ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

A STUDY ON
URBAN AGRICULTURE: THE CASE OF SMALL-SCALE URBAN DAIRY FARMING IN SELECTED AREAS OF ADDIS ABABA

BY
TEFEREE MAKONNEN KASSA

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DEPARTMENT OF GEOGRAPHY
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DEDICATION

This research paper is dedicated

to the memory of my father,

Makonnen Kassa Wassie

ABBREVIATIONS

AAU	-	Addis Ababa University
AI	-	Artificial Insemination
CSA	-	Central Statistics Authority
DDA	-	Dairy Development Agency
DDE	-	Dairy Development Enterprise
EMA	-	Ethiopian Mapping Authority
ESAP	-	Ethiopian Society of Animal Production
FAO	-	Food and Agricultural Organization of the United Nations
HH	-	Household
HHH	-	Household Head
IDRC	-	Institute of Development Research Center
ILCA	-	International Livestock Research Center for Africa
ILRI	-	International Livestock Research Institute
KARI	-	Kenyan Agricultural Research Institute
MOA	-	Ministry of Agriculture
RLDS	-	Rural and Local Development Studies of AAU
RUFA	-	Resource Center for Urban Agriculture
SSA	-	Sub Saharan Africa
UA	-	Urban Agriculture
UNDP	-	United Nations Development Programme
UPA	-	Urban and Peri urban Agriculture
WHO	-	World Health Organization
WRI	-	World Resource Institute

ABSTRACT

This research paper is a study on urban agriculture with particular emphasis on small-scale dairy farming in selected areas of Addis Ababa. The general objective of the study is to identify some of the major problems and constraints faced by the urban dairy farmers, and investigate and explain the character and role of urban agriculture with emphasis to small-scale dairy farming. It also tries to see the types of assistance needed and suggestes possible solutions to the problems.

The analysis of the study utilized both primary and secondary data. The primary data were collected through a questionnaire survey that covered 240 small-scale dairy farming households with less than five dairy cows in their herd in twelve 'weredas', two 'weredas' each from the six zones, of Addis Ababa. The 'weredas' are located in the central and peripheral parts of the city. The secondary data were collected from different libraries, document centers, organizations and offices.

The study discusses the role of urban agriculture in connection with nutrition and food security, income generation and employment, and environmental improvement. An assessment was also made on the problems of urban agriculture. An attempt was made to investigate the socio-economic and demographic profile of the dairy farming households. Accordingly, people in the higher age groups with low level of education and large household size, well established migrants, males (85.5%), married (76.5%) and people from diverse occupation groups are major participants. Amhara and Oromo ethnic groups comprise the bulk of the dairy farmers (88%) and 93.3% of the producers belong to Orthodox religion.

As the findings of the study reveal, the need to feed family as the major factor that motivated dairy farmers to start the activity is 59.2% and business at residence as the major consideration in site selection is 75.0%. Most of the dairy farmers initially purchased dairy cows to start operation (80.8%) using their own money (82.1%) and acquired information and skills to run activity mainly from relatives/friends (80.8%).

The dairy herd in both locations is composed of local, crossbred and pure exotic breeds. The local breeds are found to have extended calving intervals, short lactation lengths and low milk yields compared to crosses and exotic breeds. Average production of milk and fat, original cost and feed supply were major factors considered in initial breed selection.

The producers mainly conduct the dairying activity using family labour in smaller land area, including the living accommodation. Stall-feeding is practiced in both locations, but grazing is also common in the periphery, and the major feed sources include hay, wheat bran, concentrate oil cake and "atela". Animal feed is not only costly but its availability is also seasonal. Feed is brought to farm using vehicles, donkeys and human porters. Piped water is a major source of drinking water for animals. Natural mating is the most frequently used breeding method used by 77.9% of the farmers. About 71.7% of the producers obtain veterinary services from MoA while others use private clinics and local traditional practitioners. Nearly 74.2% of the farmers have never been supported by extension agents in their activity.

Evidence from the findings of this study indicated that the most ranked source of expense of milk production is animal feed followed by utilities and labour. Similarly, the most ranked factor that affects the productivity of the dairy cows and profitability of the dairy farms is choice of breeds followed by feed resources and improved feed system, and veterinary services and animal health care. The major problems in managing the dairy farms include shortage and high cost of animal feed; diseases like mastitis, pneumonia, anthrax, tick related, foot and mouth; low production potential of indigenous cattle; lack of adequate space for dairying; lack of labour, credit and veterinary and extension services. Most of the producers have fear of eviction and do not know government's attitude towards urban dairy farming and its recognition, and most of them have never received assistance from the government.

Most of the producers (63.7%) do not keep records of daily milk output from each cow milked. Most of the milk is allocated for sale and the sale of fresh milk is the most frequent and regular source of cash income for the producers. The majority of the farmers sold milk directly to consumers. Proximity, price and reliability were considered in the selection of market outlets. Milk prices are found to be slightly higher in the inner city compared to the periphery and prices are determined mainly by the producers. Milk is sold at the point of production (farm gate) or is delivered to customer's house mainly on foot. Fresh milk is the most frequently consumed product by the producers followed by Yoghurt. Unsold milk is processed into butter and local cheese, consumed by the family or is fed to animals. Most of the producers use manure as a source of household energy.

CHAPTER ONE

INTRODUCTION

The world population is becoming highly urbanized rapidly, with urban poverty growing at a higher pace in the developing world. Food and fuel absorb a large share of urban poor household incomes, and household food insecurity has been worsening in recent years (Dubbeling, 2001). Hence, at a time of increasing urbanization, dwindling agricultural resources, increased food insecurity and an accelerating deterioration in the quality of life for those living in urban areas, it is absolutely vital to be considerate of the existing and future urban agricultural (UA, here after) activities.

