ECONOMICS OF MILK PRODUCTION IN THE THRISSUR DISTRICT

By

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THESIS

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DECLARATION

I hereby declare that this thesis entitled "Economics of Milk Production in the Thrissur District" is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title of any University or Society.

Vellanikkara
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CERTIFICATE

Certified that this thesis entitled "**Economics of Milk Production in the Thrissur District**" is a record of research work done independently by **Mr. Sreejith, T.K.**, under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to him.

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CHAPTER I

INTRODUCTION

India is predominantly an agrarian economy with more than 70 per cent of its population living in villages and depending on agriculture and allied activities for their livelihood. Land and cattle have traditionally been the two basic income yielding assets of Indian farmers. Most of the cultivating households, irrespective of the size of their land holdings, own some milch animals. Animals can easily be maintained on the crop residues, on weeds and wild grass, and the abundant availability of family labour has made cattle rearing an integral part of rural life. Thus dairying acted as the most effective instrument for supplementing farmers' income and generating employment in the rural sector. Moreover the disparity in income generation resulting from the crop production can be reduced by organising and enlarging dairy and animal husbandry activities in the rural sector. Thus dairying is being envisaged as an important means of reinforcing the income for economically weaker sections of the society who are largely landless labourers and small farmers.

Dairying is practiced on a small scale as a secondary occupation by 70 million rural farmers. These small milk producers maintain 53 per cent of the bovines in milk and

account for 50 per cent of total milk production. Though 23 per cent of the world's cattle population is concentrated in India, the annual milk production is only 6.5 per cent of the total world production. The total milk production in India was about 16.61 million tonnes in 1940, 16.93 million tonnes in 1950, 19.84 million tonnes in 1960, 20.79 million tonnes in 1970, 29.72 million tonnes in 1980, 38.40 million tonnes in 1985 and reached 40 million tonnes by 1990. At the same time milk production of Kerala increased from 0.8 million tonnes in 1977-78 to 1.7 million tonnes in 1991-92. During 1989-90, Kerala's share of milk production stood at 3.11 per cent of the all India production of milk.

The need for promotion of dairying arises due to several considerations such as low per capita availability of milk, prevalence of large-scale unemployment, shrinking agricultural land, particularly wetland, achieving self-sufficiency in the production of milk and milk products and to supplement the farmers with additional income. Again cattle constitutes an important source of drought power in Indian agriculture also. But despite the cattle domination in the Kerala state, the productivity remained low, compared to many other regions in India. The low productivity of milk in Kerala was due largely to the rising milk production costs, inability to fully commercialise dairy units, tiny land

holdings and low levels of management efficiency. The demand for milk in the state, however, has been rising at a rapid rate not only because of the increase in population but also increase in absolute incomes (especially from external remittances).

The per capita per day availability of milk in Kerala was 169 g in 1991-92 and that of Thrissur district was only 157 g. The per capita milk consumption was far short of the 210 g per head per day as the minimum requirement recommended by the Nutrition Advisory Committee and 201 g per head per day as recommended by Sukhatme, though the per capita availability has risen in the state over the years.

Apart from increasing milk production, there is another more important aspect of dairying. It has great potentiality for improving the economic lot of the large number of small farmers and agricultural labourers. The concentration of bovine population is more in small farms. An analysis of Indian bovine economy reveals that the average number of bovine stock per unit of cultivated area in holding with less than one acre carry over six times as many bovines per unit area of holdings of 30 acres and more. Again there is a preponderance of adult females in the very small holdings which seems to suggest that they concentrate more on milk production (Vaidyanathan, 1978). Again productivity in small

farms could be raised only by an optimum exploitation of available resources such as land, manpower, animal and water and by integrating livestock and crop production. According to the Report of the Working Group on Animal Husbandry and Dairy Co-operatives, 1962, which appears to be valid even today, there is increasing awareness of animal husbandry and dairying as an integral part of a sound system of diversified agriculture in which crop production and animal husbandry are dovetailed for efficient and economic utilization of land, labour and capital. This would lead to fuller utilization of soil fertility, fuller employment for agriculturists throughout the year and increase in rural income.

Systematic development of dairy and cattle industry started only after the launching the country's Five Year Plans. In order to increase the milk production efforts to improve the quality of the livestock, better feeding and management practices were encouraged in the plans. The importance attached to raising milk production as the primary aim of cattle development was strengthened by Operation Flood Programme implemented during the Fourth Five Year Plan. Operation flood of the Indian Dairy Corporation ushered in rapid development of the dairy sector and through its multi-pronged activities, milk production in the country and in Kerala state has increased. In continuation of Operation

Flood-I, the second phase of Operation Flood Project (OF-II) was launched under the Seventh Plan. Both in terms of financial outlay involved (Rs.480 million) and of the geographical coverage (160 districts) it was one of the biggest dairy development project ever undertaken in India. The Operation Flood programmes have largely been made possible on the basis of dairy commodity aid and grants received from a variety of international agencies, the most important of which have been the World Food Programme (WFP) of the United Nations, Food and Agricultural Organisation (FAO), the European Economic Community (EEC) and the World Bank. Later dairying increasingly became a part of the state's anti-poverty programme. Organisations like the Small Farmers Development Agency (SFDA) and Integrated Rural Development Programme (IRDP) gave priority to dairy development projects as an instrument for uplifting the economic conditions of the weaker sections of the rural population and liberally extended credit and subsidies for purchasing cows. The main targets of the Third phase of the Operation Flood Programme which was launched during 1987-88 and spanned over 7 years was to cover 6.7 million farmers through 70,000 dairy cooperatives and to attain milk procurement of 13.7 million kg per day, an increment of 5.2 million kg per day from the base year of 1987. Kerala state has advanced further in animal husbandry by launching a commercial project on embryo transfer

technology under Operation Flood Programme. This could usher in a new generation of super cows in the state.

The milk supply schemes which were primarily designed to tackle the problems of marketing and short supplies as well as ensuring remunerative prices to producers have succeeded only partially because of the slow pace in milk procurement, processing, distribution and transportation and in input supplies to producers. It was realised that institutional support should aim at safeguarding the interests of both producers and consumers of milk. The co-operative sector which balances the interests of producers and consumers is best suited for dairy development. Efforts for organising dairy industry and trade on co-operative lines were facilitated by the enactment of Co-operative Societies Act, 1912. Dairying in the co-operative sector in Kerala had its beginning in 1939 when the Calicut Milk Supply Union was registered. The formation and activities of dairy co-operatives remained at a low level for fairly long time and gained momentum in the 1970s and early 1980s.

That co-operatives in the dairy sector can give a new and promising direction to dairy development was demonstrated with the establishment of the Kaira District Co-operative Milk Producer's Union Limited in 1946, popularly known as 'AMUL'. The pattern of working evolved by the Anand Union has come to

be known as Anand pattern. The two-tier pattern evolved by AMUL met with great success and several states have organised milk producers co-operative societies on that pattern. The replication of Anand pattern in different milk sheds of the country actually started in 1970. One of the main objectives of Operation Flood Project was the replication of Anand pattern in its different facets in the various milk sheds of the country viz. organisation of producers co-operatives, establishing dairies and chilling centres, providing artificial insemination facilities and health cover to the animals of producers and to undertake the production enhancement programme like fodder - development, supply of cattle feed, providing calf-subsidy etc.

The Kerala Co-operative Milk Marketing Federation known as 'MILMA' is the implementing agency of Operation Flood Programme in Kerala since 1980 with technical and financial assistance of National Dairy Development Board. With the setting up of 148 new dairy societies (traditional and Anand pattern together), the total number of dairy societies registered till the end of December 1992 has reached 2147 with a total membership of 52 lakhs in the state. In Thrissur district there are 199 dairy co-operative societies as on June, 1992 of which 115 are Anand Pattern (APCOS) societies and the rest are traditional (NON-APCOS) societies. The

impact of dairy co-operatives can be seen in the villages in the form of generation of funds, creation of self-employment opportunities, direct employment in societies, distributive justice and reduction in economic and social disparities.

According to the 1987 quinquennial livestock census, Kerala state had 3.4 million heads of cattle and of that 7.7 per cent were concentrated in Thrissur district. Out of the total adult cattle, non-descript cattle accounted for 48.36 per cent and cross-bred cattle accounted for the rest i.e. 51.64 per cent.

The dairying is one of the enterprises wherein the co-operative movement has made considerable progress in the country. Moreover dairying has been considered as an economic activity which in closely related to agriculture. For the development of agricultural sector, we should maximise the output of this sector giving high priority to those projects which are aimed at integration of livestock into small farmer system and obtaining better utilization of farm resources, thereby bringing a favourable complementary relationship between cropping and livestock production within the context of small farming system. Apart from their role in milk production, they contribute a huge quantity of organic manure which is one of the major inputs in our agriculture. The consumption pattern of livestock products will also change the

demand for these commodities which is affected by changes in income of the farmers. Again the economic aspects of milch animals will also change from area to area and it is essential to know how the policy measures like structure of holdings, ownership pattern, size, feeding aspects, labour, sale and consumption of milk etc. affects the economics of milk production. Hence the present study was conducted for the selected group of farmers in the selected localities of co-operative societies of Thrissur district of Kerala state. The study has the following specific objectives.

1. To study the economics of milk production
2. To work out the income elasticities
3. To understand the marketing channels for milk
4. To work out the resource use efficiency in milk production with regard to certain explanatory variables

The study is divided into five chapters. Besides the first chapter; the second chapter deals with the literature having a bearing on the present study. Chapter three explains the profile of the Thrissur district and methodology of the study. The fourth chapter analyses the various aspects of economics of milk production. The fifth chapter summarises the findings of the study by offering suggestions.

Review of Literature

CHAPTER 2

REVIEW OF LITERATURE

Animal Husbandry in India is closely interwoven with agriculture and obviously the former plays an important part in the rural economy. But it did not receive as much attention as crop production till the twenties when the Royal Commission on Agriculture (1928) provided a comprehensive and incisive discussion on India's livestock economy. The last three decades witnessed stepped-up research efforts leading to significant contributions to the understanding of the bovine economy and resulting in increased dairy activity in the country. The significant studies having a bearing on the present study been reviewed here.

Rajagopalan et al. (1961) in a case study conducted in Coimbatore region of Tamil Nadu found that the income from crops was seasonal and affected by time lag whereas income from livestock was steady and distributed throughout the year. they also observed that income from livestock varied between farms depending on the number of animals maintained.

Puri (1963) worked out the economics and the cost of production of milk using the data from National Dairy Research Institute for the last completed lactation upto the beginning

of 1962 for the three breeds maintained by the institute. The most important item of expenditure accounted for was feed and it stood around two-thirds of the total cost.

Amble (1965) conducted a random sample survey in typical large tracts in different animal husbandry regions of the country in order to estimate the annual milk production and study the feeding and rearing practices of cattle. He observed that feeding of animals differed very much in respect of Digestible Crude Protein (DCP) provided through stall feeding, and there was no possibility of increasing the availability of by-products such as grains, cakes, brans, husks and straw. Linear programming application showed that the most economic way of meeting the shortfall is to grow nutritious green fodder and the farmers should be induced to grow green fodder through incentives like subsidy in irrigation charges, fertilizers etc. and supply of improved seeds of cultivated fodder.

Chatterji and Goswami (1965) conducted a study on National Sample Survey data for 1955-56 and observed that non-cultivator households manages cattle and buffaloes better than cultivator households.

Ramasubban and Goel (1965) enquired into the economics of dairy enterprises in selected agricultural tracts of the

Delhi region using the data collected by the former Agricultural Economics section of the Indian Agricultural Research Institute during 1959-60 to 1961-62. Their analyses showed that cost incurred on feed items as the most relevant and important factor to be reckoned for the milk production. Using double log model, they found per capita consumption of milk to be significantly and positively influenced by gross earnings from crops and total milk available per family. Again, milk supply by cultivator-producer of this region depended on the extent to which additional resource facilities by way of more milch animals on easy credit terms and feed were available at low costs.

Singh (1965) conducted a study of 60 Delhi Farms using the farm business data collected by the Agricultural Economics Division of the Indian Agricultural Research Institute to estimate the feed-milk response, to compare seasonal feeding pattern with the standard feeding ration recommendation and to analyse the cost of production of milk. Using power function it was observed that milk yield has a positive and significant correlation with Total Digestible Nutrients (TDN) but not significant in relation to Digestible Crude Protein (DCP). The analysis of seasonal net returns has suggested better possibilities in the summer and rainy seasons for expanding milk production. It was considered mainly a

function of seasonal price difference for milk which required more feed supply in those favourable seasons.

