ECONOMICS OF MILK PRODUCTION IN MADURAI DISTRICT OF TAMIL NADU

THESIS SUBMITTED TO THE
NATIONAL DAIRY RESEARCH INSTITUTE, KARNAL
(DEEMED UNIVERSITY)
IN PARTIAL FULFILMENT OF THE REQUIREMENT
FOR THE AWARD OF THE DEGREE OF

MASTER OF SCIENCE
IN
DAIRYING
(DAIRY ECONOMICS)

By
P. RAJA DURAI

DIVISION OF DAIRY ECONOMICS, STATISTICS & MANAGEMENT
NATIONAL DAIRY RESEARCH INSTITUTE
(I. C. A. R.)
KARNAL - 132 001 (HARYANA), INDIA

2002

Regn. No. 2102K02

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Approved by

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CERTIFICATE

This is to certify that the thesis entitled **"ECONOMICS OF MILK PRODUCTION IN MADURAI DISTRICT OF TAMIL NADU"** submitted by **P. RAJA DURAI** in partial fulfillment of the requirement for the award of the degree of **MASTER OF SCIENCE (DAIRYING)** in **DAIRY ECONOMICS** of the National Dairy Research Institute (Deemed University), Karnal (Haryana), India, is a bonafide research work carried out by him under my supervision and guidance and no part of the thesis has been submitted for any other degree or diploma.

SBAgarwal

(Dr. S.B. AGGARWAL)
MAJOR ADVISOR

Date: 17th June, 2002

To My Parents

Shri. P. Pithchai & Shmt. P. Rajeswari

And My Brothers

Shri. P. Theiveegan & Shri. P. Elam Prabhu.

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I dedicate my thesis to my beloved Parents and my Brothers who have been the pillars of my life. Their sacrifices, love, inspiration and encouragement to bring me to this level are sincerely acknowledged.

Place : Karnal
Date : 17th June, 2001

D. Rajadurai

[P.RAJADURAI]

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Abstract

ECONOMICS OF MILK PRODUCTION IN MADURAI DISTRICT OF TAMIL NADU.

ABSTRACT

Animal husbandry and dairying plays a vital role in Indian agriculture, particularly in rural economy. The overall growth rate of total milk production during the twenty-year period (1970-90) showed that Southern region posses the highest growth rate than other region. Among Southern region, Tamil Nadu significantly contributed to higher growth when compared to other states. Madurai, one of the districts of Tamil Nadu which has more than 75% of its population living in rural areas whose main occupation is agriculture and allied activities like dairying, goat rearing, poultry keeping etc., with the bovine population of 3.16 lakhs (1997), its annual milk production is 216 thousand tonnes (1999-'00). The analysis of cost and returns from milk production, herd size-productivity relationship, milk disposal pattern etc. would help the dairy farmers to know their relative performance of their enterprise and to reap the available opportunities in improving their business.

Keeping in these in view, the study " Economics of milk production in Madurai district of Tamil Nadu", was carried out with the following objectives:

1. To workout cost and returns from milk production for different herd size categories.
2. To establish herd size and productivity relationship.
3. To study the utilization pattern of milk by the rural households.

Multistage stratified random sampling design was adopted to select the households. The households were categorized in to three categories viz, small, medium and large using probability proportional to herd size sampling.

Major findings:

1. Dairying was the main subsidiary occupation in the study area.
2. Crossbred animals dominated the study area and performed better with respect to milk production and cost per litre. Thus milk producers preferred rearing crossbred cattle in the study area.
3. The expenditure on feed and fodders was consistently higher for crossbred as compared to local cows and buffaloes.
4. A very little quantity of green fodder was offered to milch animal whereas quantity of dry fodder offered to milch animals was very high.
5. Feed alone accounted for 60-80 per cent of the total gross cost.
6. The cost per litre of milk production was highest for local cow followed by crossbred. Higher cost per litre of milk for local cows may be due to low productivity.
7. The net return per day per animal was highest in crossbred rearing. There was very few number of buffaloes in the study area which indicated that many farming households replaced buffaloes with crossbred animals rearing. On the whole small farmers were efficient in crossbred dairy farming.
8. Herd size exerted significant influence on productivity.
9. Marketed surplus of milk was about 97 per cent which was almost of the same order for all the three categories of households. The largest proportion of the total milk marketed was disposed to Milk Producing Cooperative Societies (MPCS).

Chapter 1

Introduction

1. INTRODUCTION

Indian livestock sector contributes an estimated 8 to 10 per cent country's Gross Domestic Product (GDP) and 26 per cent to the agricultural output at current prices (Economic survey, 1997-98). Of the total livestock population, bovine claims the lion share with 204.53 million cattles and 83.5 million buffaloes adding one more feathers to our Indian crown of world's first in bovine population. India has a long tradition of keeping milch animals as a part of farming households. It is rural based, land saving and gender neutral. Milk production came on its own after the green revolution of late 60s when wheat and paddy straws became available in abundance for enhancing the yields. During the last 25 years, we have moved from a situation of scarcity and rationing of milk to a scenario which infuses considerable confidence in pushing ahead with dairying as a sire path for rural development. Milk production over the last decade has increased by about 4 to 5 per cent per annum. The per capita availability of milk has improved from 107 gm in 1970s to 214 gm (Dairy India 1997). The dairy sector today provides some 70 million farm families with the triple benefits of nutritive food, supplementary income and productive employment for family labour. From the time immemorial dairying is considered as *"bearer cheque"* for the rural poor.

India, today, represents one of the largest and fastest milk producing countries in the world with 77 million tonnes of milk production in 1999 (FAO's Economic and Social Development Report 1999). There are two important secrets behind this success. One, the efficient milk production pattern which is integrated into agriculture and secondly, the active involvement of milk producers in setting up their own organizations for milk production enhancement, procurement, processing and marketing. These success stories can be attributable to the remarkable achievements offered by

well structured dairy cooperatives and Operation Flood programmes which pushed the country to the number one position through the objectives in question, more particularly, the upliftment of rural poor.

It cannot be ruled out that the world dairy is zooming on India for its rapidly growing markets that promises the 'moon'. The changing international dairy pattern, following GATT and the emergence of WTO, offers lucrative opportunities to Indian dairying to take its bow as an exporter. With the reduction in heavy subsidies that support dairy producers in the West, India's low cost milk will become price competitive. This along with its geographical location, surrounding by many milk deficit countries in Asia, no doubt, will push up India as a "slumbering giant of the international trade". But at the same time, success is impossible without obstacles. Decreasing gross cultivable area due to rapid urbanization, shift of profession by many farmers from agriculture, being unremunerative, to other professions challenges the resource stock of dairying, more particularly the fodder availability (Katyal, 1997). It is projected that by 2020 the demand for milk would be 496 million tonnes (Bhalla and Hazell,1997; Kumar,1998) which crystal clearly reflects the vast scope for rise in milk demand in foreseeable future. Amidst upsurging population and declining scarce resources, challenges to future dairying can be faced through properly organised and well developed dairying integrated with great support from the government in furnishing adequate financial, marketing and infrastructural facilities which provides an instrument of social justice to the larger section of rural people for whom dairying is the way of life.

The overall growth rate of total milk production during the twenty-four period (1970-90) showed that Southern region posses the highest growth rate of 5.9% followed by Eastern region (5.4%), Western region (5.0 %) and Northern region (4.0%). Further examination of individual states in Southern region indicated that Tamil Nadu and Kerala significantly contributed to

higher growth compared to Karnataka and Andhra Pradesh. This could be due to rapid growth in the crossbred cattle population in these region (Patel, 1993). Among these two, Tamil Nadu possesses the highest number of milch animals with 43.73 lakhs than Kerala of 17.06 lakhs (All India dairy business directory 2001). The annual milk production (1997-1998, provisional) is also high in Tamil Nadu (4 MT) than Kerala (2.35 MT). So the research was only confined to Tamil Nadu state.

As India enters an era of economic reforms agriculture, more particularly the live stock sector, is positioned to be a major growth area. It is increasingly recognized that dairying could play a more constructive role in promoting rural welfare and reducing poverty. Madurai, one among the districts of Tamil Nadu constitutes more than 75 per cent of the rural population whose main occupation is agriculture and allied activities like dairying, goat rearing, poultry keeping etc. It is blessed with the bovine population of 3.16 lakhs (1997-1998, Provisional) of which cattle is perhaps the major tangible asset and also main stay of farmers security. The annual milk production is 216 thousand tonnes (1999-'00). Though dairying is being effectively practiced, the information on cost and incomes from milk production pertaining to the study area is scanty and falls short of making any economic generalization . It is the one, which is most important from producer point of view who undertakes dairying as a new profession. It is in this purview the researcher undertook an in-depth study on economics of milk production in various herd size categories of different households in that regions widely varying in resource endowments. No doubt, this study would enable the producers, consumers and policy makers for long-term attractiveness of investments and to look for the opportunities in scientific dairy farming for effective conduct of business in the study area.

Milk production is influenced by many factors like genetic factors, environmental factors like geographical location, comparative advantage of

the specific area over others, etc. and socio economic factors of farmers. It is of immense importance to study the herd size-productivity relation in the area of concern, which is a major determining factor in decision-making process of optimum herd size to optimally utilize the available scarce resources in question.

Keeping all these in view, the present study on "Economics of milk production in Madurai district of Tamil Nadu", was under taken with the following objectives:

1. To workout cost and returns from milk production for different herd size categories.

2. To establish herd size and productivity relationship.

3. To study the utilization pattern of milk by the rural households.

LIMITATIONS OF THE STUDY

Great care was taken to maintain the objectivity of the study, few limitations could not be avoided such as:

1. Due to non-availability of dairy farm records among rural households, the reliability of the data totally depends upon the memory of respondents.

2. Though every effort was made to take accurate information, the possibility of some respondents giving biased information could not be completely ruled out.

3. The study which restricts its horizon to Madurai district. So the findings cannot be generalized for different agro-economic regions.

4. Resources and Time constraints of the research scholar confine the study only to Madurai district of Tamil Nadu.

ORGANISATION OF THE STUDY

The study has been presented in six chapters. Chapter 1 introduces the problem with objectives. A brief review of the past studies related to cost and returns to milk production, herd size and productivity relationships and disposal pattern of milk has been incorporated in chapter 2. Profile of the study area and infrastructure available for dairy development has been discussed in chapter 3. Analytical framework of the study has been discussed in chapter 4. Results of the study have been presented and discussed in chapter 5. The summary of the study and conclusions that emanate from the investigation has been provided in the last chapter. At the end of the last chapter bibliography and annexure have been given.

Chapter 2

Review of Literature

2. REVIEW OF LITERATURE

For any scientific investigation, it is mandatory on the part of research worker to go through the early studies conducted so as to establish the body of existing knowledge and to relate further findings of the ensuing research. This enables the researcher and others to understand the methodology used by various researchers and thus the results helps in understanding the realities under various circumstances. So, for brevity, various earlier studies related to the present objectives of the study has been presented chronologically as mentioned below,

2.1. Cost and returns from milk production.

2.2. Herd size and productivity relationship.

2.3. Utilization pattern of milk by the rural households.

2.1. Cost and returns from milk production

Singh (1980) conducted a study on economics of milk production in tribal areas of Himachal Pradesh and reported that average maintenance cost per cow and per litre of milk produced increases with an increase in size of holding and significantly higher in case of local cow, and concluded that net return from local cow is very small, it provides sizeable employment to the family members.

Ram *et al.* (1981) found that the cost of production of a litre of milk was the lowest for the crossbred cattle, followed by exotic and Zebu cattle. It was observed to be highest in Murrah buffaloes. The feed cost is the major component of cost of milk production, followed by labour and supervision costs.

Anantha Ram (1983) conducted study in arid area of Western Rajasthan and found that the feed cost was accounted as a major segment, followed by labour cost in buffalo milk production. The share of other cost component like depreciation, interest, etc. constituted small segment of the cost of milk production. The result also revealed that the family labour component of total labour cost was as high as 79 percent.

Sharma and Singh (1985) compared the milk production performance in ICDP area of Karnal in 1977-78 between 100 beneficiaries with crossbred dairy cows and 60 non-beneficiaries dairy farmers. Investment on milch animals, cattle shed, stores, and dairy equipments averaged Rs.4254.87 per milch animal for beneficiaries and Rs.2911.20 for non-beneficiaries. About 60 percent of this expenditure was on animals. Cost per litre of milk was also lower for crossbred cows at Rs. 1.66 as against Rs.2.30 to 2.40 for Indigenous cows and Rs.2. 1 0 for buffaloes. The main component of cost was feed (60%) for all the classes.

