....1.2. Sex: M / F 1.3. Marital status: M / NM

1.4. Educational Status : Illiterate (1) / Primary (2) / Middle (3) / Secondary
(4) / Senior secondary (5)/ Graduate (6) / PG (7) / Professional (8) /
Others (specify)

Please indicate the number of years of formal education -
.....

1.5. Family details:

Family members	Age	Sex	Education status	Occupation	Participation in dairy activities (YES/NO) & experience in dairying in years
	(yrs)	(M/F)			

1.6. Have you attended a specialised training in dairying: Yes / No

If YES,

- Give details of the organiser: **LMTC / DTC / MILMA / UNIVERSITY / ETC / OTHERS(Specify).....**
- Duration:days
- Give details of any other extension programme you have attended during the previous year with number

Name of the event: Seminar/ Farm visi./ Study tour/ Vaccn camp/ Farm school / Farm clinic/Symposium/ Exhibition / Healthcare camp/ Cattle show/ Infertility camp / Others (specify).....

1.7. Major occupation: a.Agriculture / b. Dairying / c. Govt job / d. Private job / e. Business / f. Agricultural labour/ g. Industrial labour / 8.Others (specify)...

1.8. Subsidiary occupation: ... 1.9. Land holding (Cents)

1.10. Cropping pattern & income

Sl no	Particulars of crop	Area / Number (acres)	Annual production (Kg/ Number)	Av price / kg or Number (Rs)	Total income / year (Rs)
1	Dairying				
3	Paddy				
4	Coconut				
5	Rubber				
6	Livestock				
7	Others				

1.11. Experience in dairying (no of years)..... (Completed years as on the date of interview)

1.12. Purpose of cattle rearing: From the following options rank the importance of why you rear cattle

OPTIONS	RANK
Self employment	
Additional income	
Manure	
Use of crop by products	
Quality milk	
Inheritance	

1.13. What was your major source of income before you started cattle rearing?

a. Working abroad b. Govt. job c. Private job d. Others (Specify).....

1.14. Mass media exposure (*Source and Frequency of utilisation of communication sources*)

(Please indicate the frequency with which you seek information from the following sources)

Sl no	Source	<i>daily</i>	<i>weekly</i>	<i>fortnightly</i>	<i>monthly</i>	<i>Occasional</i>
1	Neighbours					
2	SHG members					
3	Veterinarian					
4	DEO					
5	Universities					
6	Radio					
7	TV					
8	Newspapers					
9	AH magazines					
10	Internet					

1.15. Social participation (From the options below, please indicate if you are actively involved in organisational activities)

a. Not a member of any organisation

- b. Member of one organisation
- c. Member of more than one organisation
- d. Office bearer of an organisation

2. HERD PROFILE

2.1. HERD SIZE

ADULT MILCH COW.....		HEIFER	CALF.....	
<i>IN MILK</i>	<i>DRY</i>		<i>male</i>	<i>female</i>

2.2. HERD BUILDING (MODE OF ACQUISITION)-TOTAL

- a) How are animals replaced on the farm (Rank): a. By purchase b. Farm reared
- b) How many animals on the farm were purchased (Adult)Heifer....calf.....
- c) How many animals on the farm are home reared? (Adult)... Heifer....calf.....

2.3 a) In cases where animals have been purchased, indicate the following details (based on last animal purchased)

Number of animals purchased: Total number.... Milch cow..., Heifer..., Calf.....

Give numbers in each category

Type of purchase	From where purchased	Finance for purchase	Breed purchased	Production of animal purchased	Stage of purchase	Lactation number
1. Direct	1. Within District	1.Own finance	1. CB Jersey	1. 1- 5 l	1. Lactating	1. 1 st
	2. Within State	2.Only loan	2. CB HF	2. 5-10 l	2. Pregnant	2. 2 nd
2. Through a scheme	3. Outside State	3.Own finance + loan	3.Others	3. 10-15 l	3.Heifer	3. 3 rd
		4.Loan+ subsidy		4.15-20 l	4.Calf	4. 4 th
		5.Loan+own fund + subsidy		5. Above 20 l		

b) Indicate your own preferences in case of animal purchase (give ranks)

<i>Type of purchase</i>	<i>Place of purchase</i>	<i>Finance for purchase</i>	<i>Breed preference</i>	<i>Level of production</i>	<i>Stage of purchase</i>	<i>Stage of lactation</i>
1. Direct	1. Within District	1. Own finance	1. CB Jersey	1) 1- 5 l	1. Lactating	1. 1 st
		2. Only loan	2. CB HF	2) 5-10 l		
	2 Within State		3. Others (specify)	3) 10-15 l	2. Pregnant	2. 2 nd
		4. Loan+ subsidy	4) 15-20 l	2. Pregnant		
2. Through a scheme	2 Within State	3. Own finance+ loan.	5) Above 20 l		3. Heifer	3. 3 rd
		3. Outside State	reasons (rank)	reasons (rank)		
	3. Outside State		4. Loan+ subsidy	1. Easy maintenance	1. Economy	4. Calf
		5. Loan+ own fund+ subsidy	2. More milk	2. Easy Maintenance		
			3. Milk fat	3. .Poor Marketing Facilities		
4. Others	4. Not Interested In Comm Dairying					
	5. Others (Specify)					