Jacob et al. (1969) studied the feed-input, milk-output functions by considering each of the constituent feed such as paragrass, concentrate mixture groundnut cake and ragi straw as input factors from the materials obtained from an experiment conducted at the Southern Regional Station of the National Dairy Research Institute, Bangalore during 1959-62. Using the Cobb-Douglas production function they found that the inputs paragrass and concentrate mixture were statistically significant and that nearly 77 per cent of variation in milk yield was explained by all the feed ingredients put together. Studies on the substitution rates revealed that substitution of concentrates by greens is feasible to a considerable extent at lower levels of milk production but the scope for such substitution decreases as the production level increases.

Wells and Pasour (1970) studied the effects of certain factors associated with the cost of production of cow milk using Cobb-Douglas production function and found that about 50 per cent of the variation in cost was explained by variables like value of milk yield, amount of milk sold per cow, herd size and quantity of roughages.

Jacob et al. (1971) collected data from urban, sub-urban and rural areas of Tamil Nadu namely Madras city, the sub-urban areas consisting of villages surrounding the city from which milk was being supplied to the city and in a village of Gudiatham taluk in North Arcot district during 1960-62. They studied the effect of feed cost, paid labour, unpaid labour and depreciation on animals and assets on the milk yield by using Cobb-Doughlas production function and found that these variables together had explained 46 per cent of the variation of milk yield and among them feed cost showed a positive response towards milk production.

Acharya et al. (1973), in view of the importance of dairy farming in the economy of tribal communities, studied the economics of milk production with a sample cultivators selected from the co-operative milk collecting centres of the tribal areas of Ahmednagar district in Maharashtra. Although the per animal production of milk was high in the case of buffaloes, cost of production was high both in the case of buffaloes and cows.

Kahlon et al. (1973) observed that there was no relationship between the size of the farm and maintenance cost of the cows.

Ram et al. (1973) conducted a study in Karnal city (Haryana) to establish the relationship between marketed surplus and size of land holding and observed that per capita consumption of milk increased with increase in size of holdings whereas the marketed surplus of milk decreased with an increase in size of holdings.

Raut and Singh (1973) worked out the cost of production of milk in households of landless cattle owners and small, medium and large farmers utilizing the data collected in a large scale sample survey in Krishna delta area of Andhra Pradesh. Cost of production of milk was the lowest for landless cattle owners and the highest for small farmers whereas feed cost which is the major component of production cost was, the highest in holdings of large farmers and the lowest in households of landless cattle owners.

Gupta and Pandey (1975) in their study on the consumption and availability of milk in India estimated the supply of milk as 22.32 million tonnes in 1979 rising to 23.02 million tonnes in 1986. They had also estimated that there will be a gap of five to nine million tonnes of milk between the supply and demand for milk in future years. They suggested that the best way of increasing the production of milk is to maintain better management, proper breeding of

suitable animals, managing the demand for milk and milk products and proper feeding of livestock.

Kunwar et al. (1975) conducted a study to work out the economics of milk processing under the public and co-operative units and examined milk production, costs and income per milch buffalo per annum under private and co-operative guided management in Kanpur district, Uttar Pradesh. The study revealed that processing cost per litre in the case of public unit was about one and a half times higher that of the co-operative societies. The study also revealed that the co-operative society has superiority over the public unit as well as private farmers hence development of such organisations will be in the interest of producers, consumers and the country as a whole.

Sankhayan and Joshi (1975) studied the relationship between milk production and age of animals, number of lactation, stage of lactation, concentrates, dry fodder and green fodder by fitting Cobb-Douglas production function, observed that milk production declined with increase in age of animal and stage of lactation while increasing concentrates, dry fodder and green fodder would increase the milk production at the geometric mean levels.

Singh (1975) by studying a random sample of 140

cultivators from the rural areas of Aligarh district during the period 1966-67 to 1970-71, found by fitting Cobb-Douglas production function that the marginal value productivity was the highest for concentrates followed by fodder and human labour.

Solanki (1975) studied the milk market structure in Karnal city during 1972, and found that as the number of intermediaries increased, the producer's share in the consumers price decreased.

Singh and Patel (1976) conducted a study on the impact of commercialisation on producer's milk consumption pattern in the rural and urban areas of Muzzaffar Nagar district in Uttar Pradesh. They found that in both the areas consumption of milk and milk products was high among the households maintaining milch animals as compared to the pure consumer households. Consumption inequalities of milk and milk products were low in the case of producer-consumer (commercial) households, thereby indicating higher standard of living for the households adopting dairying on commercial basis as compared to the non producer-consumers.

Madalia and Charan (1976) conducted a study to compare the cost of maintenance of animals and milk production as affected by size of holdings among the selected members

supplying milk to Samul dairy at Surat. The study revealed that cost of maintenance of buffalo calf increased with the increase in size of land holdings, whereas that of cow calf excluding the landless group decreased. In the case of dry animals, the cost of maintenance increased with increase in the size of holdings. They observed that cost of maintaining the milking animals was higher than that of the dry animals in the various sized farms and feed cost stood at the top followed by labour cost.

Rai and Gangwar (1976) worked out the cost of milk production and seasonwise resource use efficiency on different herd size in Hissar district (Haryana) revealed that concentrates was the most significant factor influencing milk yield in small herd size farms in each season and in winter and summer seasons in medium and large herd size. They also observed that large producers in Haryana had 100 per cent of their buffaloes in milk during summer when market prices for milk were the highest.

Raju (1978) in his study pointed out that the reasons for low yield of milk were due to lack of intensive breeding facilities, inadequate supply of feeds and fodders and lack of facilities for disease prevention measures. He also urged to review the structure of marketing and distribution of liquid

milk by different milk supply schemes in the country to improve the utilization of milk.

Singh et al. (1979) conducted a study in Punjab using the secondary data for the year 1975-76 to examine the cost structure of milk production, to work out the annual maintenance cost of a milch animal and to estimate the per litre cost of production of milk. They observed green fodder as the major item of operational cost followed by concentrates, dry fodder and manual labour. The per litre cost of production of milk was estimated as Rs.1.82 for the state as a whole. The study suggested that the cost of production can be reduced through a number of measures like offering subsidy on concentrates, providing adequate and prompt health care to the animals, low interest rates for loans for the purchase of high yielding animals etc.

Pawar and Sawant (1979) studied the comparative efficiency of alternative milk marketing agencies on the basis of cost criteria in Western Maharashtra and reported that the private agency was comparatively more efficient in terms of processing, transport and distribution of milk.

Singh and Sharma (1979) in their study urged to increase the productivity of the indigenous cattle by cross-breeding through artificial insemination.

Prabhakaran (1980) conducted a survey in Trichur taluk during 1976-77 to understand the nature and problems of livestock enterprises. Multiple linear regression analysis revealed that feed cost and sale of milk were the main determinants in milk production and price received per litre had negative influence on milk production. Output of milk by households was found to be influenced more by sales than price considerations.

Rao (1980) using the probability proportional in sampling, selected households having dairy animals from Chitturpu village in Krishna district of Andhra Pradesh during 1979 to examine the relative cost structure in milk production and investment pattern in dairy enterprises. It was found that the major investments per household were made on dairy animals and cattle sheds and lowest for labour for the households having farming as main occupation. It was revealed that feed cost constitute the major component of cost of milk production followed by labour in all the seasons.

Singh (1980) conducted a study in Jaunpur district of Uttar Pradesh during 1978-79 and found that feed cost per litre of milk was comparatively low for crossbred cows than that of local cows and buffaloes.

Arora and Kumar (1981) conducted a study on market

structure and marketable surplus of milk in Meerut district of Western Uttar Pradesh. Their findings indicated that structural changes are taking place in the milk marketing system mainly due to the introduction of dairy development programme of AMUL model. The co-operative network is not only able to benefit milk producers, but is also able to safeguard the interests of milk consumers. They also expressed that a meaningful coordination between the co-operative credit and milk marketing institutions will go a long way, if accomplished in this direction.

Singh et al. (1981) conducted a study with 100 farmers selected randomly from 10 villages of two blocks of Unnao district in Uttar Pradesh and observed that the farmers with large size of holdings had incurred higher expenditure because of maintaining good breed and provided good quality fodder and concentrates.

Bal et al. (1982) in their study revealed that share of intermediary agencies accounted for 30-40 per cent of the consumer's rupee depending upon the number of agencies involved in the marketing channel. They also brought out the fact that there exists a large surplus of milk on the farm holdings of Punjab State which can be tapped for the market by improving the existing marketing system and providing remunerative prices to the milk producers.

Pandey et al. (1982) carried out an economic analysis of dairy enterprises and crop cultivation in Haryana suggested for the commercialization of dairy enterprises along with the crop enterprises.

Gajja and Vyas (1984) in their study on the cost structure of milk marketing in the co-operative sector in Western Rajasthan revealed that the price paid to the producer formed a large share in the total cost of milk processing. Transportation cost showed a decreasing trend with an increase in the quantum of milk handled implying that an increase in the total quantity of milk handled result in substantial reduction in the transportation cost. It was also revealed that procurement of milk was much below the installed capacity of both the milk plant under study, indicating further scope for milk procurement and reduction in the marketing cost.

Rao (1985) in his study on factors affecting milk production, observed that the inputs such as green fodder and concentrates are the principal factors affecting the milk production.

Prabhaharan and Sivaselvam (1986) conducted a study in Chengalpattu district in Tamil Nadu during 1983-84, revealed that milk consumption increased with increase in land holdings. Production function derived for the study clearly

indicated that there existed definite scope for improving milk yield by increasing the feeding level of concentrates, green fodder and roughages.

Arya and Ram (1988) in their study indicated that there are wide differences in expenditure pattern between rural and urban consumers within various socio-economic groups in the same region. The factors attributed for these differences were per capita monthly expenditure, family size and educational status in rural areas and per capita total expenditure and educational status in urban areas.

Shiyani et al. (1989) in their study in Kheda district of Gujarat revealed that the return per litre of milk was highest in small size group of milk producer households (Rs.0.40) followed by large farmers (0.38), landless (0.37) and the medium (0.32) farmers.

Dayakar et al. (1991) in their study conducted in Hyderabad city during 1985-86 observed that feed and fodder costs together accounted for about 71 per cent of the total cost of which concentrates constituted the highest cost and it had positive relationship with the herd size.

Sreeja (1991) undertook a study in selected villages in Thrissur district during 1987-88 to estimate the cost and returns in milk production and found that net income from

crossbred cows was higher than that of desi cows and also the net income from milk production was higher for low income farmers when compared to middle income farmers. She also pointed out that the net cost for desi cows was low compared to crossbred cows.

Grover et al. (1992) in their study conducted at Bathinda district of Punjab observed that yield of milk per milch cattle had no relationship with the farm size, and feed cost accounted for the major cost involved in the cost of production of milk.

Kumar and Agarwal (1992) undertook a study in 1990-91 in Mathura district of Uttar Pradesh to measure the resource productivity and resource use efficiency of milk production. The production function analysis revealed that the green fodder and concentrates contributed positively and significantly to the milk yield. Production elasticities of feeds and fodder were positive for all categories of households indicating the scope for increasing the productivity of bovines. The MVP of concentrates was positive and significantly greater than unity and the MVPs of green fodder and dry fodder were positive but less than unity showing excessive use of these inputs.

Singh (1992) conducted a study to examine the factors

influencing milk yield and resources use efficiency in milk production in the intermediate zones of Jammu and Kashmir for the agricultural year 1989-90. Cobb-Douglas production function fitted with the data revealed that the inputs green fodder, dry fodder, concentrates, and family labour days were significant in the milk production. The coefficient of multiple determination (R^2) was found to be statistically significant indicating a good fit of the function with the selected variables. The production elasticity of family labour was found to be negative on all categories of farms indicating its over utilization in all the farms. It was suggested that, green fodder supply per animal in milk must be improved and increased to enhance the milk production.

Singh and Paul (1992) examined resource use efficiency in milk production based on data collected for the agricultural year 1989-90 from 100 households selected from Kangra and Kully districts of Himachal Pradesh. The average cost of milk production per litre was found to be the lowest for crossbred cows and the highest for non-descript local cows. Green fodder, dry fodder, concentrates and labour had positive and statistically significant regression coefficients in milk production function. They also observed that increasing the use of green fodder and concentrates would increase milk output and profit.