A study conducted by Tripathi *et al.* (1986) in Bundelkhand region of U.P. on economics of dairy enterprise during 1977-78 indicated that maintenance cost for buffaloes and cows was Rs.1004.03 and Rs.637.09, respectively. It was reported that milk production cost was Rs.1.17 and Rs.l.53 per litre for cow and buffalo, respectively, and farm business income Rs.306.82 and Rs.478.44. For both species, input/output ratio averaged 1:1.31 and net farm income averaged Rs.323.35.

Gill and Singh (1986) conducted a study on 16 farms in the sub-mountainous, central and southern zones of Punjab. Farm size in the three zones averaged 13.25, 26.70 and 29.50 acres, respectively, with 0.50. 3.85 and 6.80 buffaloes along with 4.25, 7.00 and 5.60 crossbred cows per farm. The cost of production of buffalo milk worked out to be Rs.2.3 1, Rs.2.55 and Rs.2.46 per litre, while the cost per litre of crossbred cow milk was found to be Rs.1.62. Rs.1.54 and Rs.1.60, respectively, in the three zones.

Gupta (1987) studied cost of milk production in Ropar and Patiala district of Punjab State and found that for buffaloes, the cost was minimum in the rainy season, followed by winter and summer season, respectively, but for the Jersey, Brown Swiss and Indigenous cow, cost was minimum in the rainy season, cost of summer was less than winter. For all season, crossbred Holstein-Friesian cows were found most profitable for milk production.

Gangwar and Shastri (1988) conducted studies on economics of buffalo performance throughout the country. The study revealed wide variations in milk yields, cost of maintenance, cost of milk production and profitability. The conclusions reached were that feed constitutes the main component of cost of maintenance; milk yields were lowest in the rainy season, although cost of production was highest in this season, and cost of maintenance was relatively higher in Punjab, Haryana and Gujarat State.

Shiyani *et al.* (1989) studied the economics of buffalo milk production in Kheda district of Gujarat State and observed that cost of milk production per litre was Rs.2.55, while the net cost was Rs.2.45 which results into net returns of 37 paise per litre of milk. The input-output ratio of total cost to incomes in milk production was 1: 1.15. The total cost of maintenance of a buffalo per year was Rs.4020. The concentrate had been the main item of cost (38.64%). The bulk-line cost of milk production was Rs-2.78 per litre.

Singh *et al.* (1990) conducted studies on one hectare land unit at the CCS Haryana Agricultural University), Hisar, for determining Comparative economics of buffaloes and crossbred cows under mixed farming system. The findings indicated that mixed farming with three crossbred cows was more Profitable as compared to mixed farming with three buffaloes yielding net profit of Rs. 18433 and Rs.9315, respectively. This was due to shorter calving interval, longer milking period and higher milk production in case of crossbred cows.

Devraj and Gupta (1991) conducted study on economics of milk production in Churu district of Rajasthan. He concluded that cost of milk production of lactating buffaloes and local cows was Rs.3.96 and Rs-4.02 per litre, respectively. He also reported that green fodder and concentrate were most significant input influencing the milk yield.

An investigation made by Siwach *et al.* (1992) on economics of buffalo keeping in Rohtak district of Haryana concluded that the average cost of milk production was Rs.3.08. The average annual maintenance cost of per buffalo was about Rs.6495, of which the variable cost was 76.77 percent. It was observed that feed cost alone accounted for about 55 percent of total cost. The study suggested that buffalo rearing was economical only, if the milk yield per buffalo was greater than 1208 litres per lactation (year).

Siwach *et al* (1992) in a cost-income analysis of buffalo milk production for different categories of households in Rohtak district of Haryana found that the major components of variable costs were concentrates (25 per cent) and human labour (20 per cent). Mean milk yield (litres), cost of milk production (Rs. per litre) and net return (Rs. per litre) was 1653.7, 3.77 and 0.48 respectively. It was concluded that profits were relatively greater for households with small and medium herds.

Ram *et al.* (1993) conducted a study on economics of milk production in rural areas of Western U.P. and observed that average maintenance cost and milk yield per day per buffalo was Rs. 15.81 and 4.41 litres, respectively. The free availability of sugarcane tops contributed 9 to 10 percent of total maintenance cost. The per litre cost of milk production worked out to be Rs.3.07. Fixed as well as variable cost was found lower in case of landless cattle owners and marginal farmers as Compared to small farmers.

Deoghare *et al.* (1994) examined the economics of milk production in Mathura district of UP and observed that expenditure on fodder and

concentrate formed the major share in the total cost of production. Net return per buffalo per year was highest for large farms (Rs. 1 128.89), followed by medium farm (Rs. 1005.65). Income was low on marginal farms (Rs.756.28), Average cost per litre of buffalo milk was Rs.3.71. Overall contribution of crop production and buffalo was found to be 83 and 17 percent, respectively, to the net farm income.

Singh *et al.* (1994) attempted to study economics of buffalo milk production in Mohindergarh district of Haryana and observed that the daily mean of total cost per milch buffalo was Rs.20.43 and the gross cost of milk production per litre was Rs.3.67 (Rs.4.09, 3.63 and 3.41 in summer, rainy and winter seasons, respectively). Cost decreased with increase in herd size and net return per litre milk was found Rs.0.50 on an average among different categories of fanners. Feeds and fodder accounted for about 60 percent of the total costs of production followed by labour cost (17%).

Balishter and Singh (1995) conducted study on cost and incomes from buffalo in Agra district of U.P. Maintenance cost, milk yield, milk production cost, gross and net return of buffalo keeping were worked out and it was found that net return were quite high for household maintaining more than one buffalo. Net return could be increased, if arrangement were made for supply of green fodder, and concentrate at subsidised rates by development agencies.

Kalra *et al.* (1995) conducted studies on rural area of Haryana and showed that the maintenance cost of buffaloes, crossbred cows and local cows was respectively, Rs. 19.11, Rs.20.25 and Rs. 14.22 per day per animal. The milk production of local cows resulted in a net loss of Rs.3.82 per day. The cost of producing milk was Rs.4.95, Rs.3.53 and Rs.6.91 per litre for buffalo, crossbred and local cows, respectively.

Gupta and Agarwal (1996) conducted a study on economics of milk production in Himachal Pradesh and revealed that of all the types of milch animals, the crossbred cow produced milk at the lowest cost (Rs.4.68 per litre). Although dairying is an economically viable enterprise in the states, the net return from it is quite meager. It is due to low milk yield caused by inadequate feeding of milch animals. Among different categories of milk production, the landless labourers earned the highest net return per litre of milk from crossbred cows, and upper medium farmers from buffalo.

Pundir (1996) have analysed input structure of milk production in Himachal Pradesh and revealed that variable inputs like green fodder, dry fodder, concentrate and labour accounted for 22.5, 26.5, 13.4 and 26.0 percent for buffalo and 18.1, 21.0, 18.6 and 25.2 percent for crossbred cows and 21.3, 24.7, 10.1 and 31.3 percent for local cows, respectively. Per litre cost of milk production was found to be Rs.4.75, 2.51, 4.65 in rainy season, Rs 4.95, 3.18 and 5.32 in winter season, followed by Rs.5.29, 3.99 and 4.85 in summer season for buffalo, crossbred and local cows, respectively. The crossbred cow was found most suitable as it gave highest net return per day, followed by buffalo during the year.

Panghal *et al.* (1997) attempted for a comparative economic study of milk production in different agro-climatic regions of Haryana and concluded that total milk production was less in dry region as compared to irrigated region. Among cost component, operational cost was found major one (68-70%) and the labour cost was found decreasing with the increase in the farm size in all the regions. The cost of green and dry fodder were almost equal in irrigated region, which may be due to more availability of green fodder throughout the year.

Sinha (1997), in Nalanda district of Bihar observed that the average net cost was Rs. 6.06 for crossbred cows. He also observed that the feed cost was

the major component of production cost, followed by labour in all categories of households and for different types of milch animals.

Ganesh kumar (1998) in a study conducted at villupuram district of TN reported that the cost of cow milk per litre was high in local cows followed by crossbred cows and was Rs.8.7 and Rs.7.27, respectively. He also observed that among the total cost, green fodder and concentrates accounted more in case of local cows followed by crossbred cows (23.46% and 25.46%, respectively). On the other hand the net return per cow per day was Rs. 9.93 in crossbred cows and Rs.1.88 in local cows.

Kumaravel, K.S (1998) in his survey on economic analysis of milk production and disposal pattern in Virudunagar district of TN concluded that rearing crossbred cows are more profitable one than local cows and negative incomes in case of local cows are largely attributed to their very low yield levels.

Sudheer, S., Raja Gopalan, T.G and Thomas, C.K (1999) conducted a study on comparative economics of milk production in organized sector at Ernakulam district of Kerala and reported that the cost of milk production per litre was high in unorganized sector than organized sectors accounting Rs. 6.89 and Rs. 6.63, respectively. They also found that the net return was higher in unorganized sectors mainly because the dairymen in unorganized sector sold their milk to the local consumer for a better price than organized sector earning Rs.8.71 and Rs.7.80, respectively.

2.2. Herd size and productivity relationship

Jacob *et al.* (1971) in Tamil Nadu and West Bengal observed that stall size showed very little effect on the average milk yield per animal. Though not significant, milk yield per animal showed a positive response to stall size in seven out of ten cases, while in rest three cases, it showed a negative response.

Singh and Krishna (1975) studied economics of three private dairies with 12, 20 and 25 milch animals in Meerut district (U.P.). The net returns per liter of milk produced showed an increase with an increase in the number of milch animals in the dairies.

Solanki *et al.* (1976) conducted a pilot study on returns to scale, herd size and productivity relationship in milk production in Karnal city of Haryana. The study observed an inverse Relationship between annual average milk yield per animal and herd size.

Singh (1982) used data for 73 commercial herds in Karnal city to estimate the herd size and productivity relationship. It was observed that the productivity per milch animal declined with the increase in herd size.

Siwach (1989) studied herd size and productivity relationship and incomes to scale in milk production of buffalo in Rohtak district of Haryana. The study revealed that the milk yield per milch animal decreased substantially and significantly with the increase in the herd size, and incomes to scale in buffalo milk production were constant in the study area.

Shirsendu Roy (2001) studied the resource use efficiency and incomes to scale in milk production in Panipat district of Haryana. In his study, the regression coefficient of herd size had a positive and significant effect on milk yield showing positive relationship between the milk production and herd size

2.3. Utilization pattern of milk

Gangwar *et al.* (1989) studied under 3 sizes of farm in the Agro-climatic regions of Haryana and reported that price of milk received by all farmers was Rs. 3/litre and the mean cost of production, which was highest *for* large farms in all 3 zones, was Rs. 2.62, Rs. 2.60 and Rs. 2.70. Over all net return per litre for the 112 small, 112 medium and 56 large farms respectively was Rs.

0.52, 0.46 and 0.09 per litre. Nearly 62 per cent of total milk production was used for home consumption, 74 per cent of this as liquid milk and 26 per cent as milk products.

Rajendran and Prabaharan (1993) conducted study on production, consumption and disposal of milk in Dharmapuri districts of Tamil Nadu and found that large farms produced 8 litres of milk per household per day compared to 4.9 litres for the landless category. The quantity of milk retained for consumption as a percentage of total production increased with land holding size. Per capita consumption of milk was highest for the large farm category (0.23 litres per day). Farmers marketed their milk mainly through milk producer cooperatives societies, and less than 9 per cent of farmers disposed of milk through tea shops or neighbors. In the small farm category, 96 per cent of producers utilised the services of milk cooperative societies, including the purchasing of inputs as well as milk marketing.

Badal (1994) conducted a study on disposal pattern of milk in Gopalganj district of Bihar and observed that milk producers sold 39 percent of the milk to tea shops and Halwais, 34.78 percent to milk vendors and 26.18 percent to consumers directly realizing average price of Rs.7.16 per litre. On an average, per capita per day consumption of fluid milk was 184 ml in the study area.

Deepak shah *et al.* (1995) in a study at Bulanshahr district of UP found that the milk production, marketed surplus, the quantity and percentage of milk converted into curd was higher in villages which had an adequate market infrastructure than in those which did not and the consumption of fluid milk, curd and ghee per capita was also higher in villages which had an adequate market infrastructure than those did not.