2.4. PHYSIOLOGICAL STATE OF ANIMALS

2.4.1. MILCH COWS

PHYSIOLOGICAL STATUS		COW NO					
		1	2	3	4	5	6
AGE (yrs) DoB /year of purchase							
Initial purchase cost(Rs)							
Pregnancy (If yes, √)							
Lactation No	1						
	2						
Stage of lactation	Early						
	Peak						
	Late						
	Dry						

2.4.2. HEIFER (Above 12 months of age)

PHYSIOLOGICAL STATE	HEIFER NO				
	1	2	3	4	5
Age					
Pregnancy					
Date of insemination					
Number of inseminations needed for pregnancy					

2.4.3 CALF

PHYSIOLOGICAL STATE	CALF NO				
	1	2	3	4	5
Sex					
Age/ Date of birth					

2.4. LIVESTOCK TRANSACTION (previous year)**2.4.1 PURCHASE**

<u>MILCH COW</u>	1	2	3	4
REASON FOR PURCHASE				
AMOUNT (Rs)				
<u>HEIFER</u>				
REASON FOR PURCHASE				
AMOUNT (Rs)				
<u>CALF</u>				
SEX (M/ F)				
REASON FOR PURCHASE				
AMOUNT (Rs)				

Reason for purchase (code) 1. Replacement 2. Farm expansion 3. Others ..

2.4.2. SALE

	1	2	3
<u>MILCH COW</u>			
REASON FOR SALE			
AMOUNT(Rs)			
<u>HEIFER</u>			
REASON FOR SALE			
AMOUNT(Rs)			
<u>CALF</u>			
AGE OF DISPOSAL			
REASON FOR SALE			

Reason for sale (code): 1. Immediate Financial need 2. Labour shortage 3. Shortage of feed 4. Uneconomical 5. low yield 6. dry period 7 Disease 8. Aged 9. Infertility 10. Others

2.5. CALF DISPOSAL PATTERN: Selling out / Reared in the farm

2.6. ANIMAL MORTALITY (during previous year)

Details	1	2	3	4	5
COW					
Reason of death					
Estimated loss (Rs)					
Insurance (yes / no)					
Claim received(Rs)					
HEIFER					
Reason of death					
Estimated loss (Rs)					
CALF					
Male / female					
Reason of death					
Estimated loss (Rs)					

2.7. INSURANCE COST (during previous year)

No of animals insured	Annual premium	Reason

PART B

3. FARM INVENTORY

3.1. LAND

Type	Own land (cents)	Leased land (Cents)	Lease rate/yr (Rs)
Land for fodder cultivation			
Land for farm buildings			

3.1.1. Reason for not cultivating fodder

1	lack of promotion programme and subsidy	5	Fear of intercropping depleting nutrients
2	preference for cash crops	6	lack of awareness
3	High labour, low returns	7	lack of awareness of economic viability
4	Lack of suitable land	8	lack of planting materials
9	others		

3.2. ANIMALS (Initial purchase cost): see the table for physiological status

3.3. BUILDING AND EQUIPMENTS

SL NO	ITEM	AREA / NUMBER	AGE (yrs)	INITIAL VALUE/UNIT(Rs)	TOTAL COST (Rs)	MAINT. COST/YR
1	<u>BUILDING</u>					
	CATTLE SHED					
	OTHERS(.....)					
2	<u>EQUIPMENTS</u>					
	MILKING MACHINE					
	CHAFF CUTTER					
	SLURRY PUMP					
	PRESSURE WASHER					
	MIST SYSTEM					
	SPRINKLER SYSTEM					
	BUCKETS, MILK CANS					

	RUBBER MAT					
	WATER BOWL					
	VEHICLES FOR FARM PURPOSE					
	OTHERS					

PART C

4. MANAGEMENT PROFILE OF THE FARM

4.1 . HOUSING

1.Location	2.Type	3. Floor	4. Roof	5. Side wall	6 Standing space (m)	7.Height of roof (m)	8. Heat alleviation measures (code)
a. Attached	a. Permanent	a. mud	a. thatched	a. Full	Length	Centre	
		b. concrete	b. tiled	b. Half			
b. Separate	b. Temporary	c. any other (stone)	c. Metal / asbestos	c. No wall	Breadth	Eaves	
			d. Concrete				

Heat alleviation measure (Code)

1.Cattle shed design(orientation E-W, space , height ,height of roof) 2.Misters
3. Sprinklers 4.Fan 5.Planting trees 6. Automatic drinker 7. Feeding mngmt
8.. Others (specify).....