Tailer et al. (1992) using data collected on Surti buffaloes maintained at the All India Co-ordinated Research Project on Buffaloes, Livestock Research Station, Vallabhnagar during 1988-90 observed that 85 per cent of the total production cost was spent on feeding and among these dry fodder accounted for the maximum. Cost per kg of milk production was also highest in the case of dry fodder.

Vasani et al. (1992) in their study found that concentrates and the ratio of milking days to calving interval had positive and highly significant effect on milk yield. Dry fodder, green fodder and labour had also contributed to the milk production. The overall marginal value product of concentrate was the highest and highly significant. The marginal value product of labour was found to be negative. The study suggested for increasing the quantum of concentrates, educating the farmers for adopting recommended management and breeding practices to reduce the calving interval and efficient utilization of labour to increase the milk yield.

Methodology

CHAPTER 3

METHODOLOGY

3.1 District profile

3.1.1 Physical features

The crop production is influenced by many factors such as topography, rainfall, soil, land utilization pattern, cropping pattern, irrigation, input supply and marketing. These factors also have an effect on production and marketing of milk as well as on the farmers' earnings.

Thrissur district is located at the centre of the state of Kerala between north latitude 10° and 10°4' and east longitude 75°57' and 76°54'. The district is bounded on the north by Palghat and Malappuram districts. Coimbatore district of Tamil Nadu and Palghat district form the eastern boundary of Thrissur district. Ernakulam and Idukki districts lie to the southern side of the district and Arabian sea to the West. The total geographical area of Thrissur district is 3032 sq km which forms 7.8 per cent of the total area of the state, and the population of the district according to the 1991 census was 27,37,311.

The district comprises of five taluks, seventeen blocks and 255 villages. The district has three natural

divisions viz., highland, midland and lowland, based on elevation from sea level. All the three regions are found in Thrissur and Mukundapuram taluks. But Talappilly taluk lies in highland and midland whereas Chavakkad and Kodungallur taluks are in midland and lowland.

3.1.2 Natural resources

The water resource of the district include Bharathapuzha, the largest river flows westwards at the northern boundary and Periyar also flows westwards at the southern boundary. The district also has a wide network of canals, tanks, wells and other types of irrigation facilities. These together with the backwaters and estuaries of rivers form continuous waterway.

The soil of the district is broadly divided into sandy, alluvial, laterite and forest soil. The soil of the coastal taluks of Kodungallur and Chavakkad vary from almost pure sand to sandy loam and are deficient in all major plant nutrients and calcium. Coconut is the predominant perennial crop grown in the sandy belt. Seasonal crops like tapioca, banana and vegetables are grown in the midland regions where laterite soil is present. In the backwater areas soil is loamy type and highly fertile due to sedimentation and this soil is good for paddy cultivation.

3.1.3 Climate

The climate is tropical and humid with an oppressive hot season. The rainfall is seasonal and fairly assured. The major sources of rainfall in the district are the south-west monsoon and the north-east monsoon. The annual rainfall received in the Thrissur district during 1991 was 3399 mm concentrated in the months from June-September.

3.2 Dairying

Dairying has been considered as a subsidiary occupation for the village farming community with a view to improve the potentialities in gainful employment and to ensure regular supplementary income to the small and marginal farmers and landless labourers in the district. Milk constitute the most important source of nourishment for both vegetarians and non-vegetarians, for old and young alike. The breedable cattle population in Thrissur district as per 1987 cattle census was 1,27,312 which gives the district eighth place in the state. The total milk produced by cows and buffaloes in the district was estimated as 137.89 thousand tonnes in 1990-91. The per capita per day availability of milk in the district was very low (148 g) when compared to the state average (162 g). There were 115 APCOS and 84 Non-APCOS

functioning in Thrissur district as on June, 1992 with an efficient and effective marketing network for milk.

3.3 Research methodology

3.3.1 Sampling procedure and methodology

The study was conducted in two parts. In the first part, production, consumption and price of milk and major inputs used in the production of milk for the state as a whole were analysed using secondary data. The demand for milk and income elasticities were also worked out in this part of the study. The data obtained from the Department of Animal Husbandry, State Planning Board and National Sample Survey were mainly relied upon for this study. The NSS data, do not cover information on individual products separately. So the data on consumption of milk and milk products together was taken for this purpose. For estimating income elasticities, Engel functions were fitted taking expenditure on milk and milk products by the various monthly per capita expenditure groups. Three Engel functions were used namely, linear, log-linear and semi-log, and the form of Engel curve is shown below.

Type of function	Algebraic form	Constants	Marginal propensity to consume (MPC)	Elasticity Coefficients
Linear	$Y = a + bx$	a and b	b	b (x/y)
Log-linear	$Log_e Y = a+b \log_e x$	a and b	b (y/x)	b
Semi-log	$Y = a+b \log_e x$	a and b	b/x	b/y

In the second part of the study economics of production and marketing was analysed through a sample survey among milk producers. Milk producers, for this purpose were selected by multi-stage random sampling method. In the first stage two taluks were selected at random from the five taluks in the district. The taluks selected were Thrissur and Mukundapuram. From the total APCOS and NON-APCOS in the two taluks, list of each of these registered prior to 1980 were prepared and two each were selected at random from this list. The selected societies were Panancherry Ksheerolpadaka Co-operative Society (APCOS) and Mannamangalam Ksheeravyavasaya Co-operative Society (NON-APCOS) from Thrissur taluk and Anandapuram Ksheerolpadaka Co-operative Society (APCOS) and Thrikkur Ksheeravyavasaya Co-operative Society (NON-APCOS) from Mukundapuram taluk. From each of these four societies, 15 members were selected at random and 15 non-members residing in the area of operation of the society were also selected

randomly for the study. Thus the total sample constituted 120 households. A survey was also conducted among 15 milk traders selected randomly in and around Thrissur in order to understand the major trade channels.

3.3.2 Period of study

The reference year of the study was 1992-93 and the collection of data was carried out during the months of May-June, 1993.

3.3.3 Collection of data

The required primary data were collected from households by personal interview method with structured and pre-tested schedule (Appendix-I). The information on socio-economic characteristics and livestock position was obtained as on the date of interview. Information relating to production and marketing aspects, feeding, labour and other expenses and details of cash farm income from milk, dung etc., consumption pattern of milk and major sale outlets for milk were also collected and analysed.

3.3.4 Cost concepts

a. Fixed cost

Fixed cost consisted of depreciation on animals and sheds, interest on the value of animals and assets (fixed

capital) relating to milk production and taxes and insurance if any, paid.

b. Operational cost

Cost on feed, labour, ropes, baskets, buckets and veterinary and breeding charges incurred during the reference period with nominal interest charges formed the operational cost.

c. Gross cost

This includes the fixed cost plus operational cost.

d. Net cost

This was obtained by deducting the value of dung and calves from the gross cost.

3.2.5 Income concepts

a. Gross income

This consisted of income from milk produced, dung and calves.

b. Cash farm income/farm returns

This income include cash income obtained from the actual sale of milk and it does not include the products consumed at home.

c. Net income

This was obtained by deducting gross cost from gross income.

3.3.6 Valuation of inputs and outputs

The prices of feeds were taken as the average price that prevailed in the area at the time of survey. Labour was costed at actual wages paid for hired labour and similar amount imputed for family labour performing similar operations like feeding, washing and milking of the animals. Veterinary charges included the fee paid to technician towards insemination and expenses incurred in purchasing medicines. The actual costs incurred by the producer were used. Depreciation on animals was calculated by substracting the average sale proceeds of milch animals sold at the end of the year from the present value and divided by 365 days. A depreciation of five per cent for sheds per year on construction cost with no salvage value were assumed. The interest on working capital was calculated at 11 per cent per annum which is the rate at which farm loans are available from banks. The outputs such as milk, dung and calves were valued at the average prevailing market rates.

3.4 Analytical procedure

In addition to tabular analysis, functional relationship between the inputs and outputs were attempted in the study. The production relationship between the milk yield and other relevant inputs were studied by fitting the conventional Cobb-Douglas production function for one lactational period. Cobb-Douglas production function was fitted to the data on milk yield with independent variables such as total labour cost incurred per animal per day (x_1) cost of oil cake fed per animal per day (x_2), cost of compound feed fed per animal per day (x_3), cost of straw fed per animal per day (x_4) and cost of other feeds fed per animal per day (x_5). The form of the function was

$$Y = A\, x_1^{b_1}\, x_2^{b_2}\, x_3^{b_3}\, x_4^{b_4}\, x_5^{b_5}\, e^{u}$$

The Cobb-Douglas production function was estimated based on the primary data collected during the survey. The regression coefficients were tested for significance. The technical advantage of this type of production function is that it gives the elasticities of production directly. And the sum of the regression coefficients indicate the returns to scale. Again, the production function is defined only for non-negative values of inputs and outputs. Every possible

combination of inputs is assumed to result in maximum level of output. This means that the production function pre-supposes technical efficiency.

Marginal value products of the variables were also calculated at their geometric mean levels as follows.

Marginal value product of $(x_i) = \frac{\bar{y}}{x_i} \times b_i$, where

$\bar{y}$ - Geometric mean of y

$\bar{x}_i$ - Geometric mean of x_i

Results and Discussion

CHAPTER IV

RESULTS AND DISCUSSION

The results have been presented in four sections. In the first section, the milk production in the state as a whole and its related aspects were analysed using secondary data. The income elasticities estimated have also been presented. In the second section the results of the primary survey conducted on sample milk producers in the selected places of Thrissur district have been presented. In the third section, the functional relationships between the dependent variable, milk yield, and the various independent variables have been analysed using the Cobb-Douglas production function. In the fourth section the information collected from milk traders in the Thrissur district have been discussed to understand the trade related activities.

SECTION 1. PRODUCTION, PRODUCTIVITY AND INCOME ELASTICITY OF MILK

4.1.1 Growth of cattle and crossbred population

The growth of cattle population and percentage increase in the crossbred cattle in the state will indicate the trends and demands for crossbred cattle. In view of the

low yield potential and relatively poor production traits of various breeds of Indian cattle, crossbreeding technology with exotic breeds has been undertaken in various parts of the country on a large scale to achieve a break through in milk production. In the following tables an attempt has been made to understand the growth of cattle and crossbred populations. Table 1 shows the cattle population in Kerala during the last six censuses.

Table 1. Cattle population in Kerala (in lakhs)

Years / Items	1961	1966	1972	1977	1982	1987
Adult males	5.66 (20.56)	5.20 (18.20)	5.92 (20.73)	3.71 (12.34)	2.66 (8.59)	1.57 (4.59)
Adult females	11.62 (42.21)	12.19 (42.67)	13.00 (45.52)	13.71 (45.61)	15.13 (48.85)	17.01 (49.68)
Young stock	10.25 (37.23)	11.18 (39.13)	11.64 (40.75)	12.64 (42.05)	13.18 (42.56)	15.66 (45.75)
Total	27.53 (100.00)	28.57 (100.00)	28.56 (100.00)	30.06 (100.00)	30.97 (100.00)	34.24 (100.00)

Source: Quinquennial livestock censuses

* Figures in parenthesis shows percentage to total

From Table 1 we can find that the population of cattle in Kerala during the 25 years between 1961 and 1987 indicated an increasing trend. There was a total of 27.53 lakh cattle in Kerala in 1961, which increased to 34.24 lakhs by 1987, an increase of 24.37 per cent. In all the census, the proportion of the adult females dominated the other two categories. The proportion of adult males in the total showed a declining trend over the years. While adult males declined by 260.5 per cent, adult females increased by 46.39 per cent over the 25 year period indicating the increasing importance and demand for cows over bullocks.

The number and percentage of crossbred cattle according to the last three censuses were as shown in Table 2.

Table 2. Number and percentage of crossbred cattle in Kerala according to 1977, 1982 and 1987 census

Year	No. of crossbred cattle (lakhs)	Percent to total cattle
1977	13.55	45.07
1982	14.53	46.93
1987	17.02	49.71

Source: Livestock censuses

From Table 2 we can find that along with the increase in total cattle, the proportion of crossbred cattle in the state has also been rising over the years and accounts for about half of the total cattle in 1987. That in of the total cattle population of 30.06 lakhs in the state according to 1977 census, 45.07 per cent were crossbred cattle. Similarly out of the total cattle population of 30.97 lakhs according to 1982 census, 46.93 per cent were crossbred cattle and of the total of 34.24 lakhs cattle according to 1987 census, 49.71 per cent were crossbred.

4.1.2 Milk production in Kerala (cow only)

Acceleration in the total milk production through high quality dairy animals in the state is being achieved through crossbreeding. The policy adopted is to crossbreed the indigenous cows with high quality exotic bulls from high yielding breeds. Milk production from cattle in the state between 1980 and 1992 was as shown in Table 3.