Sharma and Singh (1994) in a study at Himachal Pradesh found that major proportion of milk produced was consumed as liquid milk and the

reason behind this was to avoid distress sale due to an inadequate and unremunerative marketing system.

Gupta *et al.* (1995) conducted a study in Chandigarh among different income groups of households and reported that the mean milk consumption per capita tended to increase with level of income and the overall mean was 0.591 litres per day. They also found that 44.55 per cent of milk was used by households as tea whitener, 30.54 percent was consumed as liquid milk, 14.75 percent was utilized as curd and 10.16 percent as butter.

Sangu (1995) studied impact of dairy cooperatives on production, consumption of milk in Meerut district of Utter Pradesh between member and nonmembers. He found that the mean milk production was higher for members than non members and concluded that the production increased with size of holding and the highest proportion of total milk production came from small farmers in both the categories and highest contribution to total marketed surplus was from landless labourers followed by small farmers.

Atul Chandra (1998) conducted a study on disposal pattern on milk in Farrukhabad district of UP. He observed that a largest proportion of milk (44.1 %) of the total milk marketed by the milk producers were collected by milk vendors followed by milk cooperatives (41.95 %), tea shops (9.66 %), and consumers (4.29 %). The largest share of marketed surplus by the landless labourers and large farmers went to milk cooperatives where as the largest share of marketed surplus by the small and medium farmers went to milk vendors. The consumers and teashops received a largest share from the landless milk producers.

Chapter

Profile of the Study area

3. PROFILE OF THE STUDY AREA

The overall economic development of any region depends on its physical endowments, human resources and technological progress. Therefore an objective description of the study area will be useful to understand the scope and limitations for its economic development. History, Location of the study area, its climatic condition, Irrigation, Land use pattern, Cropping pattern, Livestock and Infrastructure facilities of the study area are presented in this chapter.

3.1. History

Madurai is Tamil Nadu's most happening cultural arena. Today, Madurai is the thriving pulse of Tamil Nadu's industrial growth. Truly, it is believed that the gods are here to stay. Situated on the banks of river Vaigai, Madurai is the second largest city of Tamil Nadu. Madurai an important cultural and commercial centre even as early as 550AD. Madurai was the capital city for the great Pandya king. It is narrated in legend that Madurai was originally a forest known as Kadambavanam. One day, a farmer named Dhanajaya who was passing through the forest, saw Indra (the king of the gods), worshiping a swayambhu (self created lingam) under kadamba tree. Dhanajaya, the farmer immediately reported this to the king Kulasekara Pandya. He cleared the forest and built a temple around the lingam. The city was soon planned with the temple as its centre. On the day the city was to be named, Lord Shiva is said to have appeared and drops of nectar from his hair fell on the town. So, the place was named Madurai-Mathuram meaning "sweetness" in Tamil. Among the temples Meenakshi Amman Temple is the most famous one.

3.2. Geographical location

Madurai lies between 9°3′ and 10° 51′ of the Northern latitude and 77°10′ and 78°30′ of the Eastern longitude at the foot of the Western Ghats and extends over an area of 3741.73 sq. km accounts for 2.9 per cent of the geographical area of Tamil Nadu. There are two revenue divisions and

thirteen blocks in the district. There are 596 villages and 238 bank branches in the district.

Madurai district experiences a hot summer from April to June and a cold season from December to February next. The normal maximum temperature is 34.5°C and minimum temperature is 23.6°C. The concentration of rainfall is during North-East monsoon period followed by South-West and Hot weather monsoon periods. Rainfall during the winter period is negligible. The season wise distribution of rainfall for Madurai district is presented in Table 3.1. In general, out of the Average Annual Rainfall of 731.1mm, 55.65 per cent occurs during North-East monsoon, 39.50 per cent occurs during South-West monsoon and 4.85 per cent occurs during Hot Summer monsoon period.

Table 3.1. Rainfall pattern of Madurai district (2000-2001, in mm)

Rain fall season	Actual	Normal
South-West (Jun-Sep)	316.5	288.8
North-East (Oct-Dec)	226	406.9
Winter (Jan-Feb)	-	-
Hot weather (Mar-May)	9.2	35.4

Source: Asst. Director of Statistics, Madurai.2000-2001

3.3. Soils

The types of soil prevalent in the district are Red soil (36.66 per cent), Black soil (19.63 per cent), Brown soil (13.82 per cent), Alluvial (0.55 per cent) and Forest & Hill soils (14.32 per cent). Black soils are only found in Thirumangalam Taluk. Estimates of fertility status of the soils in terms of N, P and K, show that the soils in the district have low Nitrogen, high Potash and medium Phosphorus content.

3.4. Land utilisation pattern

Table 3.2 shows the land utilisation pattern of Madurai district for 2000-2001. From the table it could be seen that the total cropped area is 1,62,819 hectares, out of which net sown area is 1,48,047 hectares. The area

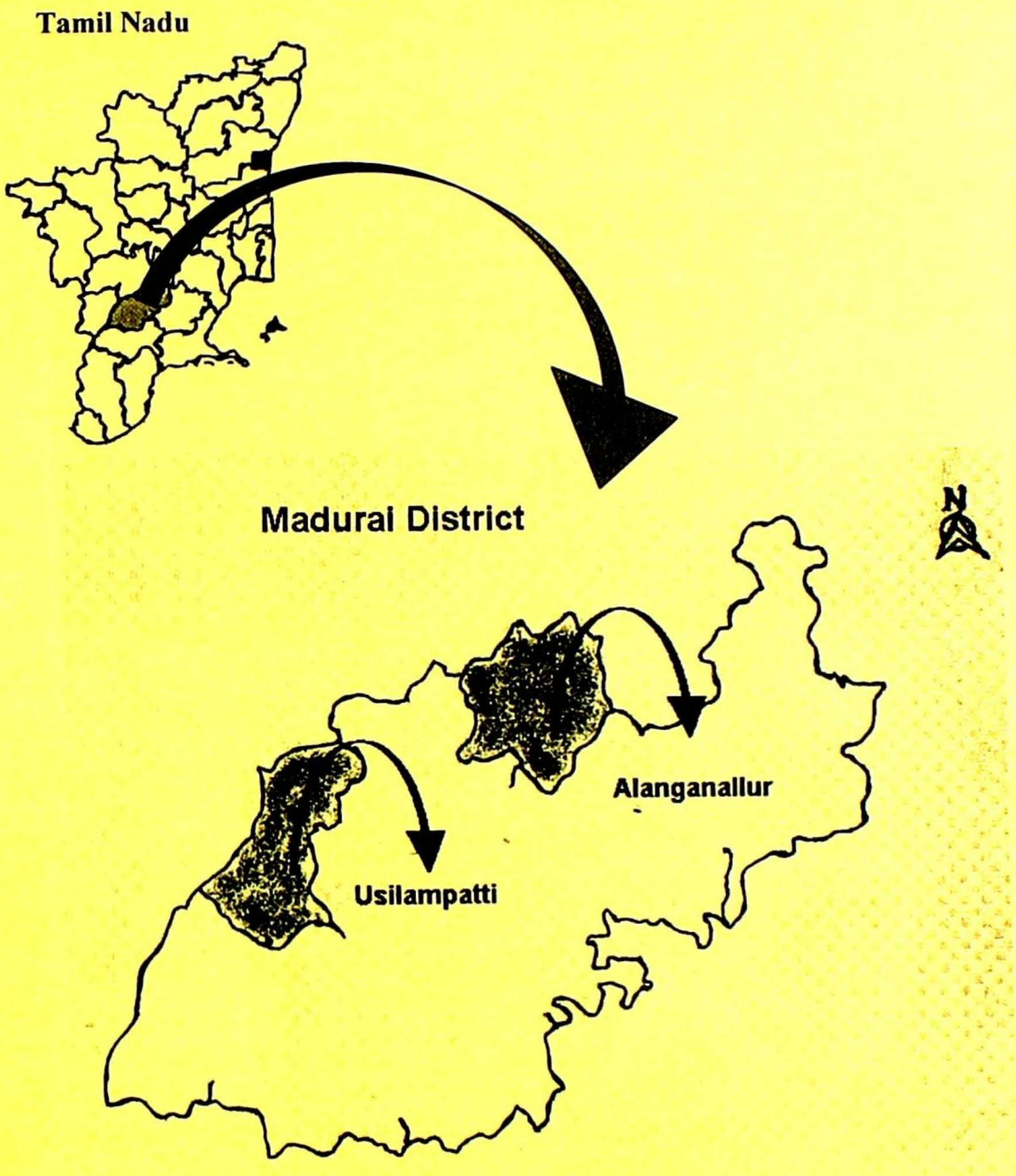


Fig. 1. Map showing the location of study area

under permanent pasture and other grazing land is only 230 hectares indicating the constraint for cattle development.

Table 3.2. Land utilisation pattern of Madurai district.

Classification	Area (ha)	Percent
Forest	50,452	12.58
Barren and uncultivable uses	15,799	3.94
Land put to Non-Agricultural uses	65,606	16.36
Cultivable waste	5,332	1.33
Permanent pastures and other grazing land	230	0.06
Current fallows	49,547	12.36
Other fallow land	37,905	9.45
Net area sown	1,48,047	36.92
Area sown more than once	14,772	3.68
Total cropped area (Net area sown + Area sown more than once)	1,62,819	40.60
TOTAL	4,00,990	100.00
Geographical area according to village papers	3,74,173	

Source: 'G' Income, Asst. Director of Statistics, Madurai. (2000-01)

3.5. Irrigation

Vaigai river originating from Western Ghats in the district is the main source of irrigation. From the Table 3.3 it may be observed that the net irrigated area is 92671ha. Canals and wells are the major irrigation sources. They benefit 54.32 per cent and 23.09 per cent of the total Net irrigated area.

Table 3.3. Source wise area of irrigation potential of Madurai district (1991)

Source	Area (ha)
Net area irrigated	92671
By canals	50334 (54.32)
By wells	21405(23.09)
By other sources	20932(22.59)

Figures in the parenthesis indicate the per cent of each source out of Net irrigated area.

Source: Asst. Director of Statistics, Madurai

3.6. Size of holdings

There are 3,14,953 holdings in Madurai district operating 2,14,289.58 ha of land. From Table 3.4, it can be seen that nearly 80.68 per cent of the holdings in the district are below one hectare operating 40.05 per cent of the total land area. Holdings larger than 2 ha form only 6.66 per cent of the total households operating 34.11 per cent of the total land area.

Table 3.4. Size of holdings (No. and Area wise) -1991

Size of holdings	Number	Percent	Area (ha)	Percent
< 1 ha	2,54,097	80.68	85,818.28	40.05
1-2 ha	39,871	12.66	55,37708	25.84
>2 ha	20,985	6.66	73,094.22	34.11
Total	3,14,953	100.00	2,14,289.58	100.00

Source: Asst. Director of Statistics, Madurai.

Table 3.5. Area under principal crops of Madurai district 1998-99

Crops	Area (Hactares)
Paddy	87230
Cholam	9937
Cumbu	1197
Ragi	203
Maize	311
Other Cereals	3623
Total Cereals	102501
Green Gram	5913
Red gram	1863
Black gram	1177
Bengal Gram	21
Horse gram	84
Other Pulses	2369
Total Pulses	11427
Total Food Grains	113928
Sugarcane	10179
Cotton	11367
Ground nut	11003
Gingelly	2642
Castor	30

Source: Department of Economics & Statistics, Chennai-600 006

3.7. Cropping pattern and cropping season

Paddy, Sorghum, Cumbu, Pulses, Sugarcane, Ground nut, and cotton are major crops grown in the district. The important crop cultivation seasons generally followed in this district are as shown below.