People tend to move to cities in order to improve their lives, find better jobs and have access to goods and services that are not available in rural areas (FAO, 1998). Hence, urbanization is most likely to be one of the major problems of human kind in the near future (Dresher, 2000). It is a huge task to feed a city of millions people who require many tonnes of food each day whereby there should be much coordination among producers, transporters, market managers, retailers on the street and in the open air markets (FAO, 1998). Over half of the absolute poor would be living in urban areas (WRI 1995, cited in Dresher 2000) and urban areas are expected to surpass rural areas in population around the year 2005 (FAO, 1998). Population growth is an important element in the growth of demand for food in the city. Age structure of the population, and income level also determine food demand. Most of the food in cities is purchased but poor urban consumers have also access to food through home production, bartering or food assistance programmes (FAO, 1999).

Cities are dynamic and changes in available space, resources and assets are often rapid. Economic changes result in considerable variation in the number of underemployed or underpaid people who need to supplement their food sources or incomes through UA.

Migrants may also bring considerable agricultural skills to the city from rural areas (Gundel, 2000).

A number of studies support the importance of urban food production to the well being of producers in connection with nutrition or consumption, health, cash saving and income generation and employment (Sawio, 1994; Smith 1994; Tinke, 1994; Bayer, 1995; Losada et al, 1996; Staal and Shapiro, 1996; Gundel, 2000; RUFA, 2001). A growing number of urban dwellers are engaged in agricultural activities specially in the less developed countries and self produced food can cover considerable share of the household's total food intake thereby releasing a large share of the household's income to cover non food expenses. UA boosts the asset base of the urban residents and reduces vulnerability to urban economic collapse (Chingarande, 2001). Hence, urban people are not passive food recipients as they are actively involved in food production. However, UA is synonymous with leisure, environmental education, healthy food production and processing, green space and genetic preservation in the developed countries (RUFA, 2001).

Urban agriculture is practiced by diverse categories of urban farmers ranging from low income survival to agribusiness (Tinker, 1994). Most UA is small-scale and intensive which can be very successful in meeting the needs of urban residents (Smit, 1990). Previous studies assumed that UA was practiced mainly by the poor, uneducated and unemployed in urban squatter areas but recent findings show that those involved in UA comprise a complex mix of socio-economic groups from various backgrounds (Sawio, 1994). These findings affirm that UA is a diverse, omnipresent, thriving and profitable economic activity throughout the world and is also a large employer of urban population (Smit and Ratta 1992; in Sawio, 1994). Similarly, the importance of UA is now being increasingly recognized in the international development arena and there has been a recognition of the role played by UA in the lives of people across the globe (Gundel, 2000).

For centuries, milk has been produced in tropical areas by farm households for home consumption rather than for sale. The intensity of production has been very low; production is lower per animal, per man employed and per unit area of land (Williamson, 1987). However, in a limited number of countries there have been a few specialized dairy farms intended to supply milk for consumers (Malcom, 1999).

Although the actual number of cattle in Ethiopia may be disputed, there is no doubt that it has the largest number of cattle in Africa. (Belachew et al, 1994; Alemu et al, 1998; FAO, 1998; G/Egziabher, 1998; Mogos and Robert, 1998). In view of its varied climate and topographic condition, its ethnic composition and the size of its livestock population, it is clear that Ethiopia constitutes a major repository of domestic animal resources and genetic diversity (FAO, 1998). It is the home of some of the most important cattle breeds in Eastern and Southern Africa. The original breeds probably originated from the migrations from Egypt up the Nile valley of the humpless Bos taurus Hamitic Longhorn and of the humped Bos indicus Zebu types from India through the Horn of Africa (Epstein 1957; in FAO, 1998). Ethiopian cattle are adapted to survive under harsh climatic conditions, severe disease challenge, poor nutrition, and indifferent management. Some of the local breeds have special characteristic like withstanding prolonged drought (Boran and Danakil), tolerance of prolonged flooding (Abigar and Fogera) and some tolerance of trypanosomiasis (Abigar) (FAO, 1998).

In Ethiopia, the total population of animals used for milk production is enormous. About 42 percent of the cattle population are milk cows managed by the private sector (ILCA, 1993), and the indigenous cattle are of poor genetic potential and their productivity is low. The largest proportion of the milk comes from these indigenous cattle while the exotic cattle and their crosses contribute small amount to the national output of milk and milk products (Alemu et al, 1998). The indigenous cattle are characterized by late age at first parturition, long intervals between births of successive calves or extended postpartum annoestrus period,

short lactation length and low number of calves per life time resulting in lower productivity (ILCA, 1993; FAO, 1998).

According to the 1994/95 agricultural sample survey, Ethiopia had a total cattle population of 29,825,030 of which the number of indigenous cattle was 29,748,980 (99.74%) while that of hybrids was 76,180 (0.26%). The average milk yield per cow per day ranges from 0.97 litres in Tigray to 1.5 litres in Addis Ababa, the national average being 1.17 litres. Average lactation period varies from 5.46 months in Afar to 6.91 months in Dire Dawa, the national average being 6.33 months. From the total milk production, the percentage converted into butter ranges from 2.05% in Harari to 54.08% in Addis Ababa and the national average is 27.91% (CSA, 1995).