From Table 3, we get an approximate idea about the milk yield of crossbred and non-descript cattle in the state and their share in the total milk production from cows. The compound growth rate of total milk production over the period mentioned above was 1.072 per cent per annum. Over the years, the share of milk of the non-descript cows showed a declining

Table 3. Milk production in Kerala (cow only)

In thousand tonnes

Year	Cow-crossbred	Cow-nondescript	Total
1980-81	528.60 (71.59)	209.8 (28.41)	738.40 (100.00)
1985-86	846.63 (77.82)	241.26 (22.18)	1087.89 (100.00)
1991-92	1268.77 (80.52)	306.93 (19.48)	1575.70 (100.00)

Source: Reports on sample survey estimation of milk, egg and meat in Kerala for the respective years issued by Statistical Division, Directorate of Animal Husbandry, Thiruvananthapuram, Kerala.

tendency from 28.41 per cent to 19.48 per cent, while there was a corresponding increase in the contribution from crossbred cows from 71.59 per cent to 80.52 per cent. Milk production by the crossbred cows was only 528.6 thousand tonnes during the year 1980-81. It increased to 1268.77 thousand tonnes showing an increase of 140.02 per cent over the 10 years. At the same time the milk production of non-descript cows which was 209.8 thousand tonnes during 1980-81, increased to only 306.93 thousand tonnes, showing an increase of 46.30 per cent over the 10 years. Total milk from cows more than doubled during the period from 738.4 thousand tonnes to 1575.7 thousand tonnes. The figures clearly indicate the achievements of the crossbreeding technology.

4.1.3 Demand and supply of milk in Kerala

The available statistics make it explicit that there exists significant gap between the demand and supply of milk in the state. Governmental efforts, though in a big way, may not be sufficient to bridge the gap between supply and demand. The economics of production and consumption are important factors influencing supply and demand. The estimates of demand and supply of milk in Kerala between 1964-65 and 1983-84 were as follows.

Table 4. Demand and supply of milk in Kerala

Year	Production 000 MT	Per capita income (at constant prices	Population 000's	Demand 000 MT
1964-65	204	568	18681	204
1977-78	702	590	24222	870
1983-84	1078	640	27097	1482

Source: Tara Nair (1988)

Table 4 reveals that with increasing population and per capita income there is a widening gap between the demand for milk and its supply in the state. Though the population

of cattle and the milk production were increasing over the years, sufficient quantity of milk as required by the increasing population was not available. The economies of milk production may be a reason for this shortfall in production. Though most of the milk produced was sold in the market, sufficient quantity was consumed at home also, owing to its nutritional properties. The farm level prices received for milk were also low in the country in general, and owing to increasing feed costs relative to milk prices, dairy farming is only of a secondary importance among the farmers. The lack of proper infrastructure for marketing and distribution of milk also led to the reduction of marketed surplus of milk in the open market.

4.1.4 Roughage - concentrate substitution in milk production

Among the many problems confronting dairying in the state, scarcity of raw materials and their high prices are the most important ones. The quantities of roughage and concentrates consumed by crossbred and nondescript cattle as reported by an integrated survey are shown in Table 5. The survey was conducted by the Directorate of Animal Husbandry, Kerala state.

Table 5. Average roughage - concentrate consumption per animal per day in 1990-91

Name of species	Classification	Breed	Green fodder (kg)	Dry fodder (kg)	Concentrates (kg)
Cattle	in-milk	ND	5.75	3.00	1.75
Cattle	Adult	ND	3.90	2.00	1.25
Cattle	Young	ND	2.50	1.00	0.40
Cattle	in-milk	CB	7.50	4.00	2.75
Cattle	Adult	CB	4.50	3.00	1.60
Cattle	Young	CB	2.75	1.50	0.75

Source: Report on sample survey estimation of milk, egg and meal in Kerala, 1991-92 issued by Statistical Division, Directorate of Animal Husbandry, Thiruvananthapuram, Kerala.

It can be seen from Table 5 that the actual quantities fed are below the nutritional needs of the animals for growth and production. Since feed is a major component of the cost of milk production, even the low quantities fed will lead to high feed cost, since most of the feeds like concentrates and to some extent dry fodder has to be imported from other states to Kerala. The farmers are rearing genetically improved cattle, but due to the poor nutritional support, the genetic improvement could not be fully exhibited and, so wasted. Hence, feeding balanced ration must be the policy for the

improvement in health and growth of crossbred cows and their youngstock for harnessing their full genetic potential in yield and other productive purposes. But these are influenced by the economics of milk production.

4.1.5 Income elasticities

One aspect of consumer demand behaviour which tends itself to econometric analysis is the relationship between a household's expenditure on some particular commodity and that household's total expenditure for a given price vector. Changes in the domestic demand accompanying changes in income is otherwise known as Engel effects. Here the estimation of Engel curves has been motivated by a desire to measure total expenditure (as proxy for income) elasticities of demand for milk and milk products for the Kerala economy. These estimates will provide information about the consumption pattern of milk and milk products in Kerala households over different income groups and over time period. The significance of studying the consumption patterns of the commodities is that it enables us to estimate the demand for these commodities as affected by the changes in income. These estimates could also be used to frame a proper price policy for these products and also for projecting the future demand for these products.

The National Sample Survey (NSS) data of 38th round (third quinquennial survey on consumer expenditure January to December, 1983) and 43rd round (fourth quinquennial survey on consumer expenditure, July 1987 to July 1988) were mainly relied upon for this analysis. The analysis was done for the Kerala economy as a whole, for urban and rural households separately using these data. The monthly per capita expenditure and total per capita expenditure for different income classes used for the estimation of income elasticities of milk and milk products are shown in Appendix II and III.

The Engel function used were linear, log-linear and semi-log. The elasticity coefficient (η) (log-linear) indicates the percentage change in consumption of a particular commodity (y) with a unit change in total income. The results of various Engel functions attempted for milk and milk products for Kerala state according to the 38th and 43rd round of NSS are presented in Table 6.

It is evident from Table 6 that in Kerala the income elasticities estimated for the function (log-linear) for consumption of milk and milk products were lower than one in both the NSS rounds for rural as well as urban households. Sinha and Giri (1987) carried out the same analysis using NSS data of 32nd round and 38th round in three states namely

Table 6. Results of Engel functions fitted for milk and milk products

Form of Engel Function	38th round				43rd round			
	b	SE	t value	η (log-linear)	b	SE	t value	η (log-linear)
KERALA-RURAL								
Linear	0.02	0.01	1.54		0.02	0.02	1.0	
Log-linear	0.63	0.53	1.19	0.63	0.54	0.31	1.74	0.54
Semi-log	7.42	2.41	3.08		6.91	3.42	2.02	
KERALA-URBAN								
Linear	0.04	0.01	4.0		0.06	0.01	6.0	
Log-linear	0.73	0.61	1.2	0.73	0.48	0.61	0.79	0.48
Semi-log	9.33	6.41	1.46		9.43	5.82	1.62	

Punjab, Gujarat and Tripura separately for rural and urban households. They found that, in Punjab the income elasticity calculated for milk and milk products was greater than one in both the rounds of rural households and it was close to one for urban households. In Gujarat, the elasticities for urban sector was almost one but for rural households elasticity was

less than one. In Tripura, elasticity for the rural sector was substantially lower than one in the 32nd round, but this increased to greater than one in the 38th round.

Here, in the present study, the elasticity coefficient (log-linear) in both the sectors decreased from 38th round to 43rd round. The percentage expenditure spent on milk and milk products in rural Kerala during 38th and 43rd rounds was less than 5 per cent of the total expenditure, and the percentage expenditure spent on milk and milk products in urban Kerala was less than 5 per cent in 38th round and between 5 and 10 per cent in the 43rd round. The percentage expenditure spent on milk and milk products in both rural and urban households in Kerala was also less than 5 per cent in the 32nd round (Sinha and Giri, 1987). These indicate that the consumption of milk and milk products was very low in Kerala irrespective of the minor rural and urban differences. It was mainly because of the widening gap between demand for milk and its supply in the state, due to the non-availability of efficient crossbred cows, poor management efficiency and poor feeding practices. Tara Nair (1988) also reported the same problems regarding the demand and supply of milk in Kerala. The elasticity coefficient (log-linear) increased from rural to urban sector in the 38th round but it has decreased in the 43rd round. It may be mainly because in Kerala most of the

rural centres are well connected with the milk marketing network and there is no clearcut demarcation between urban and rural areas as far as Kerala economy is concerned. The decline in the value of elasticity coefficients also shows that the rise in prices of these commodities between the two periods has led the households to spend proportionately less of their income during 1987-88 compared to the amount spent during 1983 although total income spent (or total expenditure incurred) increased from the 38th round to the 43rd round.

SECTION 2 - ECONOMICS OF MILK PRODUCTION

In this part of the study, the results and discussions on the detailed investigation conducted on sample households selected from different parts of Thrissur district on the various socio-economic characteristics, cattle rearing practices, cost components and economics of milk production have been explained. The samples were selected on the basis of membership in milk co-operative societies and non-members who were also engaged in dairying in the nearby areas of milk co-operative societies. Thus the sample consisted of two groups - those who have membership in milk co-operative societies form Group I and those who are not having membership in any milk co-operative society but engaged in dairying form Group II. The location and the number of households selected

under the two groups were as shown in Table 7. No distinction has been made between membership in the Anand Pattern Co-operative Societies (APCOS) and traditional milk co-operative societies (NON-APCOS) in the study for the purpose of broader classification and the members were selected at random from these two types of societies. The societies in the selected villages were - Pananchery village - Pananchery Ksheerolpadaka Co-operative Society, Anandapuram Village - Anandapuram Ksheerolpadaka Co-operative Society, Mannamangalam village - Mannamangalam Ksheeravyavasaya Co-operative Society and in Thrikkur village - Thrikkur Ksheeravyavasaya Co-operative Society.

Table 7. Number of households surveyed in selected villages in Thrissur district

Sl. No.	Name of village	Members (I)	Non-members (II)	Total
1	Pananchery	15	15	30
2	Anandapuram	15	15	30
3	Mannamangalam	15	15	30
4	Trikkur	15	15	30
	Total	60	60	120

A total of 120 sample households engaged in dairying was selected of which 60 households had membership in milk co-operative societies and the rest were not members of any milk co-operative society.

4.2.1 Socio-economic characteristics of households surveyed

The socio-economic characteristics were observed to be similar between member and non-member sample households and hence, the analysis was carried out on the aggregate sample.

4.2.1.1 Family size and land holdings

The distribution of sample households according to family size and size of land holding was as shown in Table 8. The land holdings were classified as those having less than 1 acre, 1-2 acres and 2 acres and above. The family size has been classified as those with 1-4 members, 4-7 members and 7 and above members.

By considering the sample as a whole, we can find from Table 8 that around 80 per cent of dairymen were having land holdings of less than 2 acres and only 20 per cent were having 2 or more acres. But 59.2 per cent of the sample households had a family size of 4-7 members, 38.3 per cent had a family size of 1-4 members and only 2.5 per cent had a family size of

Table 8. Distribution of households according to size of holdings and family size

Sl. No.	Size of holding (acres)	Family size			Total
		1-4	4-7	7 & above	
1.	Below 1	26	22	--	48 (40.0)
2.	1-2	15	33	--	48 (40.0)
3.	2 and above	5	16	3	24 (20.0)
	Total	46(38.3)	71(59.2)	3(2.5)	120(100.0)

* Figures in parenthesis shows percentage to total

$\chi^2 = 20.75$ ($P<0.05$)

7 and more members. Chi-square analysis did not reveal any close relationship between family size and size of holding.

4.2.1.2 Age of head of family

It is the duty of the farmers (dairymen) to adjust his farm organization from year to year to keep abreast of the changes in methods, price variability and resources available to him. It is the producer (head of family in most of the cases) who should act as an organizer and decision-maker in respect of their farm and farming activities. In Table 9, the households were distributed according to the age of head of

family in order to know the physical and mental make-up of the farmers and their likely attitudes towards dairying.

Table 9. Household distribution according to the age of the head of family

Sl. No.	Age group (in years)	Number of households	Per cent to total
1.	30-45	17	14.2
2.	45-60	41	34.1
3.	60 and above	62	51.7
	Total	120	100.0

It can be observed from Table 9 that majority of the dairymen were in the older age group. Around 85 per cent of the heads of the families were in the age group of 45 and above. One reason for this may be that the youths are not attracted to dairying or they themselves do not find time to spare for dairy activities. Since most of the households are having very few animals the elders can manage this affair and dairymen in the older age group are mainly engaged in these activities. Again the farming or decisions regarding the farm are mainly taken by the elders in the family since they are

having lot of experience and thus they can give leadership to this enterprise.