Table 3.6. Cropping pattern and cropping season

Land type	Crop	Season
Wet	Paddy Single crop	Sep-Oct to Jan-Feb
	Double crop	Jun-Jul to Sep-Oct Mar-Apr to Jul-Aug Sep-Oct to Jan-Feb
Garden	Paddy	Sep-Oct to Jan-Feb
	Cotton	Feb-Apr to Jul-Aug Sep-Oct to Jan-Feb
	Chillies	Jul-Aug to Jan-Feb Sep-Oct to Dec Jan
	Groundnut	Jan-Feb to Apr-May Jul-Aug to Dec-Jan
	Sugarcane	Feb-Mar to Jan-Feb
	Banana	Jan-Feb Nov-Dec
	Onion	Sep-Oct to Jan-Feb
	Vegetable and Millets	Feb-Mar to Jan-Jul
Dry	Ragi, Jowar , Cumbu & Groundnut	Jul-Aug to Oct-Nov
	Cotton	Jan-Feb to Sep-Oct
	Gingelly	Feb-Mar to Jan-Jul
	Minor Millets	Jul-Aug to Oct-Nov

3.8. Dairying:

Next important to crop production is the dairy farming. This sector serves as a good supplementary source of income to farmers, particularly the backward strata of farmers to make use of their crop wastages and other farm resources in an efficient manner. It is in this view, the cattle and buffalo population, Vety. Institutions, dairy development has been discussed below:

Table 3.7. Bovine population for the year 1996-97

Cattle		Buffalo		Over all	
Total	Ready for breeding	Total	Ready for breeding	Total	Ready for breeding
229088 (85.07)	118001 (79.81)	40213 (14.93)	29844 (20.19)	269301	147845

Figures in the parenthesis indicate percentage out of their respective over alls.

Source: Asst. Director of Statistics, Madurai

Of the overall total bovine population, approximately 85% of the animals were cattle and 15% of the animals were buffaloes. The cattle and buffaloes ready for breeding accounted to be 79.81% and 20.19% respectively.

Table 3.8. Dairy development:

Name of the block	Vety. Institutions	
	Hospitals	Dispensaries
Madurai east		1
Madurai west	1	5
Thiupparankundram		4
Melur	1	1
Kottampatty		2
Vadipatti		2
Alanganallur		1
Thirumangalam	1	2
Kalligudi		1
Usilampatty		1
Chellampatti		2
Sedapatty	1	3
T.kallupatty		2

Source: Asst. Director of Statistics, Madurai

3.9. Other features of the Madurai district:

The district is consciously embarking on socio-economic development by creating a congenial atmosphere to enable everyone to live in peace and harmony and creating a sense of awareness among the masses by attempting to provide gainful income generating activities for a sustainable living through various government and other programmes. The district has a few reputed organisations in the private sector like T.V. Sundaram Iyengar and sons, Madura coats, Fenner(I)Ltd. Etc., which are engaged in the production of variety of goods like tyres and tubes, machineries, conveyor belts etc, and also provider employment opportunities. Due to the existence of controlling offices of various banks, the time lag in sanctioning of proposals has been reduced, dissemination of information to the grass-root level could be ensured due to excellent coordination amongst various agencies existence of reputed educational institutions to provide necessary education to the needy, existence of good training institutions enables one to get the desired training inputs and with the advent of several reputed computer centres, people are able to get god exposure in information technology.

3.10. Predominant economic activities prevalent in the district:

By virtue of giving certain basic infrastructure facilities, the district offers ample scope for various types of economic activities prominent among them being in the field of textiles, readymade garments, bakery units, floriculture, dairying etc.

3.11. Major food, commercial and plantation/horticulture crops in the district

The major food crops grown in the district are Paddy, Cholam, Ragi and Cumbu, Banana, Guava, Mango, Sapota and Jasmine are some of the principle plantation/horticulture crops. Vegetables, Chillies, Cotton are some of the major cash crops grown in the district.

3.12. General features

Madurai is 488 kms south of Madras, the state headquaters. This southern district of the state is connected by rail, road and air with major cities of the state and other states. There are many transport corporations providing ample transport facilities to the people of this district. All India Radio (AIR) is situated at Madurai. The famous Jallikattu, the courageous sport of youth used to have spectacular performance during the Pongal (Mahara sankaranthi) festival in Alanganallur in this district.

Chapter 4

Methodology

4. METHODOLOGY

4.1. Selection of the study area

A comprehensive investigation was undertaken in the rural areas of purposively selected Madurai district of Tamil Nadu. This district falls at the foot of Western Ghats, which is suitable for agriculture and allied activities. Of the subsidiary occupation, dairy farming occupies its own position and has now been considered as one of the most profitable enterprises which utilizes the farm by products very efficiently. Moreover, this district has well established milk cooperative union with 547 milk cooperative societies, which provides good marketing facilities to the disposable milk with the farmer. There is a well established communication network which connects all major cities of the states and other states. In addition to this, no previous study on dairying is available for this district which could serve as a ready reckoner for dairy development department, dairy farmers and policy makers. This has created a great deal of urge for selecting the study area.

4.2. Sampling design

Multistage stratified random sampling procedure was adopted to select the sampling households. Madurai district posses 13 blocks out of which two blocks namely, Alanganallur and Usilampatty were randomly selected. Two villages namely, Paalamedu and Sathira vellalapatti from Alanganallur block and Chettiyapatti and Thottappanaikkanur from Usilampatty block were randomly selected. Key information regarding the villages were collected from sources like veterinary clinics, cooperative socities and village panchayats. Altogether 80 sample households were selected with probability proportional to herd size spread overall categories. The households were classified into three categories namely, small (upto 2 milch animals), medium (3 milch animals) and large (more than 3 milch animals) using cumulative cube root method.

4.3. Data collection

The data for the study were collected broadly under two categories viz,. data from Primary sources and data from Secondary sources and investigation was made in order to meet the study objectives.

1) Primary data:

The primary data were collected during January - February 2002 from the sample households by conventional survey method using a well structured, pre-tested schedule through personal interview. Various aspects of dairy enterprises like occupation, family size, sex, education, operational holding, herd size, type of animals, dairy equipments, value of cattle shed, quantity of various feed and fodders, milk yield and cow dung along with their money values, family and hired labour used along with prevailing wage rate and other related miscellaneous expenditures. The information regarding the milk utilization and disposal pattern of milk for different category households were also collected.

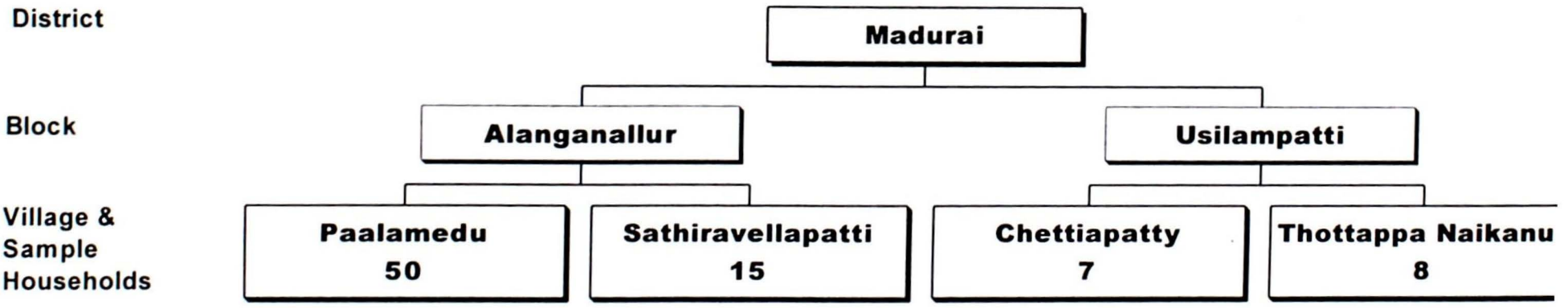
2) Secondary data:

Secondary data regarding total area of the district, population, agro climatic features, land use pattern, cropping pattern, cropping intensity, livestock population, Number of milk producers coop. society, infrastructural facilities of dairy development, etc. were collected from various sources like District Animal Husbandry department, District Statistical Office, etc. These data were also be collected both from published as well as unpublished sources.

4.4. Feeding practices

The feeding practices did not vary much throughout the study period. Green fodder, dry fodder and concentrates were fed during the season. However the feeding proportion was little different among farmers. The green fodders mainly fed to the animals were jowar, other grasses collected from waste land and nearby hills. The dry fodder mainly fed to the animals were paddy straw and jowar. In the study area the dry fodder (jowar) was fed

Fig 2. Sampling Plan



without chaffing. Regarding concentrates, ground nut cake, sesamum cake, bajra grain, rice flour, cotton seed, maize flour, etc, were fed to the animals.

4.5. Estimation procedure:

Besides the quality of animals, milk production depends largely upon socio-economic indicators of any locale of which the cost parameters are most important. It is, therefore, essential to study various cost components, which includes expenditure on cattle shed, animals, feeds, labour, maintenance, and other related cost components. The cost items were categorized into fixed cost and variable cost.

4.6. Cost components

A. Fixed cost:

Fixed costs are those expenditures, which are incurred whether or not the production is carried out. It includes interest on fixed capital, depreciation. The fixed costs were apportioned based on Standard Animal Unit (SAU) given by Patel, RK et al. (1981) The conversion coefficients are,

Adult crossbred cow	1.4
Adult local cow	1
Adult buffalo	1.3
Draught animals	1.0
Cross bred heifer > 1 year	0.75
Local > 2 year	0.75
All calves > 1year	0.50
All calves < 1year	0.33

1. Interest on Fixed Capital

It is the payment for the use fixed capital. It comprises the value of cattle shed, equipment, machinery and milch animal. The interest rates on fixed capitals were calculated at the current bank lending rate of 10.5 per cent per annum.

2. Depreciation

It is the loss in the value of a given assets as a result of the use, wear and tear, accidental damage and time obsolescence irrespective of the change in the general price of the item. It includes depreciation on permanent cattle shed, machinery, equipments and milch animals. This was calculated by using the parameters developed by Rao (1991) and Patel (1979).

The depreciation rate on various items took into account were,

Items	Depreciation rate
Pucca cattle sheds and stores*	2%
Kaccha cattle sheds and stores*	5%
Milch animal upto 3 lactation**	Nil
Milch animal of 4th and 5th lactation**	10%
Equipment and machinery	As per productive life of the equipment (Individually)

* given by Rao (1991) ** given by Patel (1979)

B. Variable cost

It includes feed cost, labour cost, veterinary and breeding cost and miscellaneous costs.

1. Feed cost

It was worked out for various categories of households by multiplying the average value of quantities of green fodder, dry fodder, and concentrate fed per animal with their respective market prices.

2. Labour cost

The cost of family labour was computed on the basis of prevailing wage rate. The time devoted by child and female labour was converted into standard man-hour[1]. Since there were no permanent or hired labour, only family labour cost was accounted.

[1] Conversion coefficients of standard man hour:

2 male = 3 female

1 male = 2 children

3. Veterinary and breeding cost

The charges for natural services, artificial insemination, and treatment of milch animals were calculated for various breeds under different categories of households based on their respective charges.

4. Miscellaneous expenses

It includes cost of repairs, electricity tariff, water charges, purchase of buckets, ropes, chain, broomsticks, etc.

Gross cost

Gross cost for various breeds under different categories of households were calculated by adding total fixed cost and total variable cost.

Net cost

Net cost for various breeds under different categories of households were calculated by subtracting the income from dung from gross cost.

Income from milk

Income from the milk was calculated by multiplying the quantity of milk with current market price.

4.7. Analytical techniques

4.7.1. Cost and returns from milk production

Simple tabular analysis was used to find out the cost and returns from milk production using cost concepts for different categories of households for various breeds.

4.7.2. Functional analysis:

Production function is basically a mathematical relationship between explanatory variables and dependant variable. It provides information of the possible effect of explanatory variables on dependant variable in the production process. Milk production function is a mathematical relationship between milk yield and various inputs used in the milk production process. It was Heady *et al*(1951) who first attempted to establish milk production function and studied the response of feed inputs on milk production. Since then extensive studies have been undertaken in this direction. Herd size is an important variable which affects the productivity on milch animals. There

were many studies which have reported the impact of herd size on productivity per milch animal. Since herd size impose considerable impact on productivity, an attempt has been made to study the relationship between the two variables. Linear, Cobb- Douglas and quadratic production functions have been tried. The specifications for these production functions are,

Linear

$$Y = b_0 + bX$$

Cobb-Douglas

$$Y = b_0 X^b$$

Quadratic model

$$Y = b_o + bX + cX^2$$

Where,

Y = Milk yield per standard adult milch animal (lit).

X = Size of the herd (standard adult milch animal units)

b_0 = Intercept term of milk yield.

b & c = Estimate of the parameter of regression equation.

4.8. Utilization pattern of milk:

The utilization pattern of milk for sample households was studied by simple tabular analysis of percentage method.