When we look at livestock rearing as part of the urban agricultural activity, it has been practiced by a growing number of families in all income groups (Sawio, 1994; Gundel, 2000). Livestock numbers are growing in Addis Ababa and small-scale dairy production is increasing but only small amounts of the milk enter official market channels. According to the 1994 census result, there were about 5167 dairy farms in the six zones of the city which have one to more than ten exotic cows. According to the same source, there were 58568 cattle of which 31,319 were indigenous breed and 27,249 were exotic breed. There were 14,045 exotic cows and 9,177 indigenous cows.

1.1 Statement of the Problem

Ethiopia is a country where subsistence agriculture of low productivity predominates and there has been an acute deficit in food supply and hence food self sufficiency is a primary issue in the national agricultural development policy. Rural agriculture is not in a position to supply food both for the rural and the urban population. Hence, UA activities have been carried out in cities supplementing rural agriculture.

Although UA plays a significant role in producing food and generating employment and income for the urban dwellers, it has been given less emphasis. In this connection Tinker in 1994: vii stated that:

> *Despite its critical role in producing food for the city dwellers around the world, urban food production has largely been ignored by scholars and agricultural planners; government officials and policy makers at best dismiss the activity as peripheral and at worst evict farmers, claiming that urban farms are not only unsightly but also promote pollution and illness.*

Most of the urban development studies in the developing countries concentrate on housing, urban services and non-agricultural informal activities. However, they mainly exclude or give little attention to UA. Despite its contribution to the urban economy and environment, UA has been underestimated and unrecognized, unassisted or discriminated and in some cases outlawed because of the supposed hazards associated with it. It is also treated as a temporary phenomenon and research on this area has been scanty, specially in Ethiopia. It has been disregarded by researchers and little understood by urban planners and decision makers. (Axumite, 1994; Sawio, 1994; Smith, 1994; Tinker, 1994; Haight, 1999; Moldakov, 2001). In short, studies conducted on this sector are limited and the existing studies focus on limited aspects. On the other hand, there are governments who create agencies to manage UA and are actually encouraging the activity (Tinker, 1994).

There is not much literature on urban food production but the literature that is available acknowledges the role that urban food production plays in meeting the food needs of many households in urban areas in many countries in Africa (Chingarande, 2001). The potential of UA in satisfying basic needs like providing food, income, employment, and environmental protection and its role in the context of savings on transport costs and foreign currency is considerable though it has not been well understood. UA also makes the most out of scarce

land, water and other natural resources and often makes use of wastes in addition to better nutrition, poverty reduction and job creation.

Despite large cattle population, the dairy industry in Ethiopia is untapped and has not yet developed. Milk production has remained too low. The perishable nature of fluid milk coupled with inefficient infrastructure in terms of transport, refrigeration facilities, collection centers and processing plants have inhibited the commercialization of dairying. Per capita consumption of milk and milk products has shown a declining trend. Contrary to this, there has been a sharp rise in imports. But the fact is that there is a high potential for domestic production to meet the excess demand and limited supply (Belachew et al, 1994, staal and Shapiro, 1996; Alemu et al, 1998; Wondwosen, 1998).

Government services concerned with livestock production for urban populations have given most attention to large to medium-sized governmental or private enterprises with exotic breeds and specialized production than the small-scale raising of animals by families. Urban livestock keeping has also been regarded as transitory by planners but there is no indication that livestock rearing decreases the longer people live in cities (Bayer, 1995). But the very fact is that small-scale livestock keeping is much more widespread than most authorities would care to admit. It usually consists of low input production of livestock with indigenous breeds. With deteriorating economic conditions and rapid urbanization small-scale urban farming is being practised by a growing number of families in all income groups (Bayer, 1995; Gundel, 2000).

Dairy farmers are confronted with many problems. Most small scale livestock keepers make little use of formal livestock services. They cannot afford large cash expenditures. They also experience high animal mortality and reproductive wastage and diseases of intensification. Feed supply is one of the biggest problems faced by small-scale livestock keepers specially in the inner city where there is little room for animal grazing. Lack of refrigeration facilities

and the relatively high atmospheric temperature for milk to be cooled promptly, traditional standard of sanitation resulting in poor quality milk, lack of capital for smallholder dairying to improve breeding stock, production and processing, lack of access to land and labour are all major problems. Inefficient marketing, small quantity of individual farm produce, low production potential of the dairy animals, lack of knowledge of advanced production technology, inavailability of adequate production inputs and services, inadequate and sometimes insensitive government-managed service sector response to some needs are all major problems. Manure, dirty bedding material, feed rests etc., if not properly handled, attract vectors and also lead to pollution. Traffic accidents may be caused by roaming animals. Neighbours often complain about odors and noise of livestock (Bayer, 1995; Brock, 1999; ILRI, 1999; Devendra, 2001).

The fact that the country is importing milk products and milk replacers, while possessing the largest cattle population in Africa, is a manifestation of the complexity of the problem. the cause of the inefficiency in productivity and the inadequacy in milk and milk products can be attributed to many factors and the problem varies both in time and space. Therefore, from the discussion it is apparent that the small-scale dairy farmers do have problems of multi-facted nature both inherent and induced from outside sources. In light of this, the study tries to examine the conditions that impede productive functioning of the small-scale dairy enterprises and investigate the problems faced by them as the issue demands consideration and systematic study.

1.2 Objective of the Study

Despite the great contribution that urban agriculture has in food production, its important potential for efficient urban land utilization, environmental benefits, its advantage in providing employment opportunities and in reducing transport and energy costs, in providing

lower cost and fresh food for the city, it has been ignored by scholars and planners and much attention has not been given to this sector.

Research on UA is limited, as it has been perceived as transitory; it has been overlooked because this form of urban land use is considered ephemeral and may escape the notice of researchers who concentrate on more visible, permanent forms of urban land use. The practice has also been perceived as a health hazard and substandard living. However, with deteriorating economic conditions and rapid urbanization, small scale UA, including animal husbandry, is being practised by a growing number of families in all income groups.