4.2.1.3 Cropping pattern

The cropping pattern of the sample households will reveal the importance of agriculture in relation to dairying, since the crop residues and agricultural by-products form an important item of feed among roughages besides fodder cultivation. Integration of dairy enterprise with crop enterprise can at best, be viewed only from the point of view of providing an avenue for the utilization of crop residue as well as supply of green fodder. The cropping pattern of the sample households is presented in Table 10.

Table 10. Cropping pattern of the sample households

Size of holding (acres)	No. of house-hold	Average net operat-ed area (acres)	Average area under paddy (acres)	Average area under coconut (acres)	Average area under other crop (acres)	Average area under green fodder (acres)
Below 1	48	0.50	0.17	0.30	0.03	0
1-2	48	1.23	0.80	0.38	0.05	0
2 & above	24	3.65	1.43	1.65	0.56	0.01
Total	120	1.42	0.67	0.60	0.15	0.001

From Table 10 it can be seen that in the aggregate the cropping pattern was fairly evenly balanced between paddy and coconut with other crops such as mango, cashew and rubber, having a minor role and fodder cultivation virtually non-existent. Paddy straw generally formed the main portion of the feeds fed to animals and invariably formed the only fodder among roughages. The average area under paddy was less among the farmers with lower sized holdings (below 1 acre) as compared to other classes. This will reflect in the cost because the households with larger area under paddy may have cost advantage in the total cost as paddy straw itself act an important component of feed. No effort has been taken by the sample households to rear green fodder and thus to minimise the feeding cost. Thus it has led the producers to depend upon purchased feeds and incur more cost which is clearly evident in the subsequent analyses.

4.2.2 Production, consumption and sale of milk

4.2.2.1 Households and milk production range

Each of the sample households surveyed during the reference period had only one cow-in-milk and no buffaloes, so the distribution of cows-in-milk also implied distribution of households under each group in the following analyses. The distribution of cows-in-milk/households according to the

production per day in both the groups was as shown in Table 11.

Table 11. Distribution of cows-in-milk/households according to output

Milk yield/ day (litres)	Members (I)	Non-members (II)	Total
3.00-4.75	5	7	12
4.75-6.50	26	34	60
6.50-8.25	20	19	39
8.25-10.0	9	--	9
Total	60	60	120

$Z = 1.79$, $P \leq 0.05$

The total number of cows-in-milk and households surveyed were divided into 4 quartiles based on the milk yield/output obtained per day with an increase of 25 per cent between each quartile. There were a total of 120 cows-in-milk, each group comprised of 60. Around 50 per cent of the households surveyed produced between 4.75-6.50 litres of milk per day. Only 7.5 per cent of the households had an output of 8.25-10.0 litres per day and that too among the member group only. No household in the non-member group had produced milk more than 8.25 litres per day. Normal Deviation Test has been

carried out to test whether there is any difference between member households and non-member households. No significant difference between the two groups was observed. Further analyses has been carried out in the following sections to test whether there is any difference in the other parameters related to the economics of milk production.

4.2.2.2 Consumption and sale of milk

Dairying has been recognised as one of the important subsidiary occupations of the farmers and milk constitute an important source of nutritional food. Household consumption of milk take place in the form of liquid milk, use in tea or coffee and preparation of milk products such as curd, ghee and butter milk. The consumption of milk for the above said purposes as a whole was taken as the daily consumption of milk. Apart from consumption, the sale of milk brings income to the households. Consumption of milk was relatively low among those households who were giving more consideration to income through sale, although, by and large, differences between households were narrow. In Table 12, the average production, consumption and sale of milk per day by the sample households have been shown.

It can be observed from the Table 12 that the milk output per day was higher among member households than the

Table 12. Production, consumption and sale of milk according to output per day

Group	Milk yield/ day (litres)	No. of house-holds	Average quantity of milk (in litres)		
			Produced	Consumed	Sold
Members (I)	3.00-4.75	5	4.0	1.3 (32.5)	2.7 (67.5)
	4.75-6.50	26	5.7	1.3 (22.8)	4.4 (77.2)
	6.50-8.25	20	7.4	1.5 (20.3)	5.9 (79.7)
	8.25-10.0	9	9.2	1.8 (19.6)	7.4 (80.4)
Total		60	6.6	1.4 (21.2)	5.2 (78.8)
Non-Members (II)	3.00-4.75	7	4.0	1.1 (27.5)	2.9 (72.5)
	4.75-6.5	34	5.5	1.3 (23.6)	4.2 (76.4)
	6.50-8.25	19	7.3	1.6 (21.9)	5.7 (78.1)
Total		60	5.9	1.4 (23.7)	4.5 (76.3)
Overall		120	6.3	1.4 (22.2)	4.9 (77.8)

* Figures in parenthesis shows percentage to total produced

non-member households as the member households were possessing more high yielding cows. It is also observed that the quantity of milk retained for home consumption was very small in all the categories when compared to the quantity of milk sold in the market in both the groups. The percentage of milk retained for home consumption out of the total production declined whereas the percentage sold increased with the increase in output in both the groups, though in absolute terms the quantity of milk consumed did not show appreciable difference between different levels of output or between the two groups. Milk consumption and sale were analysed further in the following sections.

4.2.2.3 Levels of milk consumption and output

The daily household consumption and the number of households consuming different quantities of milk per day among the two groups were as shown in Table 13.

It can be seen from Table 13 that average milk consumption per household per day was fairly stable in the case of member as well as non-member households because within the groups there is negligible difference in the consumption units. It can be also seen that family size has not much of influence in consumption of milk within the group as well as between the groups because the family consumption units were

Table 13. Distribution of households according to milk output and consumption per day

Group	Milk output per day (litres)	No. of households consuming			Total no.of house holds	Average milk consum-ption/ day/hh (litres)
		0.5-2.0 litres	2.0-3.5 litres	3.5-5.0 litres		
Members (I)	4.0	5	-	-	5	1.3
	5.7	21	4	1	26	1.3
	7.4	15	4	1	20	1.5
	9.2	4	5	-	9	1.8
Total	6.6	45	13	2	60	1.4
Non-members (II)	4.0	7	-	-	7	1.1
	5.5	26	8	-	34	1.3
	7.3	14	3	2	19	1.6
Total	5.9	47	11	2	60	1.4
Overall	6.3	92	24	4	120	1.4

Group I - χ^2 = 8.65 ($P<0.05$), Group II - χ^2 = 6.95 ($P<0.05$)

almost similar. Chi-square test has been carried out to test whether the milk consumption by the sample households is influenced by the level of output obtained. It is statistically seen that levels of milk consumption was not

influenced by levels of milk production in both the groups. In the aggregate, the average milk consumption per sample household was 1.4 litres per day. This confirms the earlier observation that irrespective of output, the quantity retained for home consumption tended to be fairly stable in all households.

4.2.2.4 Level of milk sale and output

The quantity of milk sold and the number of households selling different quantities of milk according to the output per day are presented in Table 14.

From the Table 14, it can be observed that the quantity of milk sold increased with increase in milk production in both the groups. The average quantities of milk sold per day by the members were more than that by the non-members. It is primarily because the number of farmers in the higher output brackets were more among members than among non-members. Chi-square test has been carried out to test whether the milk sale by the sample households is influenced by the level of output. It is statistically seen that milk sale is dependent on the output obtained in both member and non-member groups. The sale tendency or commercial outlook was fairly similar in both the groups. And also with fairly stable

Table 14. Distribution of households according to milk output and sales per day

Group	Milk output per day (litres)	No. of households selling			Total no.of house holds	Average milk sold/ day/hh (litres)
		2-4 litres	4-6 litres	6-8 litres		
Members (I)	4.0	5	-	-	5	2.7
	5.7	4	22	-	26	4.4
	7.4	-	6	14	20	5.9
	9.2	-	-	9	9	7.4
Total	6.6	9	28	23	60	5.2
Non-members (II)	4.0	7	-	-	7	2.9
	5.5	7	27	-	34	4.2
	7.3	1	5	13	19	5.7
Total	5.9	15	32	13	60	4.5
Overall	6.3	24	60	36	120	4.9

Group I - $\chi^2 = 67.82$ ($P<0.05$), Group II - $\chi^2 = 12.59$ ($P<0.05$)

consumption, the sales increased with increase in output which means that nutritional level is uniform among milk producers in the area selected for the study and they seems to spare more milk for marketing perhaps to meet the cost of production in part or whole.

4.2.2.5 Sale outlets and volumes of milk sold

Marketing methods in milk marketing are still traditional, basically due to low volumes per producer and the peculiar characteristics of the product. Perishability of milk has always handicapped the milk producers, traders, other intermediaries and distribution network. So, sale outlets and dependence on each sale outlet by the milk producer is very important in dairying. The respondents covered under the survey distributed according to different sale outlets chosen by them are as shown in Table 15.

Table 15. Distribution of households according to the sale outlets

Group	Total no. of house-holds	No. of households selling milk to				
		Co-opera-tives only	Tea shops only	Consu-mers only	Co-oper-ative & consumers	Co-oper-ative & tea shops
Members (I)	60	54	-	-	6	-
Non-members (II)	60	45	3	9	1	2
Overall	120	99	3	9	7	2

The sample households have used three principal outlets for selling milk - (1) to milk co-operative societies, (2) to local tea shops, and (3) direct to consumer households. There were a few combinations of outlets as well. In effect both outlets (2) and (3) can be considered as direct channel between producer and consumer. In the case of members, all of them sold milk to the co-operative society, which they are obliged to do. But six members (or about 10 per cent) were also observed to be selling part of the milk directly to consumer households. But in the case of non-members, 75 per cent of them were found selling milk exclussively to the co-operative society. It may be mainly because of the instability of other marketing channels in rural areas, although these producers may not be getting the benefits due to members of societies. To this can be added another three households (or 5 per cent) who were also selling part of the milk to the society. Only 12 households (around 20 per cent) sold milk exclusively through channels other than society.

The marketed surplus of milk going through different outlets from the producers were as shown in Table 16.

From Table 16, it can be observed that the performance of co-operative network in milk marketing was remarkable as around 90 per cent of the overall marketed surplus passed through this channel. Around 97 per cent of marketed surplus

Table 16. Volume of milk sold through different outlets (litres/day)

Group	Volume of milk sold/ day (litres)	Quantity of milk sold through		
		Co-operative	Tea shops	Consumers
Members (I)	314.0 (100.0)	303.5 (96.7)	-	10.5 (3.3)
Non-members (II)	270.0 (100.0)	223.0 (82.6)	14.5 (5.4)	32.5 (12.0)
Overall	584.0 (100.0)	526.0 (90.1)	14.5 (2.5)	43.5 (7.4)

* Figures in parenthesis shows percentage to total sold

from members and 83 per cent from non-member households were sold through co-operative societies. In the aggregate around 82 per cent of the sample households sold milk exclusively through co-operative societies and the volume of milk sold amounted to be 90 per cent of the aggregate marketed surplus. Only 20 per cent of the sample households sold milk through channels other than co-operative society and the volume of milk sold through these channels amounted to only 10 per cent of the total marketed surplus. The dependence of co-operative was quite obvious in the case of members as they are bound to sell milk to the co-operatives for which they are availing

many services and benefits from the society, but because of the instability of alternative sale outlets, non-member households were also depending on the co-operatives to a large extent to sell their milk in all areas under the study, eventhough they realise only lower prices from society than direct sales. Many of the non-members were reluctant to take membership in co-operative society because they were not willing to be in the clutches of rules and regulations of the society and the society themselves will only give membership to those producers who were continually giving milk to the society for a specified period of time. Perhaps the non-members want to take the advantage of free market sales whenever there is seasonal rise in demand (and also price) for milk.

4.2.2.6 Price realisation

The price realised by the milk producers is influenced by the type of outlet and quality of milk. The highest price was realised from sale to the consumers directly (current market rate was Rs.7/- per litre, and the lowest price was obtained from sale to the co-operative societies (ranged between Rs.5/- to Rs.6/- based on fat and SNF content). In all the areas price obtained from tea shops was comparable with the price charged for the direct sale to consumers. Thus the price received from the co-operatives was far below the

price received from direct selling to consumers and tea shops. The non-members were found selling milk to the co-operative societies in almost all the areas due, perhaps, to the instability of alternative sale outlets. It may also be possible that the non-members are aiming to become members after the lapse of the stipulated minimum period of supply to the society. Further, sale of milk to the co-operatives entitled the members to obtain bonus on volume of milk sales as well as inputs (like feeds) at concessional rate, where the real value in terms of per litre of milk sold is not properly estimated. During the survey, the producers opined that if there exists an assured outlet other than the co-operatives, which will give them higher price for the milk, they prefer to sell milk to them rather than to the milk co-operatives; a simple indication of their economic outlook, as aiming at higher direct prices than indirect concessions.