Chapter 5

Results & Discussion

5. RESULTS AND DISCUSSION

Commensurate with the objectives set forth for this study, the results for the study on Economics of milk production in Madurai district of Tamil Nadu are presented in this chapter under four sections. In this chapter the distribution of milch animals for different categories of sample households, Average daily consumption and expenditure on feed and fodder both in quantity as well as in value terms, Average daily milk yield per milch animal have been analyzed. Further, Cost and returns from milk production for different categories of sample households, Cost per litre of milk production, herd size and productivity relationship in milk production have been estimated. Finally, utilization pattern of milk, consumption, marketed surplus for the different categories of household have been discussed.

5.1. Distribution of milch animals

The distribution of milch animal for different categories of sample households is presented in Table 5.1.

The large category of households possessed the highest percentage of milch animals (35.71 %), followed by medium (34.29%) and small (30.00%) category of households. Of the total crossbred cows large category of households maintained the highest crossbred cows (38.33 %) followed by medium (35.56 %) and small (26.11%). Of the total local cows small category of households possessed the highest milch animals of (43.48 %) followed by medium (30.43%) and large (26.09%) category of households. The crossbred milch cows dominated the study area.

5.2. Average daily milk yield per animal

Average daily milk yield per milch animal was calculated for the sample households and is presented in Table 5.2.

The overall average daily milk yield per milch animal was worked out to be 7.69, 4.54 and 8.24 litres for crossbred, local and buffaloes respectively. It was the highest (8.11 lit) for small category of households and was lowest

(6.84 lit) for large category for crossbred cows. In local milch cow it was highest (5.38 lit) for large household category and lowest (3.45 lit) for medium household category. The highest milk yield per buffalo was mainly due to the fact that the number of observations for buffaloes was only 5 and all were in lactating stage. Otherwise, crossbred cows performed better than local cows.

5.3. Average daily intake of feed and fodder per milch animal

Average daily feed and fodder intake per milch animal was worked out for different categories of households. The same has been presented in Table 5.3.

On an average, the daily consumption of the green fodder, dry fodder and concentrates per milch crossbred cow was found to be 2.61, 13.47 & 2.85 kgs. respectively. These figures per milch local cow were found to be 3.72, 11.07, 1.87 kgs. The average daily consumption of green fodder, dry fodder and concentrates per buffalo was found to be 2.81, 12.25 and 2.35 Kgs. Further, the average daily intake of dry fodder and concentrate increased with the category of households both in crossbred and local cows except the concentrate for medium category , which was the highest (2.33 kgs.) in case of local cows. While, the intake of the green fodder was the highest (2.86 kgs) for the small category of households and was the lowest (2.36 kgs) for the medium category of households. Further, only small category of households fed their local cows and buffaloes with green fodder. Whereas, crossbred milch cows were fed with green fodder, though very little, by all the category of households.

Table 5.1. Distribution of milch animals for different category of households.

Category of households	No. of sample households	Milch animals			
		Crossbred	Local	Buffaloes	Overall
Small (Upto 2 animals)	40	47 (26.11)	10 (43.48)	4 (80.00)	61 (30.00)
Medium (3 animals)	24	64 (35.56)	7 (30.43)	1 (20.00)	72 (34.29)
Large (> 3 animals)	16	69 (38.33)	6 (26.09)	-	75 (35.71)
Overall	**80**	**180 (100)**	**23 (100)**	**5 (100)**	**208 (100)**

Figures in the parenthesis indicate percentage to total milch animals

Table 5.2. Average daily milk yield per milch animal according to different categories of households (litres/day)

Category of households	Milch		
	Crossbred	Local	Buffalo
Small	8.11 (0.79)	4.62 (0.95)	8.43 (0.40)
Medium	7.40 (0.62)	3.45 (0.61)	7.50 (-)
Large	6.84 (0.47)	5.38 (1.21)	-
Overall	**7.69 (0.40)**	**4.54 (0.63)**	**8.24 (0.36)**

Figures in the parenthesis indicate standard errors.

Table 5.3. Average daily intake of feeds and fodders per milch animal for different categories of households (Kgs.)

Category of households	CROSS BRED			LOCAL			BUFFALO		
	Green fodder	Dry fodder	Concentrate	Green fodder	Dry fodder	Concentrate	Green fodder	Dry fodder	Concentrate
Small	2.86	12.76	2.77	3.72	10.56	1.69	2.81	11.00	2.38
Medium	2.36	13.91	2.86	-	11.00	2.33	-	16.00	2.25
Large	2.50	14.13	3.00	-	12.67	1.96	-	-	-
Overall	**2.61**	**13.47**	**2.85**	**3.72**	**11.07**	**1.87**	**2.81**	**12.25**	**2.35**

5.4. Average daily expenditure on feeds and fodders per milch animal

Information only on average daily quantities of feed and fodder is not sufficient for cost study. The average daily expenditure incurred on feed and fodder is a requisite in order to know the magnitude of expenditure spent under each and every category of households for different breeds. In the present study average daily expenditure on feeds and fodders were worked out for different breeds for each categories of household.

The average daily expenditure on feeds and fodders per milch animal has been presented in Table 5.4.

The average daily expenditure on feeds and fodders for crossbred milch cows, over all categories was worked out to be Rs. 2.95, 17.27& 21.43 on green fodder, dry fodder, and concentrates respectively. These figures for local cow were found to be Rs. 2.60, 13.84 and 13.82 on green fodder, dry fodder, and concentrates respectively. The average daily expenditure on feeds and fodders for buffalo, for the over all categories was worked out to be Rs. 2.82, 15.00 and 19.02 on green fodder, dry fodder, and concentrates respectively.

On the whole, the average daily expenditure on feeds and fodders was consistently higher for crossbred cows compared to local cows and buffaloes. However, expenditure on green fodder was less which may be due to the fact that animals are allowed for grazing in the nearby wastelands and hills from the morning to till evening. Further the average daily expenditure on green fodder for small category of households was the highest (Rs. 4.33) in local cows and lowest (Rs. 3.51) in crossbred cows.

The average daily expenditure on dry fodder among the crossbred cows was high for large category of household (Rs. 17.66) followed by medium (Rs. 17.39) and small category of households (Rs. 16.95). These figures for local cows were Rs. 15.83, Rs. 13.75 & Rs. 12.05 for large, medium and small category of households respectively. The expenditure on concentrates for crossbreed cows was highest for large category of household

Plate No. 1. Typical cattle shed in the study area

Plate No. 2. A view of front portion of house partly being used as cattle shed

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The average daily expenditure on feeds and fodders for crossbred milch cows, over all categories was worked out to be Rs. 2.95, 17.27& 21.43 on green fodder, dry fodder, and concentrates respectively. These figures for local cow were found to be Rs. 2.60, 13.84 and 13.82 on green fodder, dry fodder, and concentrates respectively. The average daily expenditure on feeds and fodders for buffalo, for the over all categories was worked out to be Rs. 2.82, 15.00 and 19.02 on green fodder, dry fodder, and concentrates respectively.

On the whole, the average daily expenditure on feeds and fodders was consistently higher for crossbred cows compared to local cows and buffaloes. However, expenditure on green fodder was less which may be due to the fact that animals are allowed for grazing in the nearby wastelands and hills from the morning to till evening. Further the average daily expenditure on green fodder for small category of households was the highest (Rs. 4.33) in local cows and lowest (Rs. 3.51) in crossbred cows.

The average daily expenditure on dry fodder among the crossbred cows was high for large category of household (Rs. 17.66) followed by medium (Rs. 17.39) and small category of households (Rs. 16.95). These figures for local cows were Rs. 15.83, Rs. 13.75 & Rs. 12.05 for large, medium and small category of households respectively. The expenditure on concentrates for crossbreed cows was highest for large category of household

Plate No. 1. Typical cattle shed in the study area

Plate No. 2. A view of front portion of house partly being used as cattle shed

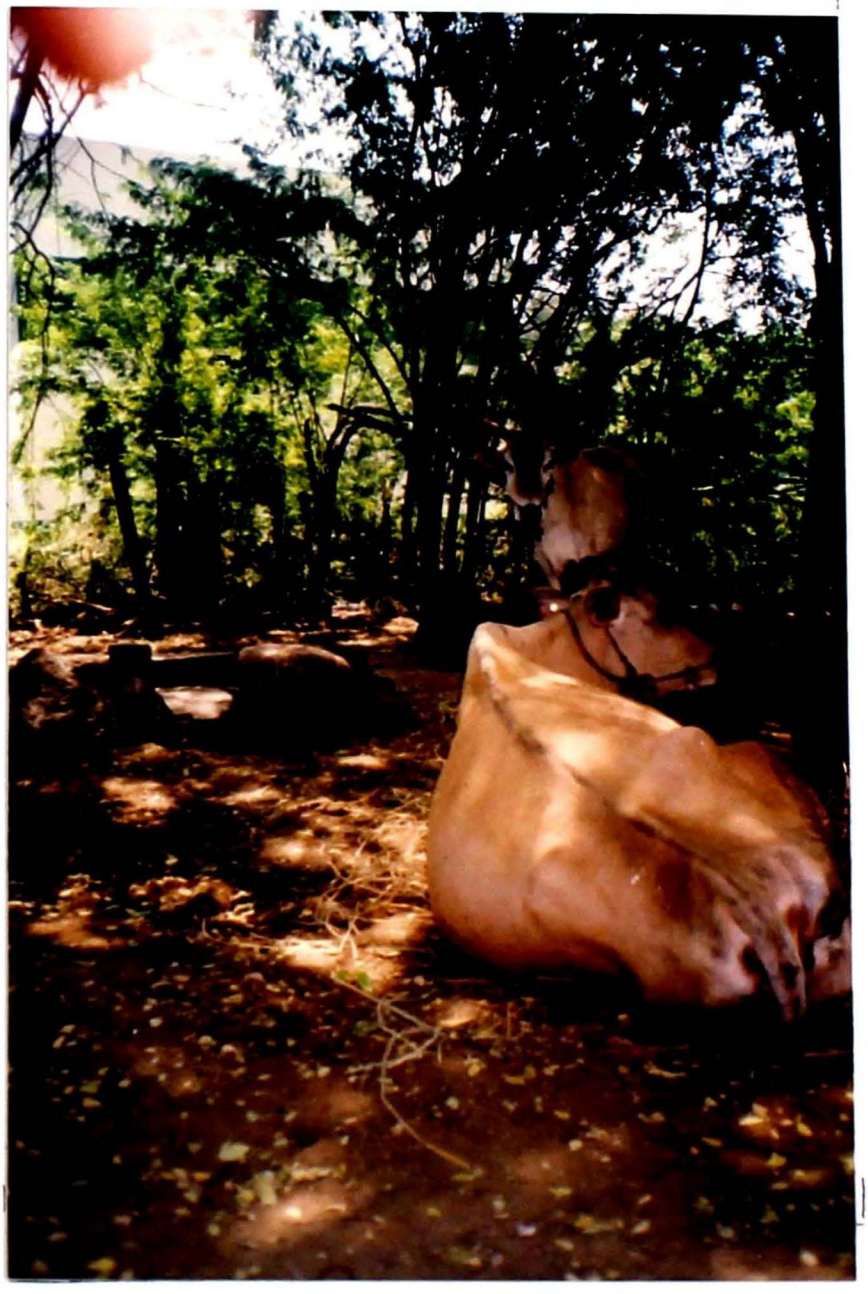

Plate No. 3. Cattle in open shelter

Plate No. 4. Cross bred cows in the study area

Plate No. 5. A typical dry fodder heap

Plate No. 6. Various types of concentrates fed to animals

Plate No. 7. Utensils used in dairy farming in the study area

(Rs. 23.12) and lowest for medium category of households (Rs. 20.59), whereas the expenditure on concentrates for local cow was highest (Rs. 16.85) for large category of households and lowest (Rs. 12.05) for small category of households.

5.5. Cost and returns from milk production per milch crossbred

The cost and returns from milk production per milch crossbred per day has been presented in the Table 5.5.

It was observed that the gross cost for overall category was Rs. 56.65, which was the highest for small category (Rs. 59.76) followed by large (Rs. 55.01) and medium (Rs. 53.86) category of households. The total feed cost was more than 2/3 rd of the gross cost in all the category of households. The total variable cost for all the categories of household was almost of the same order accounting to 90 per cent. It was found that the labour cost for small category of household was significantly higher per day per animal as compared to other two categories of households. The overall net return per day per crossbred milch was Rs. 11.24, which was highest for small category of household (Rs. 13.62) followed by medium (Rs. 10.48) and large category of households (Rs. 8.02), i.e., it declined with herd size category.