4.2. FEEDING METHODS

1. GENERAL FEEDING PRACTICES

1. GENERAL FEEDING PRACTICES			
Item	Details	Items	Details
1. System of feeding	a. Stall feeding	2. Feed type	a. GF+DF+CONC
	b. Grazing only		b. GF+ CONC
	c. Grazing &stall feeding		c. DF+CONC
			d. GF+DF
3. Grazing area	a. Homestead	4. Type of conc	a. Compounded at home
	b. Common grazing land		b. Branded
5. Source of fodder	a. Cultivation	6. If fodder is cultivated	a. Intercropping
	b. Purchase		b. Pure crop
	c. Local		

7. Type& variety of fodder cultivated	a. Grass	8. Source of straw	a. Own
	b. Legume		b. Purchased
	c. Tree fodder		

2. FEEDING SCHEDULE (ON PREVIOUS DAY)

A.GREEN FODDER FEEDING-Indicate whether individual or group feeding
Individual / group / production wise / age wise / physiological state wise / body wt / others (specify)

Type of	Qty fed/day(kg)			Total qty/ animal /day(kg)	Total qty used/day in farm (kg)	Transportn cost (Rs)	Lab Cost (Rs)
Animal	Cultivated	Local grass	Purchased (Price/kg)				
Milking animal					Cultivated		
Dry animal					Local		
Calf					Purchased		

B. DRY FODDER FEEDING-Indicate whether individual or group feeding:
Individual / group / production wise / age wise / physiological state wise / body wt. / others (specify)

Type of animal	QTY FED/DAY (kg)		Total qty		Transportation cost(Rs)
	Own	Purchased (Price/kg)	Total qty/animal/day (kg)	used/day in farm(kg)	
Milking animal					
Dry animal					
Heifer					
Calf					

C. CROP RESIDUE FEEDING - Indicate whether individual or group feeding:
Individual / group / production wise / age wise / physiological state wise / body wt. / others (specify)

Type of animal	QTY FED/DAY(kg)		Totalqty/ animal /day(kg)	Total qty used/ day in farm (kg)	Transportation cost(Rs)
	Own	Purchased (Price/kg)			
Milking animal					
dry					
Heifer					
Calf					

D. CONCENTRATE FEEDING - Indicate whether individual or group feeding:

Individual / group / production wise / age wise / physiological state wise / body wt. / others (specify)

Type of Animal	Type of feed/ qty/day(kg)					
	Branded feed Price / kg	Feed 1 Price / kg	Feed 2 Price/ kg	Feed 3 Price/ kg	Feed 4 Price/ kg	Feed 5 Price/ kg
Milking animal						
Dry						
Heifer						
Calf						
Total feed used in farm /day (kg)						
Transportation cost(Rs)						

4.3 . BREEDING

1. Agency which provide AI service	2. Dist to AI centre (km)	3. AI done by	4. AI usually done at	5. Availability of service	6. Expected no of AI in the farm/yr	7. Cost of AI/yr
a. AHD		a. Govt vet	a. Farm premises	a. Good		
b. MILMA		b. Pvt vet	b. ICDP centre	b. Satisfactory		
c. Others		c. LI	c. Hosp	c. Poor		
		d. Private person	d. Others			
		e. Others				

4.4. MILKING

1. Method of milking	2. Milking done by	3. Number of milking in a day	4.. Interval between two milking
a. Machine	a. Milker	a. 3	
b. Hand	b. Self	b. 2	
		c. 1	

4.5. HEALTH CARE

1. Veterinary services provider	2.Usual Place of Vet. service	3.Dist bwn farm and hospital (km)	Availability of service-	Average		
				No of Dr visits	Cost / visit	Cost of service, med/yr
a. DOCTOR (AHD / PVT)	a. Hospital		a. Good			
b.LI	b.		b. Satisfactory			
C. Others	Farmers house		c. Poor			

4.6. LABOUR

Type of labour- a. Family labour b. Paid labour c. Both

Paid labourer- a. Within state b. Outside state

Type of labour used	Nature of work	No of workers employed	No. Working hours/day	Other benefits	Wage rate Daily/ monthly
<i>Paid labour</i>					
Male					
Female					
<i>Family labour</i>					
Husband					
Wife					
Children					
Others					

4.7. WASTE MANAGEMENT

1. Manure pit	2. Urine pit	3. Type of pit	4. Use of cowdung	5. Use of liquid waste	6. Inc from manure / month (Rs)
a. Yes	a. Yes	a. Attached /Away	a. Selling out	a. Irrigation	
		b. Roofed/ Not	b. Own field	b. Sale	
			c. Biogas	c. Value addition	
b. No	b. No	c. Above ground/ under ground	d. Vermicompost	d. Not used	
			e. Other	e. Others	
			f. Combinations		

4.8. OTHER RECURRING EXPENDITURE

ITEM OF EXPENDITURE	AMOUNT /YEAR (Rs)	REMARKS
Electricity , Water		
Taxes		
Misc		

5. EXTENT OF ADOPTION OF RECOMMENDED DAIRY FARMING PRACTICES*(Please indicate the extent to which you have adopted the practices)*