4.2.3 Cost components in milk production

4.2.3.1 Feed cost of the cows-in-milk

Being the major component of the cost of production of milk, it is very informative to know the feed cost incurred per household for rearing a cow-in-milk. The feed cost incurred per household and cost per litre of milk production among the two groups were as shown in Table 17.

Table 17. Feed cost of the cows-in-milk

Group	Average milk production (liters)	Average feed cost/hh/day (Rs.)	Feed cost/ litre (Rs.)
Members (I)	4.0	12.40	3.10
	5.7	14.94	2.62
	7.4	18.21	2.45
	9.2	20.58	2.25
Total	6.6	16.67	2.51
Non-Members (II)	4.0	11.26	2.81
	5.5	13.92	2.52
	7.3	18.66	2.55
Total	5.9	15.10	2.55
Overall	6.3	15.89	2.53

From Table 17, it can be seen that the average feed cost per household per day increased with increase in output of milk. But the feed cost per litre showed a declining trend, among both members and non-members. Though the feed cost incurred is not significantly different between the two groups, the feed cost incurred per household per day was relatively higher among the member households than the non-member households. It is, perhaps because of the higher milk output among the member households. The major reason for the

high feed cost among the sample households in general was that they were mainly depending upon purchased feeds since green fodder cultivation was almost non-existent among these producers as seen in the earlier section. Although dry fodder exists there but based on the market cost it is imputed and added with in the total feed cost. Lack of grazing facilities together with absence of fodder cultivation has compelled the producers to incur more feed cost. It was observed from the per litre feed cost structure that feeding practice was almost similar among members and non-members. It was Rs.2.51 per litre in the case of members and Rs.2.55 per litre in the case of non-members. It can also be noticed that there exists cost efficiency with higher productivity and there seems to be perceptible indication of reduction in per litre feed cost by enhancing the productivity of animals. In the aggregate around Rs.16/- was incurred as average feed cost per household per day and Rs.2.50 as feed cost per litre of milk production.

4.2.3.2 Cost of labour of the cows-in-milk

Labour charge is another major cost item involved in the estimation of cost of production of milk though for dairy activities most of the labour used came in the form of family labour. Although the family labour has no opportunity cost as such due to lack of alternative opportunities, family labour can be attributed to some other enterprises within the farm

and, hence, the value of family labour has been imputed. Average labour cost incurred per household per day and labour cost per litre of milk production among members as well as non-members were as shown in Table 18. For the calculation of labour charges, average wage rates prevalent in the locality were taken.

It can be observed from Table 18 that the labour cost incurred per household per day was almost similar in both the groups. It was Rs.15.25 per household per day among the members and Rs.15.21 per household per day among the non-members. Between the groups there is slight variations in the labour cost incurred because of the amount of labour used for washing the animals, cleaning stalls and feeding/grazing were different among the sample households. Labour cost incurred per litre of milk production was slightly high among the non-member households owing to the lower productivity among those cows-in-milk. When dairying is viewed as a supplementary enterprise for providing employment opportunities the structure becomes more meaningful, since, except a few households, the hulk of the producers relied on family labour. In the aggregate Rs.15.23 was incurred as labour cost per household per day and Rs.2.42 as labour cost per litre of milk production. Traditionally it was believed that feed cost comes to around 50-60 per cent of the total cost of

Table 18. Labour cost of the cows-in-milk

Group	Average milk yield/day (liters)	Average labour cost/hh/day (Rs.)	Labour cost/ litre (Rs.)
	4.0	14.00	2.50
Members (I)	5.7	14.33	2.52
	7.4	16.00	2.15
	9.2	16.94	1.85
Total	6.6	15.25	2.29
	4.0	11.79	2.95
Non-Members (II)	5.5	15.59	2.82
	7.3	15.79	2.16
Total	5.9	15.21	2.57
Overall	6.3	15.23	2.42

production. But here almost similar amounts have been incurred for feed as well as labour among the sample households in all the areas, and feed cost stood only slightly higher than the labour cost. It is the indication of high wage rates prevalent in the areas which gave a cost equivalent to that of feed. Here the units are smaller and most of the labour used came in the form of family labour, but when the units are enlarged with a view of commercialization of

dairying, the labour cost should be given due consideration since at that time the producers may have to avail hired labour.

4.2.3.3 Average total cost per household per day

The overall cost includes components of feed, labour, miscellaneous recurring expenditures (including veterinary charges), depreciation on animals, depreciation on capital investment and interest on capital both fixed and variable. Among these, feed cost and labour cost stood at the top and other charges incurred were negligible among the sample households. In Table 19, the average total cost incurred per household per day and cost per litre of milk production is presented.

From Table 19, it can be seen that the average total cost incurred per household per day showed an increasing trend while cost per litre of milk output showed a declining trend with increase in output of milk in both the groups. Because of the high feed cost and labour cost, total cost per day were also high among the members. Around 87 per cent of the total cost accounted for feed cost and labour cost together in both the groups. Most of the households were using purchased feeds in both the groups and also because of the absence of green fodder cultivation and poor grazing, total cost stood high in

Table 19. Average total cost per household per day

Group	Average milk yield/day (liters)	Average total cost/hh/day (Rs.)	Total cost/ litre (Rs.)
	4.0	30.13	7.53
Members (I)	5.7	33.41	5.87
	7.4	38.85	5.23
	9.2	42.75	4.66
Total	6.6	36.35	5.47
	4.0	26.50	6.63
Non-Members (II)	5.5	33.61	6.08
	7.3	39.91	5.45
Total	5.9	34.77	5.88
Overall	6.3	35.56	5.66

both the groups. In addition to this labour cost is actually imputed in most of the cases since hired labour was very rare, and due to the high wage rate in the locality, the total cost stood high. The average total cost per household per day among the members were Rs.36.35 whereas it was Rs.34.77 in the case of non-members. Total cost incurred per litre was declining as the increase in milk output, showing the cost efficiency among the higher productive cows. In the aggregate

Rs.35.56 was incurred as total cost per household per day and Rs.5.66 as total cost per litre of milk production.

4.2.3.4 Average net cost per household per day

The net cost was derived by deducting the income obtained from the sale of dung and calf from the total cost incurred. The average net cost per household per day was as shown in Table 20.

Table 20. Average net cost per household per day

Group	Average milk yield/day (liters)	Average net cost/hh/day (Rs.)	Net cost/ litre (Rs.)
	4.0	25.33	6.33
Members (I)	5.7	27.75	4.88
	7.4	33.75	4.55
	9.2	36.42	3.97
Total	6.6	30.85	4.64
	4.0	21.36	5.34
Non-Members (II)	5.5	29.55	5.34
	7.3	34.70	4.74
Total	5.9	30.22	5.11
Overall	6.3	30.54	4.86

The same increasing trend in the case of average net cost per household per day and declining trend in the case of net cost per litre was observed in this case also. The average net cost incurred per day by members and non-members was almost similar but there was slight variation within the group due to the variations in income obtained from the sale of byproducts. The net cost per litre of milk production declined in consonance with the increasing output, showing the economies of scale in milk production with regard to higher productivity. Again the cost per litre of milk production was lower among members compared to non-members, attributable to the higher productive efficiency among the member households. In the aggregate Rs.30.54 was incurred as net cost per household per day and Rs.4.86 as net cost per litre at milk production.

4.2.4 Income

4.2.4.1 Cash farm income (Farm returns) per household per day

The aim of the farmer in undertaking commercial dairying as a subsidiary occupation is to earn additional income from this source. It is very important to note the income derived from the sale of milk among the sample households. Table 21 indicates the cash farm income (farm

returns) obtained per household per day from dairy activities among members as well as non-members.

Table 21. Cash farm income per household per day

Group	Average milk sale/day (litres)	Cash farm income/hh/day (Rs.)
	2.7	14.85
Members (I)	4.4	24.81
	5.9	32.93
	7.4	40.64
Total	5.2	29.06
	2.9	17.50
Non-Members (II)	4.2	24.67
	5.7	31.28
Total	4.5	25.93
Overall	4.9	27.49

The cash farm income realised by the producer shows the net income obtained from the sale of milk. This does not include milk taken for home consumption. The farm returns increased with increase in output owing to larger quantities being sold at higher levels of output. Though the farm returns do not cover the total cost incurred per household, it

covers the feed cost and other cash costs incurred by the producers. In some cases, they are having some surplus farm returns which can be considered as returns to labour, most of which came in the form of family labour. This is in spite of the fact that about 90 per cent of the milk being sold to co-operative societies in both the groups where the returns are less than open market rates. Due to the instability of other sale outlets, non-members were also depending upon the milk co-operatives as their principal outlet. It is, however, to be thought of whether the present input uses are efficient and rational since, in reality the prices offered by the co-operatives is somewhat lower than the prevailing market rates.

4.2.4.2 Gross income per household per day

The gross income (income from total milk output) obtained by the sample households per day were as shown in Table 22.

From Table 22, it can be observed that gross income obtained were increasing with increasing output. It was slightly high among members as they possess higher productive animals. Though the gross income earned covered the cost incurred per household, it included the milk taken for home consumption also. In the aggregate Rs.41.70 was earned as gross income per household per day.

Table 22. Gross income per household per day

Group	Average milk yield/day (litres)	Gross income/hh/day (Rs.)
Members (I)	4.0	28.10
	5.7	38.59
	7.4	47.78
	9.2	58.53
Total	6.6	43.77
Non-Members (II)	4.0	29.18
	5.5	37.52
	7.3	47.26
Total	5.9	39.63
Overall	6.3	41.70

4.2.5 Economics of milk production

The cost of production of milk can be optimally reduced and milk production can be enhanced by effective and efficient management. Efficiency measures are designed to visualize the outcome as envisaged by the objectives or goals of an activity in relation to efforts made. In farm management, the efforts constitute the use and allocation of

various resources among alternative uses and the goal is profit maximization on a continuing basis subject to certain utility considerations. Thus, the efficiency measures are the tools of farm management analysis which help to measure the returns to particular segments of the farm business as returns to particular factors of production or returns from particular activities as well as in knowing the overall efficiency of the farm business. The aim of the farmers to undertake dairy enterprise is to earn income from that source and to make some profit from that enterprise. It is not easy to make profit from this enterprise since the cost incurred was in no way comparable to the income obtained. Here an attempt has been made to know whether the milk producers are getting any economic returns from the dairy enterprise. Table 23 will give an indication about the gross margin and net margin earned by the sample households.

From Table 23 it is evident that except those member households with low productive animals, all others are making gross profit from dairy activities. The gross profit earned was high among the members than the non-members, except in the case of member households with lowest output per day. But the net margin was negative in all the cases except in the case of those member households with highest productive cows. Though

Table 23. Profit/loss per household per day

Group	Average milk yield/day (liters)	Gross margin/ hh/day (Rs.)	Net margin/ hh/day (Rs.)
	4.0	-2.03	-10.48
Members (I)	5.7	5.18	-2.95
	7.4	8.92	-0.83
	9.2	15.77	4.22
Total	6.6	7.42	-1.79
	4.0	2.67	-3.86
Non-Members (II)	5.5	3.91	-4.88
	7.3	7.36	-3.42
Total	5.9	4.86	-4.30
Overall	6.3	6.14	-3.05

major portion of the milk output was sold by the producers, the income earned was in no way comparable with the cost incurred, and almost all sample households (around 83 per cent) depended on co-operatives as the major sale outlet and the income realised from this source was comparatively low when compared to other sale outlets. But due to the product characteristics and seasonality in demand, the producers (members and non members too) depended on that source as a

stable outlet. It was also realised that the members are having more productive cows and their cost per litre of milk production was lower compared to non-members. Assured market for whatever quantity they produced along with higher output helped the member households to obtain more economy in milk production. In addition the members also obtained bonus based on patronage - that is volume of milk supplied to the society. Due, perhaps, to the paucity of these factors, non-members were not producing more milk and thus they are having more constraints in production of milk.