Therefore, the general objective of the study is to identify some of the major problems and constraints faced by the urban dairy farmers, and investigate and explain the character and role of urban agriculture in Addis Ababa with particular emphasis to small-scale dairy farming. It also tries to assess the types of assistance needed and suggests possible solutions to their problems.

The specific objectives are to:

1. examine the factors that led the urban farmers to join the sector and find out the source of start up capital, animals, and information and skills.
2. examine the socio-economic and demographic characteristics of the urban dairy farmers i.e. age, sex, marital status, religion, educational level, occupational structure, ethnic background, place of origin and migration and analyse their impacts on urban dairy farming practices.
3. assess the spatio-temporal variation in the extent to which small-scale urban dairy farming is practiced in Addis Ababa.
4. investigate the income, employment and consumption effects of urban dairy farming on the individual households and assess their asset position.

5. identify the impact of small-scale urban dairy farming on the sustainability of the urban environment and identify the environmental benefits and problems accruing in connection with urban dairy farming.
6. assess the small-scale urban dairy farmers access to the production inputs, outlet of products to market and distribution methods. It is also meant to investigate the major determinants of earnings of the households and the sources of expenses of dairy production, dairy production processes and the factors affecting the productivity of dairy cows and profitability of the dairy farms and investigate the dairy production constraints and problems.
7. review the governmental policies that exist to support urban agriculture specially small-scale dairy farming and suggest some institutional and economic measures that need to be in place to improve the conditions of small-scale urban dairy farmers.

1.3 Research Questions

On the basis of the problem stated and the objectives formulated, the following specific research questions are raised for further investigation.

1. What are the major factors that attracted the urban dairy farmers to join the activity? What were the sources of capital, animals and information and skills to start the activity?
2. What are the socio-economic and demographic characteristics of small-scale dairy farmers and how do they influence dairy farming practices?
3. What are the conditions that bring changes in the urban small-scale dairy farming activities through time and at the different parts of the city and how are they related to land use?
4. How does small-scale dairy farming contribute towards the sustainability of the urban environment and benefiting the urban population and the dairy farmers?

5. How do the small-scale dairy farms obtain their production inputs and distribute their products to consumers?
6. What are the major sources of expenses and income of dairy production?
7. What are the major factors that influence the productivity of the dairy cattle and profitability of the small-scale dairy farms?
8. What are the major constraints and problems that are encountered by the small-scale urban dairy farmers in their activities?
9. What policies exist that support urban agriculture and improve the conditions of the urban dairy farmers?

1.4 Method of Data Collection and Processing

Both primary and secondary data have been employed in this study towards the achievement of intended objectives. The primary data used in the study were obtained through a questionnaire survey which was carried out in February 2003. To conduct the survey, the questionnaire was prepared and pretested on some selected dairy producers in two 'weredas', one each, from the central and peripheral locations after which the necessary amendments were done on the instrument to ensure reliability and validity. Then, the pretested and revised structured questionnaire was finally applied to the producers. With close supervision, the primary data were collected by 12 college students who were trained in interviewing techniques and data recording. The twelve enumerators were recruited from each wereda with the objective that they better know the area and approach and handle the respondents. The enumerators were enlightened on how to handle the respondents and fill the questionnaires.

The survey questionnaire contained both open-and close-ended questions (refer appendix 1) which were used to collect data and information addressing all the research objectives. The information was obtained from the household head or the person directly responsible for the

dairy farm by personal interviews using the structured questionnaires. Each sample dairy farming household was interviewed to get information on the dairy producer characteristics, input acquisitions and dairy production processes, marketing behaviour and distribution methods and market outlets for products, dairy consumption aspects, problems and constraints faced by producers in the recall year in the absence of long time- series data.

During the questionnaire survey both stratified and systematic random sampling techniques have been used. According to the survey conducted in 1994 by the Region 14 Agricultural Bureau, there were 5167 dairy farms in the city whereby 4825 dairy farms had 1-5 dairy cows (small-scale) while the remaining 200 and 142 dairy farms had 6-10 (medium) and greater than 10 (large-scale) dairy cows respectively. The study took a sample size of 240 (5% of dairy farms with 1-5 cows) from the peripheral and inner city locations. The target population for the study, small-scale urban dairy farms with less than five dairy cows, comprises about 93.38% of the total dairy farms in Addis Ababa. Since the study is concerned with dairy producers, the target population from which to sample was defined as all the small-scale dairy farmers in Addis Ababa who were currently producing milk and other dairy products. While undertaking the study it was found out that some of the registered enterprises had closed down and others had been started.

The sampling frame used for the selection of the dairy producers was a list of 5167 households registered by the Addis Ababa Agricultural Bureau. The list groups households within the different weredas of the city and gives information on producer names, addresses and herd size. Tweleve weredas from the six zones (two from each zone) of highest concentration of small scale dairy enterprises were selected. These include wereda 4 and 6 of zone 1; 23 and 24 of zone 2; 17 and 28 of zone 3; 12 and 16 of zone 4; 8 and 10 of zone 5 and 26 and 27 of zone 6. The selected dairy farms are found in the inner city wredas of 4, 6, 12, 16, 17 and 23 and in the peripheral weredas of 8, 10, 24, 26, 27 and 28. The stratification of dairy farmers into central and peripheral weredas was done to study the

spatial variations in the extent to which urban dairy farming is practiced in respect to production, marketing and consumption aspects of the dairy farming households and the magnitude of the problems they face and to assess the geographical variation in the socio-economic and demographic characteristics of the producers. At this point great care was taken in selecting the weredas. The peripheral weredas are those that do have considerable part of their area at the fringes of the city usually having the character of both urban and rural. The inner city weredas are enclosed by the other weredas and hence have no direct access to the fringes of the city or they may have limited access and under such circumstances dairy farmers in the part of the wereda that are far removed from the fringe and bordering central weredas were considered. In the peripheral weredas undeveloped (non built up) areas are widespread and animals are found out to be grazing in the open lands.