Sl no	Practice	Cont. adoption (3)	Dis continued (2)	Not adopted (1)
I. SELECTION OF ANIMALS				
1	Keeping Cross bed cows with more than 2500 kg milk per lactation			
2	Selection of cows/heifers based on reproductive performance			
3	Selection of cattle based on milk composition			
4	Timely culling and twenty percent replacement every year			
5	Inseminating high yielders with premium bull semen			
6	Keeping proper records			
II. HOUSING				
1	Adequate standing space in the shed			
2	Construction of floor with adequate drainage			
3	Proper construction of manger			
4	Adequate ventilation of shed			
5	Provision of heat stress alleviation measures			
III. FEEDING				
1	Maintaining proper concentrate roughage ratio (60:40)(50:50)			
2	Feeding concentrates according to production level			
3	Feeding extra concentrates from 6 months of pregnancy			
4	Feeding enough green grass throughout the year			
5	Clean drinking water available for cows at all times			
6	Feeding enough concentrate to heifers			
7	Feeding mineral mixture and other supplements			

8	Feeding bypass nutrients to high yielders in early lactation			
9	Use of ration balancing software			
IV. BREEDING				
1	Monitoring of estrus cycle and detection of heat symptoms			
2	Inseminating cows at the proper time of heat period-12-16 hrs after heat symptoms			
3	Pregnancy diagnosis between 45-120 days after AI			
4	Treatment of animals after repeated AI (more than) by a veterinarian			
5	Inseminating cows 60-90 days after calving			
6	Seeking veterinary attention in calving problems			
V. MILKING				
1	Keeping ideal interval between milking – 8-12 hrs			
2	Full hand milking			
3	Proper cleaning of machine			
4	Animals producing more than 12 kg are milked 3 times a day			
5	Post milking teat dip			
6	Milking mastitis affected animals at the end			
7	Screening for sub clinical mastitis			
8	Ensuring dry period of minimum 60 days			
VI. CALF CARE				
1	Weaning of calves immediately after birth			
2	Feeding colostrum soon after birth within 30 mts or max. within 2-3 hrs			
3	Feeding colostrums continuously for 4 days after birth			
4	Proper naval care at birth-proper cut and disinfection with Tr.iodine			

5	Feeding calf starter starting from 1-2 weeks of age			
6	Milk feeding of calves proportionate to weight gain			
7	Milk feeding upto 3 months			
8	Regular deworming of calves			
VII. HEALTH				
1	Vaccination every 6 months against FMD			
2	Vaccination in premonsoon against HS			
3	Timely veterinary aid for ailments			
4	Deworming cows in the last month of pregnancy and after parturition			
5	Deworming cows after parturition(10 days)			
5	Isolation of sick animals			
6	Quarantine of new animals			
7	Treatment against ectoparasites			
8	Practices to maintain hoof health			
9	Regular and proper cleaning and disinfection of sheds			

5.1.Reason for deviation from recommended

1. Lack of finance	5. Lack of knowledge
2. Scarcity of feeding inputs	6. Not commercial
3. Inadequate price	7. High price
4. Low milk demand	8. Lack of resources

PART D

6. PRODUCTION AND REPRODUCTION PERFORMANCE OF SELECTED ANIMALS

6.1. PRODUCTION PERFORMANCE OF ANIMALS

Animal no	Date of calving	Day of recording	Yield on the day of previous day of recording(L)	Peak yield(L)
1				

6.2. REPRODUCTION PERFORMANCE OF SELECTED ANIMALS

Ani m No	DO B	Age at first servic e	No of insemns /concep n for first concpn	Age at first calvni g	Date of last calvni g	Date of successfu l AI	N o of AI	Lactn lengt h	Dry perio d
1									

PART E

7. MILK PRODUCTION ,QUALITY AND DISPOSAL

7.1. DISPOSAL PATTERN

Total milk(L)		House consumption (L)		Qty sold(L)		Milk used for value addition (L)	
<i>am</i>	<i>pm</i>	<i>am</i>	<i>pm</i>	<i>am</i>	<i>pm</i>	<i>am</i>	<i>pm</i>

7.2. DETAILS OF MILK SOLD

Name of agency	Qty(L)						Value addition			
	am			pm			item	Qty/day	Price /unit	Av. daily sale (Rs)
Milk co op										
	fat	CLR	SNF	fat	CLR	SNF				
	PRICE(Rs)			PRICE(Rs)						
Direct sale Price /l										
Agency..... Price / l										

7.3 DETAILS OF MARKETING

Name of agency	Dist to place of disposal (km)	Mode of transport	Cost of transport (Rs)	Reason for selling milk to a part agency-specify

7.4 PERCEIVED BENEFITS OF PARTICIPATION IN DAIRY COOPERATIVES*(Please indicate the benefits of participation in DCS to you)*

BENEFITS	FARMERS' PERCEPTION		
	VERY IMP (3)	IMP (2)	NOT IMP (1)
Guaranteed market			
Assured supply of inputs			
Access to better extension services			
Lowers transaction costs in purchasing inputs and selling milk			
Input purchase on credit			
Availability of bonus			
Availability of credit			
AI SERVICES			
VET SERVICES			
Personal relations with other members			
Others (specify)(Insurance, loans, scholarships etc.)			