Table 5.4. Average daily expenditure on feeds and fodders intake per milch animal for various categories of households

(Rs./Day)

Category of households	Cross bred			Local			Buffalo		
	Green fodder	Dry fodder	Concentrate	Green fodder	Dry fodder	Concentrate	Green fodder	Dry fodder	Concentrate
Small	3.51	16.95	21.16	4.33	13.20	12.05	3.52	13.75	19.15
Medium	2.41	17.39	20.59	-	13.75	16.09	-	20.00	18.50
Large	2.69	17.66	23.12	-	15.83	16.85	-	-	-
Overall	2.95	17.27	21.43	2.60	13.84	13.82	2.82	15.00	19.02

Table 5.5. Cost and returns from milk production per crossbred milch cow for different categories of households

(Rs./Day)

Particulars	Small		Medium		Large		Overall	
I. Variable Cost								
Green fodder	3.51	(5.87)	2.41	(4.47)	2.69	(4.89)	2.95	(5.20)
Dry fodder	16.95	(28.36)	17.39	(32.29)	17.66	(32.10)	17.27	(30.48)
Concentrate	21.16	(35.41)	20.59	(38.23)	23.12	(42.03)	21.43	(37.83)
Total feed cost	41.62	(69.65)	40.39	(74.99)	43.47	(79.02)	41.64	(73.50)
Human labour cost	10.64	(17.80)	6.19	(11.49)	5.32	(9.67)	7.88	(13.92)
Veterinary and breeding cost	0.93	(1.55)	0.77	(1.43)	0.44	(0.80)	0.76	(1.34)
Miscellaneous expenditure	1.20	(2.01)	0.98	(1.82)	0.88	(1.60)	1.05	(1.33)
Total Variable Cost (A)	**54.39**	**(91.01)**	**48.33**	**(89.73)**	**50.11**	**(91.09)**	**51.33**	**(90.61)**
II. Total Fixed Cost (B)	**5.37**	**(8.99)**	**5.53**	**(10.27)**	**4.90**	**(8.91)**	**5.31**	**(9.38)**
Gross Cost (A+B)	**59.76**	**(100.00)**	**53.86**	**(100.00)**	**55.01**	**(100.00)**	**56.65**	**(100.00)**
C. Value of Dung	0.39		0.27		0.30		0.33	
Net Cost (A+B)-C	59.37		53.59		54.71		56.32	
Gross Income from Milk	72.99		64.07		62.73		67.56	
Net Return (Gross Income - Net Cost)	**13.62**		**10.48**		**8.02**		**11.24**	

Figures in the parenthesis indicate percentage of gross cost

5.6. Cost and returns from milk production per milch local cow

The overall gross cost per day per milch local was Rs. 44.58 (in Table 5.6), which was highest for small category (Rs. 47.26) followed by large (Rs. 41.55) and medium (Rs. 39.57) category of households. The highest gross cost for small category of households was mainly due to the high labour cost which alone accounted to nearly 24 per cent. However, there was a negative net return for small and medium categories which may be due to lower productivity of milch animals. But, the large household category reaped a net return of Rs. 6.75.

5.7. Cost and returns from buffalo

The overall gross cost per day per buffalo was Rs. 59.61 (Table 5.7). The overall net return per buffalo per day was Rs. 13.41. Since the number of buffaloes was very few in small and medium categories, cost and return for individual category was not discussed.

5.8. Cost per litre of milk production

It is generally assumed in economic study that the producers always wish to attain maximum profit from any enterprise. This can be attained only if the producer is aware of the stage of production and the additional cost incurred in each and every additional activity throughout the production process. A farmer as a milk producer intends to be rational in milk production process ie., Maximizing the profit from it. This can be achieved by reducing the cost of milk production through judicious use of various inputs used in milk production process. But, many of the rural households who engage themselves in dairy farming do not maintain proper and regular records related to cost incurred on various activities. This is mainly due to his triple role in his social system, as a head of the household, as a manager of his farm and as a labourer.

Table 5.6. Cost and returns from milk production per local milch cow for different categories of households (Rs./Day)

Particulars	Small		Medium		Large		Overall	
I. Variable Cost								
Green fodder	4.33	(9.16)		-	-		2.60	(5.83)
Dry fodder	13.2	(27.93)	13.75	(34.75)	15.83	(38.10)	13.84	(31.04)
Concentrate	12.05	(25.50)	16.09	(40.66)	16.85	(40.55)	13.82	(31.00)
Total feed cost	29.58	(62.59)	29.84	(75.41)	32.68	(78.65)	30.25	(67.86)
Human labour cost	11.34	(23.99)	5.21	(13.17)	4.34	(10.45)	8.71	(19.55)
Veterinary and breeding cost	0.9	(1.90)	0.79	(2.00)	0.68	(1.64)	0.83	(1.87)
Miscellaneous expenditure	1.09	(2.31)	1.02	(2.57)	0.92	(2.21)	1.04	(2.33)
Total Variable Cost (A)	**42.91**	**(90.80)**	**36.84**	**(93.15)**	**38.62**	**(92.95)**	**40.84**	**(91.61)**
II. Total Fixed Cost (B)	**4.35**	**(9.20)**	**2.73**	**(6.90)**	**2.93**	**(7.05)**	**3.74**	**(8.39)**
GROSS COST (A+B)	**47.26**	**(100.00)**	**39.57**	**(100.00)**	**41.55**	**(100.00)**	**44.58**	**(100.00)**
C. VALUE OF DUNG	0.5		0.39		0.35		0.45	
NET COST (A+B)-C	46.76		39.18		41.20		44.13	
GROSS INCOME FROM MILK	40.91		30.09		47.95		40.75	
NET RETURN (Gross Income – Net Cost)	**-4.85**		**-9.08**		**6.75**		**-3.38**	

Figures in the parenthesis indicate percentage of gross cost

Table 5.7. Cost and returns from milk production per Buffalo for different categories of households (Rs./Day)

Particulars	Small		Medium		Large	Over all	
I. Variable cost							
Green fodder	3.52	(5.77)	-		-	2.82	(4.72)
Dry fodder	13.75	(22.55)	20.00	(36.93)	-	15.00	(25.16)
Concentrate	19.15	(31.41)	18.50	(34.16)	-	19.02	(31.91)
Total feed cost	36.42	(59.73)	38.50	(71.09)	-	36.84	(61.80)
Human labour cost	17.3	(28.37)	11.50	(21.23)	-	16.14	(27.08)
Veterinary and breeding cost	1.31	(2.15)	0.82	(1.51)	-	1.21	(2.03)
Miscellaneous expenditure	1.26	(2.07)	0.28	(0.52)	-	1.06	(1.78)
Total Variable Cost (A)	**56.29**	**(92.32)**	**51.10**	**(94.35)**	**-**	**55.25**	**(92.69)**
Total Fixed Cost (B)	**4.68**	**(7.68)**	**3.06**	**(5.65)**	**-**	**4.36**	**(7.31)**
Gross Cost	**60.97**	**(100.00)**	**54.16**	**(100.00)**	**-**	**59.61**	**(100.00)**
C. Value of Dung	0.49		0.20		-	0.43	
Net Cost (A+B)-C	60.48		53.96		-	59.18	
Gross Income from Milk	74.79		63.75		-	72.58	
Net Return (Gross income - Net cost)	**14.31**		**9.79**		**-**	**13.41**	

Figures in the parenthesis indicate percentage of gross cost

Cost of milk production to them is very important to diagnose the reasons for changes in his expenditure pattern and to rectify the major fluctuations in them if his previous actions are wrong. Thus, it becomes vital to study the cost per litre of milk. This study dealt separately the Cost per litre of milk per day per animal for different breeds.

5.8.1. Cost per litre of milk production in crossbred cows

The cost per litre of milk production per crossbred milch animal per day was worked out separately and is presented in the Table 5.8.1.

It was found that the over all net cost per litre of milk was Rs. 7.44, which was highest for large household category (Rs. 8.00) followed by medium (Rs. 7.57) and small household category (Rs. 7.32). The overall gross cost was worked out to be Rs. 7.48 which was again highest for large category of household followed by medium and small category of households. The overall feed cost per litre of milk for cross bred milch was Rs.5.50, which was highest in case of large household category (Rs. 6.36) followed by medium (Rs. 5.70) and small (Rs. 5.13) categories of household. The gross and net costs increased with category of herd size.

5.8.2. Cost per litre of local milch cow

The cost per litre of milk production per local milch cow per day was worked out and is presented in the Table 5.8.2.

It was found that the over all net cost per litre of milk per milch animal per day was Rs. 9.72, which was highest for medium (Rs.11.36) categories of household followed by small (Rs. 10.12) and large (Rs. 7.66) categories of household. The overall gross cost was worked out to be Rs. 9.82 which was again highest for medium category of household followed by small and large category of households. The overall feed cost per litre of milk for local milch was Rs.6.66, which was highest for medium (Rs.8.65) household category

followed by small (Rs. 6.40) and large (Rs.6.07) categories of household. Thus, the net cost was lowest for large category as compared with the other two.

5.8.3. Cost per litre of buffalo milk production

The cost per litre of buffalo milk per day is presented in Table 5.8.3.

It was found that the net cost per litre of buffalo milk was Rs. 7.18. The gross cost per litre of milk production was Rs. 7.23 in which feed alone accounted to Rs. 4.47. Due to inadequate number of observations in buffaloes individual comparison was not discussed.

Table 5.8.1. Cost per litre of milk production per crossbred milch cow for different categories of household (Rs.)

Particulars	Small	Medium	Large	Overall
I. Variable Cost				
Green fodder	0.43	0.34	0.39	0.39
Dry fodder	2.09	2.46	2.58	2.28
Concentrate	2.61	2.91	3.38	2.83
Total feed cost	5.13	5.70	6.36	5.50
Human labour cost	1.31	0.87	0.78	1.04
Veterinary and breeding cost	0.11	0.11	0.06	0.10
Miscellaneous expenditure	0.15	0.14	0.13	0.14
Total Variable Cost (A)	**6.71**	**6.82**	**7.33**	**6.78**
Total Fixed Cost (B)	**0.66**	**0.78**	**0.72**	**0.70**
Gross Cost (A+B)	**7.37**	**7.61**	**8.04**	**7.48**
C. Value of Dung	0.05	0.04	0.04	0.04
Net Cost (A+B)-C	**7.32**	**7.57**	**8.00**	**7.44**

Table 5.8.2. Cost per litre of milk production per milch local cow for different categories of households (Rs.)

Particulars	Small	Medium	Large	Overall
I. Variable Cost				
Green fodder	0.94	0.00	0.00	0.57
Dry fodder	2.86	3.99	2.94	3.05
Concentrate	2.61	4.66	3.13	3.04
Total feed cost	6.40	8.65	6.07	6.66
Human labour cost	2.45	1.51	0.81	1.92
Veterinary and breeding cost	0.19	0.23	0.13	0.18
Miscellaneous expenditure	0.24	0.30	0.17	0.23
Total Variable Cost (A)	**9.28**	**10.68**	**7.18**	**9.00**
II. Total Fixed Cost (B)	**0.94**	**0.79**	**0.54**	**0.82**
Gross Cost (A+B)	**10.23**	**11.47**	**7.72**	**9.82**
C. Value Of Dung	0.11	0.11	0.07	0.10
Net Cost (A+B)-C	**10.12**	**11.36**	**7.66**	**9.72**

Table 5.8.3. Cost per litre of milk production per Buffalo for different categories of household (Rs.)

Particulars	Small	Medium	Large	Overall
I. Variable Cost				
Green fodder	0.42	-	_	0.34
Dry fodder	1.63	2.67	_	1.82
Concentrate	2.27	2.47	_	2.31
Total feed cost	4.32	5.13	_	4.47
Human labour cost	2.05	1.53	_	1.96
Veterinary and breeding cost	0.16	0.11	_	0.15
Miscellaneous expenditure	0.15	0.04	_	0.13
Total Variable Cost (A)	**6.68**	**6.81**	_	**6.71**
Total Fixed Cost (B)	**0.56**	**0.41**	_	**0.53**
Gross Cost (A+B)	**7.24**	**7.22**	_	**7.23**
C. Value Of Dung	0.06	0.03	_	0.05
Net Cost (A+B)-C	**7.18**	**7.19**	_	**7.18**

5.9. Herd size - productivity relationship

In this section, an attempt has been made to examine the effect of herd size on productivity of milch animals. Linear, Cobb-Douglas and Quadratic type of functions were tried, using milk yield per standard milch animals per day as dependant variable (Y) and the size of herd (in standard milch animal units) as the independent variable (X). However the quadratic function was found most appropriate as compared with the other two functions and was therefore preferred for discussion, keeping in view the sign, significance of regression coefficient of independent variable and coefficient of multiple determination (R^2) value (15.44 %). However the results for other two fitted functions have been given in the appendix.