It is the efficiency of the farm manager or the farmer to allocate his scarce resources to obtain maximum benefit. Labour is an important input used in milk production, though most of the labour used in milk production was in the form of family labour. In order to find out the efficiency of labour, gross returns to labour is calculated. Gross returns to labour showed that in the case of members they have earned Rs.22.67 by using the family labour and it was Rs.20.07 in the case of non-members. Here in the total cost calculations, labour cost came around almost equally with the feed cost. So family labour used has much significance in obtaining economy in milk production.

The members may be obtaining feed ingredients at slight concessional rates. But the sample households

(including members and non-members) in general were resorting to purchased feeds in faily large quantities with home grown food products (dry fodder in small quantities and green fodder virtually non-existent) being very negligible. This results in incurring higher cost of production. This higher cost can be avoided by giving more importance to green fodder cultivation. It is thus realised that the cost of production of milk should necessary be reduced and income earned should be enhanced and it can be done through better breeding policy, proper feeding policy and judicious management practices which can be imparted to the farmers through extension education.

SECTION 3. FUNCTIONAL RELATIONSHIP BETWEEN INPUTS AND OUTPUT

The mathematical form of the production function is $q = f(x_1, x_2, \ldots\ldots x_n)$ where f (x) denotes the form of production function. The form of the production function depends on the technology of the process. We could, for instance, have an additive production function,

$Q = a_0 + a_1x_1 + a_2x_2 + \ldots\ldots + a_nx_n$ where a_0, $a_1 \ldots\ldots a_n$ are constants, or the production function could have the multiplicative form,

$$Q = a_0 x_1^{a_1} x_2^{a_2} \ldots\ldots x_n^{a_n}$$

Given a flow of inputs x_1, x_2, x_3 ..... x_n, we can produce a flow of output Q, provided we use the most efficient technology.

The most widely used production function for empirical analysis is the Cobb-Douglas production function which takes the form

$$Q = A\, x_1^{\alpha}\, x_2^{\beta}$$

Cobb and Douglas constrained the exponent of x_1 and x_2 to sum of unity. But it in an unnecessary restriction and the above function may be generalised to many inputs.

$$Q = A\, x_1^{\alpha}\, x_2^{\beta}\, x_3^{\delta} \ldots\ldots\ldots x_n^{\Omega}$$

The Cobb-Douglas production function (log) fitted for the estimation of milk production in Thrissur district takes the form,

$$Y = A\, x_1^{b_1}\, x_2^{b_2}\, x_3^{b_3}\, x_4^{b_4}\, x_5^{b_5} \text{ where}$$

Y = Total milk yield per day (litres)

x_1 = Total labour cost per day (rupees)

x_2 = Cost of oil cake fed per day (rupees)

x_3 = Cost of compound feed fed per day (rupees)

x_4 = Cost of straw fed per day (rupees)

x_5 = Cost of other feed fed per day (rupees)

The Cobb-Douglas production function estimate based on the data collected from all the sample households are as follows.

Table 24. Cobb-Douglas production function (log)

Constant	x_1	x_2	x_3	x_4	x_5	Sum of elasticities	R^2	F
0.284570	0.165 (0.064)	0.166 (0.048)	0.175 (0.036)	0.102 (0.075)	0.085 (0.028)	0.251	0.388	14.5
t values	2.583 *	3.713 *	4.809 *	1.360	3.064 *			

* Significant at 5 per cent level

Figures in brackets are standard errors

From the functional relationship it can be observed that all the variables have positive association with the total milk yield. Except in the case of feeding by straw, all other variables were statistically significant. All the five independent variables together have been explained about 39 per cent of the variation in the total milk yield.

Elasticity coefficients of the variables showed that for every one per cent increase in the labour spent on cows, there was 0·17 per cent increase in the total milk yield. Similarly there was 0·17 per cent and 0·18 per cent increase in

the total milk yield for every one per cent increase in the cost of feeds of oil cake and compound feed respectively. The total milk yield increased by 0·10 per cent for every one per cent increase in the cost of straw and 0·09 per cent by every one per cent increase in the cost of other feeds which includes rice bran, rice, husk etc. The sum of elasticities was obtained as 0.251.

Marginal value products of various inputs were also calculated. Marginal productivity is the measure of the increase in total product, for the addition of one unit of a particular resource above its mean level while other resources are held constant at their respective geometric mean levels. Marginal value product is the marginal physical product represented in value terms. The resource use efficiency has been judged on the basis of criterion that each factor of production is paid according to its marginal productivity. The marginal value product calculated are as follows.

Marginal value product of labour (x_1)	=	0.069
Marginal value product of oil cake (x_2)	=	0.187
Marginal value product of compound feed (x_3)	=	0.254
Marginal value product of straw (x_4)	=	0.149
Marginal value product of other feeds (x_5)	=	0.203

The results of the marginal value products of the resources indicated that the various resources used in the milk production were not being used optimally by the different households. All the variables have almost equal value and it was found that compound feed as the most effective variable among all other variables in this study. So in order to increase the milk production, the various resources must be used more efficiently by the dairy farmers.

SECTION 4. MARKETING CHANNELS FOR MILK

Economic development is a social process involving an interaction between rising human capacities and their employment on the one hand, and an environment and institutions that are favourable to them on the other. The ideal marketing system suitable to an agrarian economy has been defined as the one that maximises the long run welfare of the society, consumption being the sole end and purpose of all production. The linkage between production and consumption is provided by marketing operations.

Till independence milk was considered as a luxurious item and its consumption was limited within the rich families who were keeping milch animals for this purpose. The development of urban centres created a strong demand for milk and in the early stages the unorganised sector satisfied this

demand either by keeping cattle within the towns or by bringing milk to the door step of the consumers from nearby villages. Eventhough a largest portion of the production of milk goes to the open market, we were not able to meet the growing demand for milk. The study conducted by centre for Development studies (1989) indicates that among the producer-households 37 per cent of the milk produced is consumed in the home and 63 per cent is sold, with smaller size holding selling a larger proportion of their production. In the present study an attempt has been made to understand the various trade channels of milk conducting discussions with important traders of milk in and around Thrissur town. They include traders in dairy products, co-operative societies and ordinary producer-households. The traders were not able to collect milk from the producers because of the lack of organisation and they were mainly concentrated in the sale of milk products. Even for selling milk products, they are acting only as agents for the real processors in other states - mainly Tamil Nadu. Milma was leading in the sale of milk in Thrissur district for which they have a wide network of marketing agents. They are collecting the milk from co-operative societies. It was understood that the Milk Unions which arrange the transportation of milk from the societies expect a minimum quantity through their collection routes to

keep it viable. And the facilities for refrigeration to keep the products in good condition is not available with the co-operative societies. So the local sale through the co-operatives are very low. That too increased the sale of milk through unions. The producer-households are also selling milk to the consumers directly, but most of them are giving milk to the co-operatives for which they are availing various facilities from the societies. Thus it is very evident from the marketing system that, the lead role in procurement and sale of milk in Thrissur district is vested with the organised sector.

4.5 Limitations of the study

Cost of production of milk depends on a number of factors. Variations in the cost of production according to animal characteristics and producer characteristics can be captured in a cross-sectional survey, it is difficult to obtain seasonal variations from a one point survey. Therefore many studies on the economics of milk production have adopted a design which permits repeated observations on the sample animals over a period of time. Further, the sampling plan should be carefully designed to ensure sufficient number of animals at different stages of lactation. On account of limitation of resources the sampling design followed in this study did not include the lactation stage of the animals as

one of the sampling criteria. Further, each household was contacted only once and the data often relate to the period just prior to the investigation date. In view of these difficulties the data on cost of production and milk yield should be considered only as an indicative of average pattern prevailing.

While interpreting the secondary data, analysis was carried out for the state as a whole, due to the paucity of district data. The observations may also suffer from biases in the secondary data.

Summary

CHAPTER V

SUMMARY

Dairying is one of the most effective instrument for supplementing farmer's income and generating employment in the rural sector. But the human population in India has been growing at a faster rate than the rate of increase in the milch animal population. The productivity of the milch animals are increasing with the annual per capita availability of milk in India being 167 gm. Efforts were made to improve the economic lot of large number of small farmers and agricultural labourers by providing them with effective employment in the dairy sector and to meet the nutritional requirements of milk for the growing population. To achieve growth in milk production in rural areas, programmes were implemented in the state, the principal one being the Operation Flood Programme. The present study has been undertaken with the following objectives viz. to study the economics of milk production, to work out the income elasticities, to understand the marketing channels and to work out the resource use efficiency in milk production with regard to certain explanatory variables.

The study was carried out in two parts. The first part deals with production, consumption and demand for milk.

The major inputs used in the production of milk and income elasticities were calculated using the secondary data collected from the Department of Animal Husbandry, State Planning Board and National Sample Survey. In the second part, economics of milk production was analysed through a sample survey. Multi-stage random sampling technique was used for the selection of the households. Two taluks namely Thrissur and Mukundapuram were randomly selected from Thrissur district. From each taluk two co-operative milk societies (Two Anand pattern co-operative societies and two traditional societies) were selected randomly. From these four co-operative societies 15 members each were selected at random and 15 non-members residing nearby these societies were also randomly selected for the study. the total sample constituted 120 households. No distinction has been made in respect of membership in different types of co-operative societies and members from the two types of societies were clubbed for the analysis. An interview with 15 milk traders was also done, in order to understand the trading characteristics, if any.

The primary data were collected from the selected households during May to June 1993. Information on socio-economic characteristics and livestock position was obtained as on the date of interview. Information relating to production, consumption and marketing aspects, feeding, labour

and other expenses and details of income from milk were collected.

The cattle population in Kerala as per the 1987 census was 34.24 lakhs showing an increase of 10.57 per cent over the previous livestock census, 1982. The proportion of crossbred cattle showed a sizable increase (17.1%) when compared to the nondescript cattle (4.8%) in the total cattle population from 1982 to 1987 in Kerala. Out of the total cattle population in 1987, the proportion of crossbred cattle (49.7%) and that of non-descript cattle (50.3%) were almost the same. The overall milk production in Kerala also increased over the years. The total milk production of cattle in Kerala increased from 738.4 thousand tonnes in 1980-81 to 1575.7 thousand tonnes in 1991-92. While the milk production of the non-descript cows showed a fluctuating trend over the last 10 years, that of the crossbred cows showed an increasing trend. The average annual growth rate of milk production over the last 10 years was 5.3 per cent. If this trend goes on our milk production will be between 2424.2 thousand tonnes and 2951.2 thousand tonnes by 2000 A.D. The sample survey conducted by the Department of Animal Husbandry observed that green fodder fed is in low quantities and recommended for inclusion of more green fodder.

The Engel function fitted using the NSS data on milk and milk products in Kerala showed that the income

elasticities estimated for the function (log-linear) was lower than unity, but positive, in 38th and 43rd rounds of NSS for rural as well as urban households. The value of the elasticity coefficient declined from 0.63 in rural and 0.73 in urban during the 38th round (January-December 1983) to 0.54 in rural and 0.48 in urban during the 43rd round (July 1987-June 1988). This indicates that the expenditure incurred on these items increased less than proportionate to their incomes and the rise in prices of these commodities between the two periods might have led consumers to spend proportionately less of their income during 1987-88 compared to the amount spent during 1983 although total income spent increased from 1983 to 1987-88.

As already mentioned a sample survey was conducted to study the economics of milk production in Thrissur district. Since the socio-economic characteristics were found almost similar among all the sample households, the analysis was carried out by adding the two groups. The survey revealed that most of the households (around 80 per cent) had a small size of holdings of less than 2 acres but 59.17 per cent of the households had an average family size of 4 to 7 members. It was statistically found that there was no close relationship between family size and size of holdings. Around 85 per cent of the heads of families covered in the survey

were in the age group of 45 and above, and considered dairying as one of their important subsidiary occupations and this also showed that the decision-making mainly vested with the elders in the family. The average net operated area was high among these households who had a holding of more than 2 acres. Most of the households were engaged in paddy cultivation followed by coconut and other crops such as banana, cashew and rubber. Fodder cultivation was virtually non-existent among the households.