8. PROBLEMS /COMPLAINTS REGARDING FUNCTIONING OF DCS

Problems	Very serious	Serious	Not serious
Lower price when compared to direct marketing			
Weighing of milk -defective			
Fat and SNF estimation incorrect			
No provision of input services like feed, medicine, AI etc.			
Irregular payment			
Lacking bonus			
No credit facility			
Timing of collection			
Other markets available			
Others (specify)....			

PART F

9. INSTITUTIONAL ASSISTANCE *(please indicate if you have received any assistance)*

9.1 Assistance for creating fixed assets since start of the dairying

Sl no	Type of assistance	Type /number/ amount	Fin. Value of assistance	year
1	Cattle shed			
2	Animals			
3	Equipments			
4	Others(Specify)			
TOTAL				

9.2 RECURRING ASSISTANCE IN THE LAST FINANCIAL YEAR

Sl no	Type of assistance	Type /number/Amt	Fin. Value of assistance
1	FEED		
2	CALF FEED		
3	FODDER CULTIVATION		
4	PADDY STRAW		
5	INSURANCE		
6	INCENTIVE FOR MILK		
7	VACCINATION		
8	AI		
9	MEDICINES		
10	FEED SUPPLEMENTS		
11	OTHERS(Specify.....)		
TOTAL			

9.3. FARMERS PERCEPTION REGARDING INSTITUTIONAL ASSISTANCE

Are you satisfied with existing institutional arrangement for promotion of dairying? (Give marks out of 4)

9.4. FARMERS PERCEPTION OF AREAS WHERE GOVT CAN HELP-

(rank the areas where you feel the govt can intervene to improve institutional assistance)

Area	Rank
Finance, capital with low interest	
Feed subsidy	
Vet medicine	
Vet. Services	
Training	
Increased rate of milk	
Green fodder availability	
Ensure quality of feeds in the market	
Others Quality animals, quality semen, schemes etc	

10. CREDIT ORIENTATION

1. If one needs a loan, what are the sources or institutions in your locality to obtain loan for establishing an enterprise?

*a. Banks b. Cooperatives c. Money lenders d. Friends e. Block Office
f. Relatives g. Others*

2. Have you ever taken loan for purchase of inputs? Yes / No

a. If No

i. Why?

ii. Have you ever thought of taking a loan? Yes / No

iii. Have you ever tried to take a loan? Yes / No

b. If Yes what did you do and what happened?

If Yes in Qu 2

i. **When and from which source? Please give details for the last three years.**

Institution	Nature of loan taken	Purpose	Amount received

ii. **Have you repaid the loan you had taken? Yes/No**

i. If No what was the reason?

ii. If Yes indicate the following details indicate the following details

Source	Nature of loan taken	Amount received	Time of return	Amount repaid

iii. When you need loan whether you take from the above mentioned institutions or you have stopped taking loans?

iv. If you have stopped taking loans what are the reasons?

v. What is your experience about the loan facility? What are the advantages and disadvantages?

PART G

10. CONSTRAINTS EXPRESSED BY THE DAIRY FARMERS

10.1 FEEDING

Sl no	Constraint	Farmers perception		
		Very serious	Serious	Not serious
1	Poor availability of green fodder round the year			
2	Non availability of dry fodder			
3	High price for paddy straw			
4	High price of concentrate feed			
5	Lack of knowledge of balancing ration			
6	Low quality of branded compounded feed			
7	Non availability of grazing land			

10.2. BREEDING

Sl no	Constraint	Farmers perception		
		Very serious	Serious	Not serious
1	Non availability of AI service in time			
2	Distant location of AI centre and vet hospital			
3	High Cost of breeding services			
4	Repeat breeding /infertility/anoestrous			
5	Problems at calving and periparturient period			

10.3. ANIMAL HEALTH

Sl no	Constraint	Farmers perception		
		Very serious	Serious	Not serious
1	Disease susceptibility of cross bred cows			
2	Outbreak of diseases			
3	High cost of veterinary medicine			
4	Lack knowledge about diseases and control			
5	Non availability of services of vet doctor in time			
6	High cost of veterinary services			
7	Distant location of vet hospital			
8	Non availability of vaccine in time			

10.4. POLICY ,SOCIAL AND FINANCE RELATED

Sl no	Constraint	Farmers perception		
		Very serious	Serious	Not serious
1	Requirement of high capital investment			
2	Shortage of land for fodder cultivation			
3	Change in cropping pattern			
4	Inadequate price for milk			
5	Lack of scientific knowledge/training in dairying			
6	Lack of interest in younger generation			
7	Lack of credit			
8	High interest rate for credit			
9	Lack of govt support,subsidy etc			
10	Low availability of good quality animals			
11	Difficulty/problems in waste mgt			
12	Socio –psychological constraints- social status, marriage etc.			
13	Low social participation due to the round the clock nature of job			
14	Nonavailability of family labour			
15	Non availability of hired labourers			
16	High labour cost			
17	Lack of Mechanisation			
18	Policy to purchase animals from outside state			
19.	Family health			

20.	Climate change			
21.	Others :Productivity of animals,electricity, fly menace, climate			

10.5. MARKETING

Sl no	Constraint	Farmers perception		
		Very serious	Serious	Not serious
1	Poor marketing facility for milk			
2	Non existence of DCS in the locality			
3	Non remunerative price offered by DCS			
4	Low demand for milk in flush season			
5	Low milk fat and SNF			