Quadratic function

$$Y = 4.78 + 1.81\ X^{*} - 0.14\ X^{2**}$$
$$\qquad\qquad (0.649) \quad (0.073)$$

$$N = 80$$

$$R^2 = 15.44\ \%$$

Figures in the parenthesis indicate standard error.

* Significant at 1% level.

** Significant at 10% level.

Where Y = milk yield per standard milch animal per day (in lit)

X= size of herd (standard milch animal units)

The fitted function showed that the productivity increases with herd size. But it increases upto certain level of herd size thereafter it declined. This level of herd size is called optimum level of herd size. The optimum level of herd size was found to be 6.46 standard milch animal units.

Though the R^2 value was very low but it was significant indicating the goodness of fit. As we all know that milk production is a complex process and is affected by many factors. Herd size is one of the factors which explained about 15 percent of total variation in milk production.

5.10. Utilization pattern of milk by various categories of households

Unlike other farm products, raw milk is highly perishable in nature. The keeping quality of the milk under rural setup is very low. This intends the farmer to dispose it off quickly with in a short period in order to avoid loss. Lack of adequate infrastructural facilities in this area to improvise the keeping quality is one of the most important factors to dispose off the raw milk as quickly as possible to various milk procuring agencies. Also it is generally accepted that most of the small farmers are indulging in forced sale in order to secure their minimum standard of living. So it is of vital importance to study the utilization pattern of milk in the study area.

So the present study attempts to study the utilization pattern of milk at farmer level to know the production, consumption, marketed surplus of milk and its utilization pattern to various agencies.

Average daily production, consumption and marketed surplus of milk for various category of household are presented in Table 5.10.1.

About 95 to 97 per cent of the total milk produced was available for marketed surplus which was of the same order for various categories of households. The rest was used as fluid milk by the households.

The utilization pattern of milk by various categories of households is presented in Table 5.10.2.

It was observed that among the milk procurement agencies, Milk Producing Cooperative Societies (MPCS) collected the largest proportion (89.11 per cent) of the total milk marketed, followed by the tea shops (9.82 per cent) and consumers (1.07 per cent). The largest proportion of milk utilization to Milk Producing Cooperative Societies (MPCS) was mainly attributed to technical as well as financial assistance rendered by them to the member farmers. The small category of households disposed of largest quantity of milk (92.30 per cent) to MPCS, followed by medium (91.71 per cent) and large (83.76 per cent) household categories.

Table 5.10.1 Average daily production, consumption and marketed surplus of milk for different category of households(in litres)

Particulars	Category of households			
	Small	Medium	Large	Overall
Production	13.07	20.74	30.94	21.58
Consumption	0.59	0.72	0.97	0.76
Marketed surplus	12.48 (95.49)	20.02 (96.53)	29.965 (96.86)	20.88 (96.76)

Figures in the parenthesis indicate percentage of total milk production

Table 5.10.2. Utilization pattern of milk to various Agencies (litres/day)

Agencies	Category of households			
	Small	Medium	Large	Overall
MPCS	385.05 (92.30)	412.5 (91.71)	392 (83.76)	1189.55 (89.11)
TEA SHOPS	32.1 (7.70)	37.3 (8.29)	61.7 (13.18)	131.1 (9.82)
CONSUMERS	-	-	14.3 (3.06)	14.3 (1.07)
TOTAL	417.15 (100)	449.8 (100)	468 (100)	1334.95 (100)

Figures in the parenthesis indicate percent of milk disposed to various agencies out of their respective totals.

Chapter 6

Summary & Conclusions

6. SUMMARY AND CONCLUSION

Animal husbandry and dairying plays a vital role in Indian agriculture, particularly in rural economy. India ranks first both in the milk production and as well as in the bovine population in the world. The overall growth rate of total milk production during the twenty-year period (1970-90) showed that Southern region posses the highest growth rate of 5.9% than other regions. Further examination of individual states in Southern region indicated that Kerala and Tamil Nadu significantly contributed to higher growth rate in which Tamil Nadu possesses the highest number of milch animals than Kerala.

Madurai, one of the districts of Tamil Nadu which has more than 75% of its population living in rural areas whose main occupation is agriculture and allied activities like dairying, goat rearing, poultry keeping etc. Further, the district has well established milk cooperative union with 547 milk cooperative societies rendering a good marketing facilities to the disposable milk by the dairy farmers. So far, no recent study has been conducted on economic aspects of dairying in this district. As the estimation of cost and incomes from milk production are axiomatic in portraying the economic viability of dairy enterprise, it created a genuine interest to the researcher to undertake the present study in Madurai district of Tamil Nadu.

The analysis of cost and returns from milk production, herd size-productivity relationship, milk disposal pattern etc. would help the dairy farmers to know their relative performance of their enterprise and to reap the available opportunities in improving their business. Thus the present study on "Economics of milk production in Madurai district of Tamil Nadu" was undertaken with following objectives:

1. To workout cost and returns from milk production for different herd size categories.
2. To establish herd size and productivity relationship.
3. To study the utilization pattern of milk by the rural households.

The sampling design adopted for the study was multistage stratified random sampling technique. Out of 13 blocks, two blocks were selected randomly. From each selected block two villages were randomly selected. In all 80 sample households were selected with probability proportional to herd size spread overall categories. The households were classified into three categories namely, small (upto 2 milch animals), medium (3 milch animals) and large (more than 3 milch animals) using cumulative cube root method.

Information on different cost components was collected from the sample households on pre-tested schedules by survey method. The different cost component were classified into variable and fixed costs to estimate the cost of milk production. Cost and returns were estimated for different categories of households. Linear, Cob-Douglas and Quadratic production functions were tried and most appropriate model was selected on the basis of sign and significance of regression coefficients as well as coefficient of multiple determination. The utilization pattern of milk by different categories of households was also studied.

The facile view of distribution of milch animals indicated that the large category of households possessed the highest percentage of milch animals (35.71 per cent). The crossbred milch cows dominated the study area. The overall average daily milk yield per milch animal was highest for buffaloes followed by crossbred and local cows. The higher milk yield per buffalo may be due to very few numbers of observations for buffaloes which was only 5 and all were in lactating stage. Crossbred cows performed better than local cows. The milk production per day per milch crossbred cow was the highest (8.11 litres) for small category of households. Whereas it was the highest (5.38 litres) for large category of households in local milch cows.

The quantitative details on feeding of milch animals indicated that only small category of households fed their local cows and buffaloes with green fodder. Whereas, crossbred milch cows were fed with green fodder though very little by all the categories of households. The average daily

intake of dry fodder was very high which increased with the category of households both in crossbred and local cows. The same trend was observed in concentrates feeding in case of crossbred milch cows. However, a mixed trend was observed in case of local milch cows. The average daily expenditure on feeds and fodders was consistently higher for crossbred cows compared to local cows and buffaloes.

The gross cost per day per crossbred milch animal was the highest for small category followed by large middle categories of households. The total feed cost was more than 2/3rd of the gross cost in all the three categories of households. The labour cost per day per milch animal for small category of household was significantly higher as compared to other two categories of household. The net return per day per crossbred milch was highest for small category of households which declined with herd size category.

There was a negative net return in rearing the local milch cows for small and medium categories of households owing to low productivity of milch animals. But, it was positive for large category of households (Rs. 6.75).

The cost per litre of milk was Rs. 9.72 in local cows and Rs. 7.44 in crossbred cows. The cost per litre of crossbred milk was highest (Rs. 8.00) for large households and lowest (Rs. 7.32) for small household category. However it was the highest (Rs. 11.36) for medium households and lowest (Rs. 7.66) for large households in case of local milch cows.

In order to find out the effect of herd size on the productivity, Linear, Cobb-Douglas and Quadratic production functions were tried. Quadratic production function was found to be most appropriate keeping in view of sign and significance of regression coefficients as well coefficient of multiple determination. The Quadratic function showed that the productivity increased with the herd size upto certain level of herd size and thereafter it declined. This optimum level of herd size was found to be 6.46 standard milch animal units. Though the R^2 value was very low (15 per cent), it was significant indicating the goodness of fit.

About 95 to 97 per cent of the total milk produced was available for marketed surplus, which was of the same order for various categories of households. It was further observed that among the milk procurement agencies, Milk Producing Cooperative Societies (MPCS) collected the largest proportion (89.11 per cent) of the total milk marketed than other agencies.

SALIENT FINDINGS

1. Dairying was the main subsidiary occupation in the study area.
2. Crossbred animals dominated the study area and performed better with respect to milk production and cost per litre. Thus milk producers preferred rearing crossbred cattle in the study area.
3. The expenditure on feeds and fodders was consistently higher for crossbred as compared to local cows and buffaloes.
4. A very little quantity of green fodder was offered to milch animal whereas quantity of dry fodder offered to milch animals was very high.
5. Feed alone accounted for 60-80 per cent of the total gross cost.
6. The cost per litre of milk production was highest for local cow followed by crossbred. Higher cost per litre of milk for local cows may be due to low productivity.
7. The net return per day per animal was highest in crossbred rearing. There were very few number of buffaloes in the study area which indicated that many farming households replaced buffaloes with crossbred animals. On the whole small farmers were efficient in crossbred dairy farming.
8. Herd size exerted significant influence on productivity.
9. Marketed surplus of milk was about 97 per cent which was almost of the same order for all the three categories of households. The largest proportion of the total milk marketed was disposed to Milk Producing Cooperative Societies (MPCS).

Implications and suggestions for future studies

1. Since the crossbred cows were found better milch animals as compared to other two breeds, the net return to milk producers can be maximized by rearing crossbred cows through scientific dairy farming.
2. The expenditure on feed cost was more than 2/3rd of the gross cost. Mostly, fodder was fed to the milch animals unchaffed, which has affected the consumption of fodder. Hence, it should be chaffed in order to reduce wastage and increase the milk production.
3. The sample size for the study was too small to generalize the findings. However, sample households should be increased to have better picture of the cost component and net returns.

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Appendices

Appendix I

Dairy Economics, Statistics and Management Division
National Dairy Research Institute,
Karnal

ECONOMICS OF MILK PRODUCTION IN MADURAI DISTRICT OF TAMIL NADU

Collected by: _____

Schedule No: _____ **Date :**

GENERAL INFORMATION OF SAMPLE HOUSEHOLDS:

District _____ Block _____ Village_____

Name of the head of the household _____

Educational qualification of head of household _____

Fathers name _____

Occupation

Main: _____

Subsidiary: _____

Land holding (Acres.)

Owned : _____ Leased in : _____

Leased out: _____ Net holding size: _____

Family particulars: (Joint / Nuclear)

	Workers	Dependant
Male	_____	_____
Female	_____	_____

Schedule 2:Information on cattle sheds and dairy equipments.

Particulars		Number	Year of purchase	Initial investment (Rs)	Present value (Rs)	Expected life	Depreciation
A. Building							
(a)	Cattle shed (Katcha/Pucca)						
(b)	Stock room for feed & fodder (Katcha/Pucca)						
(c)	Silo pit						
(d)	Others (specify)						
B. Equipments							
1)	Feed manger						
2)	Milk cans						
3)	Water cans						
4)	Buckets						
5)	Iron chains						
6)	Ropes						
7)	Chaff cutter (Manual)						
8)	Chaff cutter (Power driven)						
9)	Water hand pump						
10)	Measuring sets						
11)	Bullock cart for bringing fodder						
12)	Others (specify)						

Schedule 3: Details of live stock inventory

Categories of animals	Types of animals					
	Local cows		Cross bred cows		Buffalo	
	No.	Present Value(Rs.)	No.	Present Value(Rs.)	No.	Present Value(Rs.)
In milk						
Dry						
Heifers						
Pregnant heifers						
Young - Male - Female						
Bullocks / Bulls						

Schedule 4:Income from sale / hiring out of the following items

Items	No. / Qty	Rate / Unit (Rs.)	Amount (Rs)	Remarks
Green fodder				
Dry fodder				
Dung / Manure				
Sale of milk Cow Buffalo				
Sale of Cow Buffalo Heifer Male calves Female calves				
Rent from leased out shed				
Others (specify)				

Schedule 5: Details of milk production and milch animals.