The rest of the analysis has been carried out keeping the identity of the two groups, namely members of co-operative societies and non-members located in the same area, separately. The households selected for the study had only one cow-in-milk and no buffaloes, so the distribution of cows-in-milk also coincided with the distribution of households under the two groups. The average per day production of milk was 6.3 litres in the aggregate whereas it was 6.6 litres per day in the case of members and 5.9 litres per day in the case of non-members. Out of the total production 22.2 per cent was retained for home consumption and the rest 77.8 per cent sold to co-operative societies, teashops or directly to consumer households. The percentage of milk retained for home consumption out of the total production declined whereas the percentage of milk sold increased with increase in output

among members as well as non-members. In absolute terms, the quantity of milk consumed did not show appreciable difference between different levels of output or between the two groups, since the consumption units as reflected by number of members in the household did not vary appreciably. It was also statistically seen that the levels of milk consumption was not influenced by levels of milk production in both the groups. But the quantity of milk sold increased with the increase in milk production in both the groups. Since the number of producers in the higher output brackets were more among members than non-members, average quantities of milk sold per day by the members were more than the non-members. It was statistically found that milk sale is dependent on output in both member as well as non-member groups.

The dominance of co-operatives in milk marketing was remarkable as 90 per cent of the overall milk sold was through this channel when compared to other sale outlets which also proved the instability of alternative milk marketing channels and dominance of organised sector in this field. Eventhough the sale of milk to the co-operatives entitled the members to obtain bonus and other inputs at concessional rates as well as on credit, the real value of which in terms of per litre milk sold is not properly estimated by the producers.

The major cost involved for maintaining a cow-in-milk was feed cost followed by labour cost, veterinary and miscellaneous charges. In the aggregate Rs.15.89 was incurred as feed cost per cow per day and Rs.2.53 as feed cost per litre of milk production. Feed cost increased with increase in milk output among both the groups. It was slightly high among the members, perhaps, due to the higher productivity of animals. The major reason for the high feed cost among the sample households is due to the dependence on purchased feeds as the green fodder cultivation was virtually non-existent among the milk producers. It is also noticed that there exists cost efficiency with higher productivity and there seems to be perceptible indication of reduction in per litre feed cost by enhancing the productivity of animals.

Labour cost was the other major cost involved in dairying, but most of the labour used came in the form of family labour. Inspite of the fact that no other opportunity exists for the family labour, the family labour used for the dairy activities were imputed at prevailing wage rates in the locality, the rationality for which may be questionable. The labour cost incurred per household per day was more or less similar in the two groups. In the aggregate Rs.15.23 was incurred as labour cost per household per day and Rs.2.42 as labour cost per litre of milk production.

The average total cost incurred per household per day showed an increasing trend while cost per litre of milk output showed a declining trend with increase in milk output in both the groups. Around 87 per cent of the total cost accounted for feed cost and labour cost together. Since the family labour used in dairy activities were imputed at the prevailing wage rates, which was higher, the total cost also stood high among the sample households. The average net cost incurred per household per day was almost similar but there were slight variations within the groups due to the variation in income obtained from the sale of byproducts. The net cost per litre of milk production declined in consonance with the increasing output, showing the economies of scale in milk production with regard to higher productivity.

The farm returns increased with increase in output owing to larger quantities being sold at higher levels of output. Though the farm returns did not cover the total cost incurred by the households, it covered the feed cost and other cash costs incurred by the producers. The surplus over and above this was considered as returns to labour. This is in spite of the fact that about 90 per cent of milk being sold to co-operative societies where the returns are less than open market rates. Gross income also increased with increase in

output and it was slightly high among the members owing to the higher productivity of animals.

Except those households with low productive animals, all others are making gross profit from dairying. But the net profit was negative among almost all households showing they are not getting any returns from the dairy enterprise. So efficient and effective management practices should be adopted in dairy enterprise in order to make it a profitable venture.

From the discussion with the traders of milk, the importance of co-operatives and their effective and dominant role in the marketing network was evident. The private traders are dealing with negligible quantities of fluid milk and they are mainly engaged in the marketing of milk products.

The production function analysis carried out has given some interesting information as the economic use of the major resources namely feed and labour in the milk production. The feed and labour variables had positive correlation with the total milk yield. The selected variables had explained 39 per cent of the variation in relation to the milk production. The returns to scale are decreasing showing the scope for increasing the efficient use of resources. The marginal value product calculated was not significant when compared to their respective marginal costs. The lower marginal value product

may be because of the over-estimation of labour used in the dairy activities. If this is reduced, the marginal value product of feed may be more. Here it is recommended that in order to enhance the milk production, farmers have to use the various resources more effectively and efficiently.

There is likely some marginal error in the analysis since the general trends as indicators of milk production only taken in the study. It is mainly in the case of labour, some over-estimation has been made, due to the rationability of imputing the family labour. In the case of feed cost also, though the households are having paddy straw as a byproduct from their paddy cultivation, it is imputed at the market rate for the total cost calculation. So in reality, the total cost will be much less than it really occurred. And thus there is a scope for making the dairy enterprise a profitable one by effectively and efficiently allocating the scarce resources.

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Appendices

APPENDIX-I

DEPARTMENT OF AGRICULTURAL ECONOMICS

Kerala Agricultural University

SCHEDULE

ECONOMICS OF MILK PRODUCTION IN THRISSUR DISTRICT

I General information

1. Name and address of the owner :
2. Age :
3. Sex : M/F
4. Membership in milk co-operatives : Yes/No

II Family particulars

Sl. No.	Name	Sex	Age	Educational level	Relation with head of the family	Occupation		Annual income	
						Main	Subsidiary	Internal (Rs.)	External (Rs.)

III Particulars of land holding (in acres)

Particulars	Total	Wet	Garden	Others
1. Area owned				
2. Area actually cultivated				
a. Paddy				
b. Coconut				
c. Green fodder				
d. Miscellaneous				

IV Details of cattle possessed

Type	Variety/ breed	Age	No.	Present value of the animal	Remarks

V Details of milk production

No. of animals in milk	Present status of cow (Dry/ lactating)	Order of lacta-tion	Days in lacta-tion	Average milk yield/ day	Objective of pro-duction	Remarks

VI Details of feeding of animals in milk

No. of animals in milk:

Type of feed	Source (Home supply/ purchase)	Frequency of purchase	Value (Rs.)	Remarks
1. Concentrates				
a. Oil cakes				
b. Compound feed				
c. Others				
2. Fodder				
a. Grass				
b. Straw				

VII Details of labour employed

Nature of work	No. of hours employed/day		No. of days employed/month		Wage paid (Rs.)	Total (Rs.)
	FL	HL	FL	HL		

VIII Other expenditures

Type	Cost involved (Rs.)	Total (Rs.)
1. Veterinary expenses including breeding, treatments etc.		
2. Expenses of ropes, baskets etc.		
3. Miscellaneous		
4. Total		

IX Consumption details of milk and milk products

Milk		Milk products		
Average yield per day	Per day consumption at home	Type	Qty. of milk converted to milk products	Qty. consumed at home
		1. Curd		
		2. Butter		
		3. Ghee		
		4. Others		

X Marketing of milk and milk products

Type	Qty. sold	*Sale outlets	Average distance to sale outlets (Kms)	Marketing expenses		Remarks
				**Nature	Amount (Rs.)	
1. Raw milk						
2. Milk products						
a. curd						
b. Butter						
c. Ghee						
d. Others						
3. Total						

* Sale outlets:
1. Farm gate sales to vendors
2. Neighbours
3. Co-operative society
4. Hostels
5. Tea shops
6. Others (specify)

** Nature:
1. Transportation
2. Labour
3. Processing
4. Other (specify)

XI Details of pricing mechanism

1. What is the basis of fixing the price: Cost of production/ prices of co-operatives/price of any other organisation/on the basis of major cost involved/any others (specify)

2. Is the price received reasonable : Yes/No
   If no, why? :

3. Why did you opt the above said sale outlet : Stability/Ease of supply/ distance to co-operatives/ more available at home/ others (specify)

4. What do you feel as the major cost involved in the marketing? :

5. Is the price received covers the cost of production? If no, why do you stick on to this? : Yes/No

:

6. What are the constraints involved in the production and marketing?

:

7. What is your suggestion to improve the situation?

:

XII Disposal of Dung

Qty. obtained	Qty. used by farmer	Qty. sold	Value (Rs.)

XIII Other remarks, if any

Appendix-II

Third quinquennial survey on consumer expenditure (38th round)

Monthly per capita expenditure class (Rs.)	Kerala - Rural		Kerala - Urban	
	Milk & milk products	Total per capita expenditure	Milk & milk products	Total per capita expenditure
0-30	0.37	25.56	--	25.89
30-40	0.50	35.87	0.64	35.77
40-50	0.76	45.79	0.49	45.78
50-60	1.04	55.98	1.61	55.47
60-70	1.42	65.27	1.09	65.35
70-85	1.70	77.81	1.89	77.34
85-100	2.63	92.38	2.74	92.68
100-125	4.11	111.77	4.76	111.83
125-150	5.81	137.42	6.57	138.05
150-200	8.33	171.98	9.03	172.38
200-250	12.42	220.62	15.29	224.02
250-300	15.58	272.93	18.41	276.83
300 & above	22.48	535.69	29.81	526.29
All expenditure class	5.97	145.20	9.02	176.36

Appendix-III

Fourth quinquennial survey on consumer expenditure (43rd round)

Monthly per capita expenditure class (Rs.)	Kerala - Rural		Monthly per capita expenditure class (Rs.)	Kerala - Urban	
	Milk & milk products	Total per capita expenditure		Milk & milk products	Total per capita expenditure
<65	0.60	54.77	<90	3.25	70.64
65-80	1.60	72.44	90-110	3.68	99.84
80-95	1.53	871.33	110-135	4.17	120.67
95-110	1.97	102.89	135-160	5.93	147.42
110-125	3.79	117.76	160-185	9.46	171.45
125-140	3.51	133.40	185-215	8.16	199.94
140-160	4.59	149.63	215-255	14.74	229.66
160-180	7.02	170.11	255-310	18.58	279.82
180-215	10.20	197.87	310-385	29.13	345.15
215-280	13.54	244.04	385-520	34.02	452.19
280-385	18.34	320.52	520-700	50.47	603.49
385 & above	34.86	642.24	700 & above	58.77	1051.83
All house-holds	9.76	211.47	All house-holds	16.27	266.22

ABSTRACT

The study entitled "Economics of milk production in the Thrissur district" was undertaken to study the economics of the milk production, to work out the income elasticities, to understand the marketing channels for milk and to work out the resource use efficiency in milk production with regard to certain explanatory variables such as labour cost, cost of oil cake, compound feed, straw and other types of feeds fed per day.

The study was conducted using primary and secondary sources of data. Production, consumption and prices of milk and major inputs used in the production of milk for the state as a whole were analysed using secondary data. Engel functions were fitted to estimate income elasticities by taking expenditure on milk and milk products by the various monthly per capita expenditure groups. Primary data pertaining to socio-economic characteristics, livestock position, production and marketing aspects, feeding, labour and other expenses and details of cash farm income from milk, consumption pattern of milk and major sale outlets for milk were collected with the help of structured schedule from 120 sample households selected by multi-stage random sampling method. In addition to tabular analysis, functional

relationship between milk yield and relevant variables were studied by fitting Cobb-Douglas production function for one lactational period.

The study revealed that the overall milk production in Kerala was increasing over the years. The milk production of crossbred cows was also increasing but that of the non-descript cows was also increasing but that of the non-descript cows showed a fluctuating trend over the last 10 years. The Engel function fitted using the National Sample Survey (NSS) data on milk and milk products in Kerala showed that the income elasticities estimated for the function (log-linear) was lower than unity, but positive, in the 38th and the 43rd rounds of NSS for rural as well as urban households. This revealed that the expenditure incurred on these items increased less than proportionate to their incomes. The rise in prices of these commodities between the two periods might have led consumers to spend proportionately less of their income during 1987-88 compared to the amount spent during 1983 although aggregate expenditure increased from 1983 to 1987-88.

The economics of milk production revealed that the major cost involved for maintaining a cow-in-milk was feed cost followed by labour cost, veterinary and miscellaneous charges. The farm returns increased with increase in output

among the sample households. Though the farm returns did not cover the total cost incurred by the households, it covered the feed cost and other cash costs incurred by the producers. The study also revealed that except those households with low productive animals all others were making gross profit from dairying but the net profit was negative among almost all households. The importance of milk co-operatives and their effective and dominant role in the marketing of milk has been confirmed by this study. The production function analysis carried out showed the scope for increasing the efficient use of various resources. Hence it is recommended that in order to enhance the milk production, farmers have to use the various resources more effectively and efficiently.

On account of limitation of resources the sampling design followed in this study did not include the lactation stage of the animals as one of the sampling criteria, and each sample household was contacted only once and the data often relate to the period just prior to the investigation date. So the cost of production studies should be considered only as an indicative of average pattern prevailing. The observations may also suffer from biases in the secondary data.