10.6. LABOUR WORKS

Sl no	Activities	Male			Female			Others (specify.....)		
		From	To	Dur	From	To	Dur	From	To	Dur
1										
2										
3										
4										

11. ENTREPRENEURIAL FARM PERFORMANCE

Sl no	Parameter	Details
1	Capacity utilisation	a. Max. Number of cows that can be housed:..... b.Number of cows now housed:.....
2	Perceived profitability of the enterprise	<i>What do you think about the profitability of running a dairy enterprise</i> a. A very high loss b.High loss c. somewhat profitable d. More profitable e.Most profitable <i>Why you continue then , give reason?</i> No alternative / Lack of skills / Lack of fund /

		Cannot sell land & move out / Others (specify)
3	Would you like to increase number of cattle	a.Yes b.No
4	Livestock production index (Milk Yield)	How much milk was obtained initially..... how much was the peak yield..... how much at the end.....

12. MOTIVATION FOR DAIRYING(have the following reasons induced you to take up dairying (Yes/No)

1. To learn Better methods of dairying and take it as an occupation
2. To become an ideal dairyman
3. To earn additional income
4. Lack of other occupations
5. For health related aspects
6. Rearing animal for prestige aspects
7. Doing what others are doing
8. Making use of extra time
9. Financial and technical help
10. Others

Appendix II

Milk Collection data for the year 2014-15

Sl no	District	Dairy	Society	Product	Total
1	Thiruvananthapuram	34808503	24766099	0	59574602
2	Kollam	19737496	19427468	0	39164964
3	Pathanamthitta	11857481	4094531	0	15952012
4	Alappuzha	20506439	12937930	0	33444369
5	Kottayam	13245923	14297110	0	27543033
6	Idukki	35507232	14858556	0	50365788
7	Ernakulam	24072036	15670968	0	39743004
8	Thrissur	13946897	10952577	98729	24998203
9	Palakkad	58258202	25904655	0	84162857
10	Malappuram	13963983	5725596	49195	19738774
11	Kozhikkod	25523640	10237123	52718	35813481
12	Wayanad	46991852	16089707	936493	64018052
13	Kannur	21115185	21249849	461497	42826531
14	Kasargod	13979582	5552530	0	19532112
	TOTAL	35,35,14,451	20,17,64,699	15,98,632	55,68,77,782

(Source: Dairy Development Department, Govt. of Kerala)

Appendix III

Status of APCOS and Non-APCOS in Kerala (as on 31.03.2016)

Dairy Development Department Dairy Co-operatives registered - as on 31.03.2016				
Region	District	Apcos	Non Apcos	Total DCS
Thiruvananthapuram	Thiruvananthapuram	341	81	422
	Kollam	277	63	340
	Pathananamthitta	188	16	204
	Alappuzha	249	24	273
Ernakulam	Kottayam	248	27	275
	Idukki	193	15	208
	Ernakulam	330	17	347
	Thrissur	226	61	287
Malabar	Palakkad	322	21	343
	Malappuram	258	32	290
	Kozhikode	246	25	271
	Wayanad	53	2	55
	Kannur	168	57	225
	Kasargod	136	7	143
Grand total		3235	448	3683

(Source: Dairy Development Department, Govt. of Kerala)

Appendix IV

Milk Production of Kerala

Year	Milk production (LMT)
2010-11	26.4.
2011-12	27.16
2012-13	27.92
2013-14	29.03
2014-15	29.78

Per capita availability of milk in Kerala is estimated as 244 gm per day

(Source: Dairy Development Department, Govt. of Kerala)

Appendix V

Milk price Chart

Kerala Co-operative Milk Marketing Federation Ltd. Society to Producer Price Chart