Hence, a two stage sampling technique was employed in this study to collect the primary data. Firstly, the 12 weredas were selected purposely out of the six zones in the city. Secondly, the sample dairy farming households were selected from each wereda using systematic random sampling method from those with a herd size of less than five dairy cows in order to arrive at the sample size of 240.

Table 1.1: Distribution of Sample Households by Wereda

Zone	Wereda	Number of dairy farms with 1-5 cows	Sample	Spatial location
1	4	55	4	Center
	6	60	4	Center
2	23	357	25	Center
	24	741	52	Periphery
3	17	417	30	Center
	28	348	25	Periphery
4	12	153	11	Center
	16	261	18	Center
5	8	205	14	Periphery
	10	235	17	Periphery
6	26	298	21	Periphery
	27	268	19	Periphery

Total		***3398***	***240***	

Source: Region 14 Agricultural Bureau, 1994

The 12 weredas were proportionally represented within the target sample size of 240 small-scale dairy enterprises which is 5% of the small-scale dairy farms (4825) in Addis Ababa or 7% of the total small scale dairy farms in the 12 weredas selected for the study (3398). Out of the 240 sample dairy farms, 92 of them (38.3%) are in the center and 148 (61.7%) are in the periphery.

Field observations were also used to get any information that was not addressed during the interviews such as the conditions of the business premise, equipment, how animals are being fed including grazing and milked, interpersonal relations between the producers, customers and employees.

The secondary data used in the study were gathered from various sources including official documents, records and published and unpublished reports from various organizations and other related literature to achieve a comprehensive perspective of the issue under consideration. Sources of several libraries, document centers and offices were consulted in order to obtain the secondary data. Some of these libraries and offices include AAU libraries, CSA, MoA, Region 14 Agriculture Bureau, small and Micro Enterprises Development Agency, DDE and ILRI.

The data after being collected were organized in the form of tables, figures and maps. Photos were also used to show the nature of the dairy farms. Descriptive statistics were used to analyze data leading to the identification of technical information because the variables in the study were in ordinal and nominal forms. Hence, means and percentages were the most widely used statistical techniques in the analysis of the data. In addition, to filter out the most significant ones ranking the variables was made in order to identify which factors are most ranked or are most significant in affecting the productivity of the dairy cows and

profitability of the dairy farms, the major problems faced by the dairy farms, and major sources of expenses of milk production.

1.5 Rational and Significance of the Study

In taking sound measures towards achieving sustainable urban development a clear understanding of the contribution of urban agriculture has considerable significance. The decision of households to be engaged in UA is led by the need to sustain their family members and the expectation of improved returns in the absence of better paying jobs. Hence, the activity is important as a source of fresh food by improving the supply of perishable but nutritious food to urban consumers. It is sold with more affordable prices for urban consumers than imported food, and increases the overall supplies and regulates undependable supplies of food and lessens the seasonality of food available to the consumers. It is also a source of income and security for the dairy farmer and provides employment for the families as well as for herders, sellers of grass and leaves and collectors and sellers of produce i.e. providing employment upstream and downstream from the production. The activity also benefits the city at large in terms of more efficient use of land, in creating sustainable environment as livestock can turn urban waste into resources and as wastes from livestock keeping can be a valuable input for urban growing of staple foods, vegetables and fruits.

Usually special skills and training are not required for people to be engaged in UA (where dairying is a part) and hence there is a workable prospect for unprivileged sections of the society who lack formal schooling to participate. A considerable proportion of male farmers are over fifty years old and most of them are heads of households. Women are also active participants in UA. Hence, UA provides jobs for people with limited mobility, low skills and little capital. Rural-urban migrants also tend to carry the way of life that they had in rural areas to participate in UA with rudimentary technology and simple tools.

Urban agriculture, dairy farming included, therefore, contributes much both for the urban environment, the urban population at large and the urban dairy farmers in particular. Hence, there is a need to recognize the activity, develop deeper knowledge about urban dairy farming and to have the appropriate policies to improve the activity and the status of the urban farmers. Thus, it is hoped that the study will contribute a lot to indicate issues related to the nature and extent of the problems and attempts to investigate the constraints that the urban dairy farmers face at present and suggest some solutions and make significant contribution in formulating policies and strategies which could alleviate both the immediate and long-term problems of urban dairy farmers. It can also contribute to the effectiveness of governmental, non-governmental and community-based organizations in their effort in bringing about sustainable urban development. This cannot effectively be done unless planners have adequate information about the needs and constraints of those who participate in this sector. On the other hand, very little research has been conducted to investigate the problems and needs of small-scale urban dairy farmers and very little is known and documented about it thereby making the study significant.

The study will also contribute to the literature of UA in general and urban dairy farming in particular as the lessons to be drawn from this study are likely to fill the gaps in the literature about UA. It can also be used as a basis for further investigation in this area.

1.6 Scope and Limitations of the Study

Urban agricultural endeavours include varieties of activities such as the cultivation of crops, vegetables, fruits, flowers, forestry and livestock rearing including cattle for beef and dairy products, sheep, poultry, bees etc. However, the scope of this research is limited to investigating and explaining the characters and roles of small-scale dairy enterprises based on a survey of sample respondents from 12 'weredas' in Addis Ababa. Future research should focus on investigating the up and down stream effects of the activity. There is a need to have longitudinal and comparative analysis between dairy farming and non-farming households on

nutritional status and health, income and employment. The impact of urban dairy farming on non-farming households or the larger community and environment, the impacts of the uses of wastes for livestock needs to be assessed.