Breed / type of animals	No.	Order of lactation	Stage of lactation (days)	Age at first calving (months)	Milk production on previous day of visit			
					Morning	Evening	Milk fed to calf	Total
Local cows - in milk - in dry								
Cross bred - in milk - in dry								
Buffalo - in milk - in dry								

Schedule 6:Details of feeds and fodders fed per animal per day (Quantity in Kg.)

Type of milch animals	No.	Green fodder			Dry fodder			Concentrates			Mineral mixture			If grazing	
		Name	Qty	Rate (Rs.)	Name	Qty	Rate (Rs.)	Name	Qty	Rate (Rs.)	Name	Qty	Rate (Rs.)	Hrs/ day	Charges/ day (Rs)
LOCAL COWS															
In milk	1. 2. 3.														
Dry	1. 2. 3.														
CROSS BRED															
In milk	1. 2. 3.														
Dry	1. 2. 3.														
BUFFALO															
In milk	1. 2. 3.														
Dry	1. 2. 3.														

Conditions of grazing land : (Good / Fair / Poor)

Rent of grazing land per animal : _____

✓ Home grown

✗ Purchased

Schedule 6:Details of feeds and fodders fed per animal per day (Quantity in Kg.)

Type of milch animals	No.	Green fodder			Dry fodder			Concentrates			Mineral mixture			If grazing	
		Name	Qty	Rate (Rs.)	Name	Qty	Rate (Rs.)	Name	Qty	Rate (Rs.)	Name	Qty	Rate (Rs.)	Hrs/ day	Charges/ day (Rs)
LOCAL COWS															
In milk	1. 2. 3.														
Dry	1. 2. 3.														
CROSS BRED															
In milk	1. 2. 3.														
Dry	1. 2. 3.														
BUFFALO															
In milk	1. 2. 3.														
Dry	1. 2. 3.														

Conditions of grazing land : (Good / Fair / Poor)

Rent of grazing land per animal : _____

✓ Home grown

✗ Purchased

Schedule 7:Details of human labour employed for various dairy operations (Time spent in Hrs / day)

Type of labour	No. of persons	Male equivalent	Taking animals for grazing	Bringing fodder from fields	Milking the animals	Chaff cutting of fodder	Feeding of animals	Watering of animals	Cleaning of animal sheds	Sale of milk	Misc. works (if any)	Total Hrs. spent	Wage rate		
													M	F	C
LOCAL COWS															
Family															
Male															
Female															
Child															
Hired															
Male															
Female															
Child															
CROSS BRED															
Family															
Male															
Female															
Child															
Hired															
Male															
Female															
Child															
BUFFALO															
Family															
Male															
Female															
Child															
Hired															
Male															
Female															
Child															

M- Male F- Female C- Child

Schedule 8:Details of recurring expenditure

Particulars of expenses		Local cow			Cross bred			Buffalo			Remarks
		No. / Qty	Rate / Unit (Rs.)	Amount (Rs.)	No. / Qty	Rate / Unit (Rs.)	Amount (Rs.)	No. / Qty	Rate / Unit (Rs.)	Amount (Rs.)	
Service charges											
(a)	Natural service if bull is used										
(b)	Artificial insemination										
Vety.charges											
Insurance charges											
Electricity , kerosene charges											
Ropes											
Buckets											
Baskets (for lifting the dung)											
Cost of vaccination											
Grazing charges per month											
Other taxes											
Annual repair expenses											
Others (specify)											

Schedule 9:Production of milk and utilization of milk of the previous day

Particulars	Local cow		Crossbred		Buffalo		Total		Rate of selling (Rs.)	Agency to which sold		
	Qty	Price	Qty	Price	Qty	Price	Qty	Price		Name of the agency*	Qty	Price
Produced												
Utilized												
(a) Consumed as milk												
(b) Converted into Ghee Butter Dahi others												
Sold as milk												
Sold as product												

* MV – Milk vendors MPCS – Milk Producer's Cooperative Society

Con – Consumer (Direct) O – Others

Area and population of Madurai district

Block/Municipalities	Literacy (%)		Population	Population (%)	
	Male	Female		Urban	Rural
Thiupparankundram	61.8	39.5	117085	90	10
Madurai corporation			1037303	-	-
Madurai east	70.2	47.5	99237	19	81
Madurai east corporation			22998		
Madurai west	63.5	46.6	92583	27	73
Madurai west corporation			34525		
Melur	66.2	41.2	115006	22	78
Melur municipality			32878		
Kottampatty	56.9	25.7	98944	0	100
Vadipatti	61.9	20.3	109349	0	100
Alanganallur	59.8	36.8	95934	0	100
Usilampatty	59.8	38.4	63556	29	71
Usilai municipality			26413		
Chellampatti	52.9	13.8	83522	0	100
Sedapatty	53.5	27.7	105537	0	100
T.kallupatty	64.9	38.7	72649	10	90
Periyar municipality			7830		
Thirumangalam	66.9	44.7	82742	29	71
Thirumangalam municipality			34601		
Kalligudi	60.1	33	67647	0	100
Total			2400339		

Source: Census, 1991.

Linear model

$$Y = 6.71 + 0.621\ X^{*} \quad (0.196)$$

$N = 80$

$R^2 = 11.40\ \%$

Figures in the parenthesis indicate standard error.

* Significant at 1% level.

Where Y = Milk yield per standard milch animal per day (in lit)
X= Size of herd (standard milch animal units)

Cobb-Douglas model

$$\text{Log } Y = 0.329 + 0.363 \log X^{*} \quad (0.118)$$

$N = 80$

$R^2 = 10.80\ \%$

Figures in the parenthesis indicate standard error.

*Significant at 1% level.

Where
Log Y = milk yield per standard milch animal per day (in lit)
Log X = size of herd (standard milch animal units)

Appendix - IV

Average daily feed and fodder intake per lactating animal for different categories of households (Kgs.)

Category of households	CROSS BRED COW			LOCAL COW			BUFFALO		
	Green fodder	Dry fodder	Concentrate	Green fodder	Dry fodder	Concentrate	Green fodder	Dry fodder	Concentrate
Small	2.80	13.50	2.80	3.64	11.00	1.68	2.81	11.00	2.38
Medium	2.45	14.18	2.61	-	11.33	2.17	-	16.00	2.25
Large	2.19	14.25	2.52	-	13.33	1.92	-	-	-
Overall	2.52	13.93	2.66	3.64	11.61	1.85	2.81	12.25	2.35

Average expenditure on feed and fodders intake per lactating animal for various categories of households (Rs./Day)

Category of houeholds	Lactating cross bred cow			Lactating local cow			Lactating buffalo		
	Green fodder	Dry fodder	Concentrate	Green fodder	Dry fodder	Concentrate	Green fodder	Dry fodder	Concentrate
Small	2.90	16.88	22.19	4.86	13.75	11.77	3.52	13.75	19.15
Medium	2.69	17.73	19.65	-	14.16	14.10	-	20.00	18.50
Large	2.38	17.81	21.73	-	16.66	16.36	-	-	-
Overall	2.69	17.41	21.19	2.62	14.52	13.37	2.82	15.00	19.02

Appendix - V

Cost and returns milk production of lactating crossbred for different categories of households (Rs./Day)

Particulars	Small		Medium		Large		Overall	
I. Variable Cost								
Green fodder	2.90	(4.87)	2.69	(5.00)	2.38	(4.46)	2.69	(4.81)
Dry fodder	16.88	(28.35)	17.73	(32.96)	17.81	(33.35)	17.41	(31.11)
Concentrate	22.19	(37.27)	19.65	(36.52)	21.73	(40.69)	21.19	(37.85)
Total feed cost	41.97	(70.49)	40.07	(74.48)	41.92	(78.50)	41.29	(73.77)
Human labour cost	11.03	(18.53)	6.47	(12.03)	5.69	(10.66)	8.08	(14.44)
Veterinary and breeding cost	0.85	(1.43)	0.8	(1.49)	0.30	(0.56)	0.69	(1.24)
Miscellaneous expenditure	0.83	(1.39)	0.73	(1.36)	0.65	(1.22)	0.75	(1.34)
Total Variable Cost (A)	54.68	(91.84)	48.07	(89.35)	48.56	(90.94)	50.82	(90.78)
II. Total Fixed Cost (B)	5.25	(8.82)	5.73	(10.65)	4.84	(9.06)	5.31	(9.49)
Gross Cost (A+B)	59.54	(100.00)	53.8	(100.00)	53.4	(100.00)	55.98	(100.00)
C. Value of dung	0.39		0.27		0.30		0.33	
Net Cost (A+B)-C	59.15		53.53		53.1		55.81	
Gross Income from milk	87.97		92.33		91.64		90.42	
Net Return (Gross income - Net cost)	28.43		38.60		38.54		34.55	

Figures in the parenthesis indicate percentage of gross cost

Appendix - VI

Cost and returns from milk production per lactating local cow for different categories of households (Rs./Day)

Particulars	Small		Medium		Large		Overall	
I. Variable cost								
Green fodder	4.86	(10.49)	-		-		2.62	(6.04)
Dry fodder	13.75	(29.69)	14.16	(37.32)	16.66	(39.77)	14.52	(33.48)
Concentrate	11.77	(25.42)	14.1	(37.16)	16.36	(39.05)	13.37	(30.83)
Total feed cost	30.38	(65.60)	28.26	(74.49)	33.02	(78.83)	30.50	(70.34)
Human labour cost	9.44	(20.38)	5.83	(15.37)	4.91	(11.72)	7.56	(17.44)
Veterinary and breeding cost	0.67	(1.45)	0.28	(0.74)	0.23	(0.55)	0.48	(1.10)
Miscellaneous expenditure	1.09	(2.35)	0.89	(2.35)	0.80	(1.91)	0.98	(2.25)
Total Variable Cost (A)	41.58	(89.79)	35.26	(92.94)	38.96	(93.01)	39.52	(91.14)
II. Total Fixed Cost (B)	4.73	(10.21)	2.68	(7.06)	2.93	(7.00)	3.84	(8.86)
Gross Cost (A+B)	46.31	(100.00)	37.94	(100.00)	41.89	(100.00)	43.36	(100.00)
C. Value of dung	0.50		0.39		0.35		0.44	
Net cost (A+B)-C	45.81		37.55		41.54		42.92	
Value of milk (Gross Income)	53.87		45.02		56.45		52.42	
Net Return (Gross Income - Net Cost)	8.06		7.47		14.91		9.50	

Figures in the parenthesis indicate percentage of gross cost

Appendix - VII

Cost per litre of milk production per lactating crossbred for different categories of households (Rs.)

Particulars	Small	Medium	Large	Overall
I. Variable cost				
Green fodder	0.30	0.26	0.24	0.27
Dry fodder	1.73	1.74	1.78	1.74
Concentrate	2.27	1.92	2.18	2.12
Total feed cost	4.29	3.93	4.20	4.14
Human labour cost	1.13	0.63	0.57	0.81
Veterinary and breeding cost	0.09	0.08	0.03	0.07
Miscellaneous expenditure	0.08	0.07	0.07	0.08
Total Variable Cost (A)	5.59	4.71	4.86	5.09
Total Fixed Cost (B)	0.54	0.56	0.48	0.53
Gross Cost (A+B)	6.09	5.27	5.35	5.61
C. Value of Dung	0.04	0.03	0.03	0.03
Net Cost (A+B)-C	**6.05**	**5.24**	**5.32**	**5.59**

Appendix - VIII

Cost per litre of milk production per lactating local cow for different categories of households (Rs.)

Particulars	Small	Medium	Large	Overall
I. Variable Cost				
Green fodder	0.82	0.00	0.00	0.45
Dry fodder	2.31	2.79	2.61	2.49
Concentrate	1.98	2.78	2.56	2.29
Total feed cost	5.11	5.57	5.18	5.22
Human labour cost	1.59	1.15	0.77	1.29
Veterinary and breeding cost	0.11	0.06	0.04	0.08
Miscellaneous expenditure	0.18	0.18	0.13	0.17
Total variable cost (A)	7.00	6.95	6.11	6.77
II. Total fixed cost (B)	0.80	0.53	0.46	0.66
Gross Cost (A+B)	7.79	7.48	6.57	7.42
C. Value of Dung	0.08	0.08	0.05	0.08
Net Cost (A+B)-C	7.71	7.41	6.51	7.35

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