WEF 21.07.2014

CLR	23	24	25	26	27	28	29	30	31	32						
FAT	SNF	Rate	SNF	Rate	SNF	Rate	SNF	Rate	SNF	Rate						
3.0	6.9	7.1	7.4	7.6	7.9	8.1	27.28	8.4	28.05	8.6	28.57	8.9	29.35	9.1	29.86	
3.1	6.9	7.1	7.4	7.6	7.9	8.1	27.49	8.4	28.27	8.6	28.78	8.9	29.56	9.1	30.08	
3.2	6.9	7.1	7.4	7.6	7.9	8.1	27.70	8.4	28.48	8.6	28.99	8.9	29.77	9.1	30.29	
3.3	6.9	7.2	7.4	7.7	7.9	8.2	28.17	8.4	28.69	8.7	29.46	8.9	29.98	9.2	30.76	
3.4	6.9	7.2	7.4	7.7	7.9	8.2	28.38	8.4	28.90	8.7	29.68	8.9	30.19	9.2	30.97	
3.5	7.0	7.2	7.5	26.79	7.7	27.30	8.0	28.08	8.2	28.59	8.5	29.37	8.7	29.89	9.0	30.66
3.6	7.0	7.2	7.5	27.00	7.7	27.51	8.0	28.29	8.2	28.81	8.5	29.58	8.7	30.10	9.0	30.87
3.7	7.0	7.2	7.5	27.21	7.7	27.73	8.0	28.50	8.2	29.02	8.5	29.79	8.7	30.31	9.0	31.09
3.8	7.0	7.3	7.5	27.42	7.8	28.20	8.0	28.71	8.3	29.49	8.5	30.00	8.8	30.78	9.0	31.30
3.9	7.0	7.3	7.5	27.63	7.8	28.41	8.0	28.92	8.3	29.70	8.5	30.22	8.8	30.99	9.0	31.51
4.0	7.1	7.3	7.6	28.10	7.8	28.62	8.1	29.39	8.3	29.91	8.6	30.69	8.8	31.20	9.1	31.98
4.1	7.1	7.3	7.6	28.31	7.8	28.83	8.1	29.61	8.3	30.12	8.6	30.90	8.8	31.41	9.1	32.19
4.2	7.1	7.3	7.6	28.52	7.8	29.04	8.1	29.82	8.3	30.33	8.6	31.11	8.8	31.63	9.1	32.40
4.3	7.1	7.4	7.6	28.74	7.9	29.51	8.1	30.03	8.4	30.80	8.6	31.32	8.9	32.10	9.1	32.61
4.4	7.1	7.4	7.6	28.95	7.9	29.72	8.1	30.24	8.4	31.01	8.6	31.53	8.9	32.31	9.1	32.82
4.5	7.2	7.4	7.7	29.42	7.9	29.93	8.2	30.71	8.4	31.23	8.7	32.00	8.9	32.52	9.2	33.29
4.6	7.2	7.4	7.7	29.63	7.9	30.15	8.2	30.92	8.4	31.44	8.7	32.21	8.9	32.73	9.2	33.51
4.7	7.2	7.4	7.7	29.84	7.9	30.36	8.2	31.13	8.4	31.65	8.7	32.42	8.9	32.94	9.2	33.72
4.8	7.2	7.5	29.53	7.7	30.05	8.0	30.83	8.2	31.34	8.5	32.12	8.7	32.64	9.0	33.41	
4.9	7.2	7.5	29.75	7.7	30.26	8.0	31.04	8.2	31.56	8.5	32.33	8.7	32.85	9.0	33.62	
5.0	7.3	7.5	29.96	7.8	30.73	8.0	31.25	8.3	32.03	8.5	32.54	8.8	33.32	9.0	33.83	
5.1	7.3	7.5	30.17	7.8	30.94	8.0	31.46	8.3	32.24	8.5	32.75	8.8	33.53	9.0	34.05	
5.2	7.3	7.5	30.38	7.8	31.16	8.0	31.67	8.3	32.45	8.5	32.97	8.8	33.74	9.0	34.26	
5.3	7.3	7.6	30.85	7.8	31.37	8.1	32.14	8.3	32.66	8.6	33.43	8.8	33.95	9.1	34.73	
5.4	7.3	7.6	31.06	7.8	31.58	8.1	32.35	8.3	32.87	8.6	33.65	8.8	34.16	9.1	34.94	
5.5	7.4	7.6	31.27	7.9	32.05	8.1	32.57	8.4	33.34	8.6	33.86	8.9	34.63	9.1	35.15	
5.6	7.4	7.6	31.48	7.9	32.26	8.1	32.78	8.4	33.55	8.6	34.07	8.9	34.84	9.1	35.36	
5.7	7.4	7.6	31.70	7.9	32.47	8.1	32.99	8.4	33.76	8.6	34.28	8.9	35.06	9.1	35.57	
5.8	7.4	7.7	32.17	7.9	32.68	8.2	33.46	8.4	33.98	8.7	34.75	8.9	35.27	9.2	36.04	
5.9	7.4	7.7	32.38	7.9	32.89	8.2	33.67	8.4	34.19	8.7	34.96	8.9	35.48	9.2	36.25	
6.0	7.5	32.07	7.7	32.59	8.0	33.36	8.2	33.88	8.5	34.66	8.7	35.17	9.0	35.95		
6.1	7.5	32.28	7.7	32.80	8.0	33.58	8.2	34.09	8.5	34.87	8.7	35.39	9.0	36.16		
6.2	7.5	32.50	7.7	33.01	8.0	33.79	8.2	34.30	8.5	35.08	8.7	35.60	9.0	36.37		
6.3	7.5	32.71	7.8	33.48	8.0	34.00	8.3	34.77	8.5	35.29	8.8	36.07	9.0	36.58		