However, this study has limitations in data collection and analysis. Some of the limitations include the fact that most of the data obtained from the urban dairy farming households were rough estimations of the recall year; some of the dairy farming households might have closed down and new ones started operation; lack of research findings on urban agriculture in Addis Ababa; unwillingness and delay to discharge information and underestimation on items that request amount; and problems of measurement and the difficulty to quantify the variables.

1.7 Organization of the Paper

This research paper has seven chapters. The first chapter deals with the introduction part, which again comprises the overview of urban agriculture, statement of the problem, research objectives and questions, methodology, and scope and limitations of the paper. The second chapter is concerned with the review of related literature where the concept of urban agriculture; dairying ; food security; the intricate relationship between urbanization, population growth and food supply; milk constituents and factors affecting its composition; major types of dairy products; and the demand for and supply of dairy products in Addis Ababa are reviewed. The physical, demographic and socio-economic characteristics of Addis Ababa are briefly presented on chapter three.

The fourth chapter deals with the socio-economic and demographic profiles of the dairy farming households. This chapter also includes the nutritional and food security, income generation and employment, and environmental benefits of urban dairy farming. Chapter five looks into the reasons for practicing dairy farming and the source of initial capital, animals and information and skills; dairy production inputs and processes. Dairy production

constraints and problems related to urban dairy farming are also entertained in this chapter. Chapter six is devoted to the discussion of dairy marketing and distribution methods and dairy consumption and product utilization. The summary of the overall parts of the paper and recommendations are presented in chapter seven.

CHAPTER TWO

REVIEW OF THE RELATEDLITERATURE

2.1 Conceptual Framework

2.1.1 The Concept of Urban Agriculture

At one stage in history, the world's entire population was rural, living a nomadic or pastoral life and providing for their own food needs. Over time, this way of life gave way to different economic and social patterns in which people gain certain benefits from gathering together to live in towns and cities (FAO, 1998).

As urban centers expand, they often engulf villages whose residents continue to farm in increasingly constricted surroundings (Tinker, 1994). Hence, UPA can be a continuum in space and time when cities grow (Haight, 1999). The urban dwellers often maintain their own peri-urban farms and there have always been ties between villages and urban communities (Tinker, 1994).

Urban agriculture is not a recent phenomenon. Fieldwork and aerial images of archaeological sites are unravelling agricultural practices of urban settlements achieved by ancient civilizations, for the production of food, feed and fodder; fuel, building, shade, fencing, wind-break trees, ornamental and medicinal plants and livestock for food, transport (Tinker, 1994). The early cities of hunters required food storage and these led to the selective domestication of animals and to the regeneration of seed stock (Jacobs 1970, in Smith 1994). The need for food and non food supplies explains the coincidence of ancient city sites for farming. Those cities provided the incentive and testing grounds for innovations and more intensive and productive farming systems (Reader's Digest, in Mougeot 1994). Hence UA is neither a new nor a declining activity in towns; infact, agricultural goods produced in cities can be the cornerstones of many urban economies.

The capacity of governments to manage urban growth is threatened in many developing countries; providing food, shelter, and basic services and creating sustainable cities are challenges to many city authorities (Drescher, 2000). Hence, feeding urban populations adequately is a major problem in developing countries. Rural areas do not produce enough food to feed both rural and urban people and there has been poorly organized production and distribution system in rural areas, and food import is constrained by lack of foreign exchange and escalating food prices. Imported food stuffs also degrade the local food production base and introduce foreign food tastes (Sawio 1994, Haight 1999) Hence, much of the rapidly growing population in developing countries participates in the informal sector which produces and distributes basic goods and services in unregulated but competitive markets (Holmer, 2002).

Since the late 1970s, UA has been growing in the developing world as a result of rapid urbanization, ineffective agricultural policies, crippled domestic food distribution systems, constrained public spending, wage cuts, soaring inflation and rising unemployment, declining purchasing power, limited urban land use regulations, civil strife, war and natural disasters. And as a result of the prevalence of urban poverty and food insecurity, urban food production has become a complex, thriving industry (Tinker 1994; Falvey1999). To meet part of the food needs of urban dwellers, UA, crop growing and livestock rearing in both intra-urban and peri-urban areas, is becoming a familiar and almost permanent feature in the developing world (Sawio, 1994). Spatially juxtaposed with other urban activities and competing for land, labour and resources, UA makes a vital contribution to the household economy of the urban residents (Smith, 1994). Hence, there has been a tremendous increase in total city area under informal urban food production.

Urban agriculture can be practiced for a variety of reasons. A study by Maxwel (1994) in Kampala indicated that there are at least four major categories of household logic to be

engaged in UA which include commercial production, household food self-sufficiency, as a measure of food security and a no other means category comprising of low income group female headed households, widows and families suddenly abandoned by a primary wage earner.

Due to proximity to markets, business opportunities in UA abound resulting in different types of enterprises. These can be productive enterprises which include production of vegetables, fruits, flowers and ornamentals, livestock, acqua culture and forestry; processing enterprises like food preparation, packaging, milling and drying; input delivery enterprises like supplies of fertilizers, seeds, pesticides and insecticides, water, tools, animal feed; and service delivery enterprises like special labour services such as milking, agricultural advisory services, animal health assistance, accounting and book keeping (Holmer, 2002).

Urban farming can be highly productive; infact, as much as one seventh of the world's food supply comes from cities. Without urban and peri-urban agriculture, the challenge to feed cities would be enormous (Midmore, 1996). Studies indicate that animal husbandry is the main source of animal protein for households in urban areas and more of the food sold by street vendors in urban areas comes from urban home gardens than was the case years ago (Tinker, 1994).

Urban agriculture is also found to complement rural agriculture in terms of self-provisioning and marketing flows. Although UA is not expected to supply urban needs for cereals and tubbers which can be transported and stored more easily from rural producing areas with limited loses, it is striking to see that UA with little support is supplementing a significant share of cities' needs and the quality of foods they depend on (Tinker, 1994). There are also cities that manage to export to other centers (UNDP, 1992). Studies indicate that UA is not an inappropriate retention of peasant culture in the urban centers. It is also indicated that a dichotomy between rural and urban, and to assign food production solely to rural areas is not

much helpful. The comparative advantage that rural and urban areas hold must be exploited to meet the growing need for affordable and reliable supplies of sufficient and nutritious food by large cities. Hence, UA can give good reasons to better exploit rural – urban linkages (Tinker, 1994).

Since UA is a labour intensive activity, it can have significant employment generating potential for urban areas whose unemployment rates are growing (Tinker 1994;Sawio 1994; Haight 1999; Falvey 1999; Gundel 2000). It can create both full-time employment for the household heads and their spouses and part-time employment for the children and other members of the households. It reduces unemployment within the family and improves the overall level of family income. However, urban farmers are not recent migrants as new arrivals have less access to land than long-term residents (Tinker1994, Sawio1994, Smith 1994, Falvey 1999, Drescher 2000, Holmer 2002).

Urban agriculture also plays a vital role in reducing the negative environmental impacts of urban growth and also contributes towards the improvement of the urban environment. For example, vegetation can help increase humidity, lower temperatures, capture dust and gases from polluted air, acts as wind break and intercepts solar radiation (Deelstra 2002, in Mohammed 2002). Most of the reject food which is used by the producer to feed dairy cattle would have become garbage and thus increase public expenditure in the disposal process. A lot of solid waste is recycled into fresh food through UA, without long distance transportation of such wastes, thus avoiding pollution and contributing to some environmental sanitation (Brock, 1999).

It is estimated that about 800 million people are engaged in UA worldwide and play an important role in feeding the world's cities (FAO, 1999). Surveys also show that the area effectively under urban agriculture is very much greater than conventional land-use

classification and maps capture. In many countries UA claims the largest land use within the city boundaries (UNDP 1993, in Tinker 1994).

Urban agriculture is a dynamic concept that comprises a range of systems ranging from subsistence production or processing at the household level to fully commercialized agriculture. Urban agriculture is defined in different ways by different scholars. Tinker in 1994 defined UA as the practice of food production within the city boundary or on the immediate periphery which includes the growing of food crops and fruit trees, herbs, flowers, parks, fuel-wood and raising of animals including cattle, poultry, fish, bees, pigs etc or other stock considered edible locally. Urban agriculture is also defined to refer to the production and marketing of food and other plant and animal products in urban and peri-urban areas to enhance food security, provide additional income and employment and contribute to an ecologically sound urban management (Gundel, 1999)

Urban agriculture is also defined as:

> *an industry that produces and markets food and fuel, largely in response to the daily demand of consumers within a town or city or metropolis, on land and water dispersed throughout the urban and peri-urban area, applying intensive production methods, using and reusing natural resources and urban waste, to yield a diversity of crops and livestock (Smit 1996:3, in Sawio 1998).*

Urban agriculture systems exist within heterogeneous resource utilization situations ranging from scarce to abundant land, water etc. and it also exists under a range of policy environments, ranging from prohibitive to supportive conditions (Gundel, 1999). Urban agriculture is also practiced by a wide socio-economic spectrum of urban farmers. (Tinker 1994, Sawio 1994, FAO 1998, Gundel 2000, Holmer 2002).

Urban livestock rearing can be divided into different classifications based on different criteria. Bayer in 1995, for example, classified urban livestock rearing according to location: as peri-urban versus inner city and on -plot versus off-plot; main production aim: commercial, semi-commercial, subsistence; scale of production: large, medium, small, micro; intensity of production: high, medium or low level of external inputs.

The intra and inter-urban livestock keepers can be on-plot or off-plot. The on- plot livestock keepers use private residential space in back-yards or inside home and animals are often enclosed by a fence, walls or are tethered and their feed and water are brought to them. Sometimes, animals may be allowed to graze part of the day or seasonally. The off-plot livestock keepers use unoccupied private or state lands like open plots, wet lands unsuitable for construction and banks of streams and rivers, along transport and utility lines, on school and hospital grounds and in public parks. Animals tend to be grazing and are herded, tethered or allowed to roam freely (Bayer, 1995).

Animal rearing in the urban areas can be done for home consumption and as a source of highly valued food, supplementary income and hence employment for the animal keepers and for people like herders, sellers of leaves and grasses and collectors and sellers of produce, for more efficient use of land. It also helps in reducing transport and energy cost, improving the supply of perishable but nutritious food, providing lower cost food for urban areas than food imported from rural areas or abroad. Urban livestock keeping is also important for waste recycling as organic wastes from households, streets, market places, agro-industries can provide valuable feed. Wastes from livestock can be valuable inputs for urban growing of vegetables and fruits (Bayer 1995, Gundel, 2000). The utilization of wastes by farmers leads to improved waste management (Chingarande, 2001).