6.4	7.5	32.92	7.8	33.69	8.0	34.21	8.3	34.99	8.5	35.50	8.8	36.28	9.0	36.79		
6.5	7.6	33.39	7.8	33.90	8.1	34.68	8.3	35.20	8.6	35.97	8.8	36.49	9.1	37.26		
6.6	7.6	33.60	7.8	34.12	8.1	34.89	8.3	35.41	8.6	36.18	8.8	36.70	9.1	37.48		
6.7	7.6	33.81	7.8	34.33	8.1	35.10	8.3	35.62	8.6	36.40	8.8	36.91	9.1	37.69		
6.8	7.6	34.02	7.9	34.80	8.1	35.31	8.4	36.09	8.6	36.61	8.9	37.38	9.1	37.90		
6.9	7.6	34.23	7.9	35.01	8.1	35.53	8.4	36.30	8.6	36.82	8.9	37.59	9.1	38.11		
7.0	7.7	34.70	7.9	35.22	8.2	36.00	8.4	36.51	8.7	37.29	8.9	37.81	9.2	38.58		
7.1	7.7	34.92	7.9	35.43	8.2	36.21	8.4	36.72	8.7	37.50	8.9	38.02	9.2	38.79		
7.2	7.7	35.13	7.9	35.64	8.2	36.42	8.4	36.94	8.7	37.71	8.9	38.23	9.2	39.00		
7.3	7.7	35.34	8.0	36.11	8.2	36.63	8.5	37.41	8.7	37.92	9.0	38.70	9.2	39.21		
7.4	7.7	35.55	8.0	36.32	8.2	36.84	8.5	37.62	8.7	38.13	9.0	38.91	9.2	39.43		
7.5	7.8	36.02	8.0	36.54	8.3	37.31	8.5	37.83	8.8	38.60	9.0	39.12	9.3	39.90		
7.6	7.8	36.23	8.0	36.75	8.3	37.52	8.5	38.04	8.8	38.82	9.0	39.33	9.3	40.11		
7.7	7.8	36.44	8.0	36.96	8.3	37.73	8.5	38.25	8.8	39.03	9.0	39.54	9.3	40.32		
7.8	7.8	36.65	8.1	37.43	8.3	37.95	8.6	38.72	8.8	39.24	9.1	40.01	9.3	40.53		
7.9	7.8	36.87	8.1	37.64	8.3	38.16	8.6	38.93	8.8	39.45	9.1	40.23	9.3	40.74		
8.0	7.9	37.34	8.1	37.85	8.4	38.63	8.6	39.14	8.9	39.92	9.1	40.44	9.4	41.21		
8.1	7.9	37.55	8.1	38.06	8.4	38.84	8.6	39.36	8.9	40.13	9.1	40.65	9.4	41.42		
8.2	7.9	37.76	8.1	38.27	8.4	39.05	8.6	39.57	8.9	40.34	9.1	40.86	9.4	41.63		
8.3	7.9	37.97	8.2	38.74	8.4	39.26	8.7	40.04	8.9	40.55	9.2	41.33	9.4	41.85		
8.4	7.9	38.18	8.2	38.96	8.4	39.47	8.7	40.25	8.9	40.77	9.2	41.54	9.4	42.06		
8.5	8.0	38.65	8.2	39.17	8.5	39.94	8.7	40.46	9.0	41.24	9.2	41.75	9.5	42.53		
8.6	8.0	38.86	8.2	39.38	8.5	40.15	8.7	40.67	9.0	41.45	9.2	41.96	9.5	42.74		
8.7	8.0	39.07	8.2	39.59	8.5	40.37	8.7	40.88	9.0	41.66	9.2	42.18	9.5	42.95		
8.8	8.0	39.29	8.3	40.06	8.5	40.58	8.8	41.35	9.0	41.87	9.3	42.65	9.5	43.16		
8.9	8.0	39.50	8.3	40.27	8.5	40.79	8.8	41.56	9.0	42.08	9.3	42.86	9.5	43.37		
9.0	8.1	39.97	8.3	40.48	8.6	41.26	8.8	41.78	9.1	42.55	9.3	43.07	9.6	43.84		
9.1	8.1	40.18	8.3	40.70	8.6	41.47	8.8	41.99	9.1	42.76	9.3	43.28	9.6	44.06		
9.2	8.1	40.39	8.3	40.91	8.6	41.68	8.8	42.20	9.1	42.97	9.3	43.49	9.6	44.27		
9.3	8.1	40.60	8.4	41.38	8.6	41.89	8.9	42.67	9.1	43.19	9.4	43.96	9.6	44.48		
9.4	8.1	40.81	8.4	41.59	8.6	42.10	8.9	42.88	9.1	43.40	9.4	44.17	9.6	44.69		
9.5	8.2	41.28	8.4	41.80	8.7	42.57	8.9	43.09	9.2	43.87	9.4	44.38	9.7	45.16		
9.6	8.2	41.49	8.4	42.01	8.7	42.79	8.9	43.30	9.2	44.08	9.4	44.60	9.7	45.37		
9.7	8.2	41.71	8.4	42.22	8.7	43.00	8.9	43.51	9.2	44.29	9.4	44.81	9.7	45.58		
9.8	8.2	41.92	8.5	42.69	8.7	43.21	9.0	43.98	9.2	44.50	9.5	45.28	9.7	45.79		
9.9	8.2	42.13	8.5	42.90	8.7	43.42	9.0	44.20	9.2	44.71	9.5	45.49	9.7	46.01		
10.0	8.3	42.60	8.5	43.12	8.8	43.89	9.0	44.41	9.3	45.18	9.5	45.70	9.8	46.48		



MANAGING DIRECTOR