2.1.2 Problems of Urban Agriculture

Urban agricultural practices, urban dairy farming included, face different constraints both legal and technical. The main technical constraints mitigating against successful and sustainable improvements in animal production and productivity include-genetic potential of indigenous livestock in need of improvement and inavailability of animals for dairying, the widespread distribution of livestock diseases and inefficient animal health care, reproduction inefficiency, inadequate feed supplies and poor animal nutrition and absence of improved feed systems, inefficient management of animal manure and urine, and poor marketing infrastructure and arrangements and lack of organized marketing and market outlets (FAO 1998; Abaye et al 1998; Devendra, 2001)

Absence of clear livestock development policy and strategy, the pace of privatization and the possibilities of cost recovery for goods and services, lack of services and infrastructure, a credit environment unsympathetic to smallholder borrowers, weak financial services and unclear land tenure policies, absence of government support and little to no beneficiary participation in concept, design and implementation are further problems. Uncertain rainfall, declining soil fertility and traditional techniques inhibit increase in animal output (FAO, 1998). Limited access and/or availability of land and water, theft, incompatibility of livestock on residential neighbours in connection with odors and neighbor conflict, health risks as diseases can be transmitted from livestock to people are all major constraints.

The reaction of urban authorities to UA has varied enormously through time and across space, even between cities in the same country. The authorities in some Third World cities look up on UA as a relic of traditional way of life that has little place in modern city (Smith, 1991). In some cities, the dairy farms have been unjustly criticized and prosecuted by local authorities for reasons related to claims of pollution in respect of bad odors, blockage of drainage systems and the promotion of flies and rates associated with the prevalence of animals and/or feeds, and risks of illness for the human population related to the consumption of raw milk (Losada et al, 1996). In some other countries, dairy animals

have been removed from urban areas due to environmental issues and producers had to shift to distant rural areas because of the high land cost in the urban areas whereby middlemen collect maximum share and leave marginal profit for producers as they charge heavy prices from consumers and pay less to producers (Qureshi, 2002).

Urban food markets have also been designed, often since colonial times, to import food from rural areas and the input producing agrobusinesses are geared to serving rural agriculture. Hence, the input and output market systems and infrastructure favour rural agriculture (UNDP, 1996; in Mohammed 2002). Hence, the foregoing discussion clearly presents problems of multifaceted nature that are faced by the urban agriculturalists.

2.1.3 Dairying

Since domestication cattle have spread to almost all parts of the world and have been introduced wherever people have explored and settled. They are now the most important and numerous of all the domestic herbivores (Wilson, 1995). Milk is one of the most complete and oldest known animal food and cows were milked as early as 9000 B.C. Hippocrates, the Greek physician, recommended milk as medicine in the 5th century B.C. (Britanica, 1993). From the historic point of view, the origin of dairying lies in Mesopotamia at around 7000-6000 B.C. From this region, milk production and milk consumption spread to other regions (I.L.R.I, 1999).

Dairy production is a biologically efficient system that converts large quantities of roughage, which otherwise may be wasted, to milk, the most nutritious food known to man. Where there is access to market, dairying is preferred to meat production since it makes more efficient use of feed resources and provides a regular and sustained income distributed throughout the year unlike income from other agricultural products. Dairy production activity is a safe business. The dairy farmer, especially with limited capital, benefits from the quickness and the certainity of the returns as the dairy cow gives an immediate return and her

product is always marketable. The returns, while not larger at any one time, are steady throughout the year and can be depended upon. It also provides a stable income as prices of dairy products are more stable (Clarence, 1956; KARI, 1994; Mogos & Robert 1998).

Dairy production activity is also labour intensive and supports substantial employment in production, processing and marketing. It also permits efficient use of farm labour and economical use of buildings and equipment and reduces the risk involved in having one or two sources of income and is vital for capital accumulation (Singh and Moore 1982, Leeuw 1999). Dairy production improves the family diet and reduces food costs and dairying aids in maintaining soil fertility, nutrient recycling and food security (Singh and Moore, 1982; KARI, 1994; Mogos and Robert 1998). The dairy animals also provide manure for fuel and hides and fibre for clothes (ILRI, 1998).

However, there are also disadvantages of dairying which include high labour requirement as cows must be fed and milked at least twice each day and time is consumed in managing the enterprise and in marketing products; considerable capital requirement for the production of high quality dairy products; the presence of many hazards in dairy production as disease, breeding, nutritional, housing and market problems may cause loses; and substitutes for dairy products are materially affecting the dairy enterprise (Singh and Moore,1982). Some people have criticized development efforts directed at dairying on the basis that dairying needs a large investment to get started and hence benefits only richer farmers. Yet research by ILRI and its partners clearly demonstrate that dairying is far from being the preserve of the rich but rather is attractive to smallholders and moreover gives a wide range of spin-off benefits that permeate the whole community (ILRI, 1998).

Milk for direct human consumption and manufacturing milk products is obtained from many kinds of domestic livestock but it is estimated that about 90 percent of the world's total supply is produced by various breeds of domestic cattle (Ayne, 1987) and from Sub Saharan Africa milk production cow milk accounted for 80 percent (Leeuw, 1999).

The dairy animal is a milk producing factory which converts nutrients, derived from a variety of dietary constituents, into a complex, marketable and highly nutritious product. To do this it must first produce a calf and then the efficiency of the processing of the feed is important. It is determined by the amount of feed eaten, the genotype of the animal and its ability to resist the elements in the environment that operate to reduce the intake of feed or the efficiency with which it is digested and metabolised (Veroce, 1999).

Dairy production systems range from large-scale, intensive, vertically integrated commercial systems to smallholder 'subsistence-plus' income systems (Egan, 1999). Higher levels of dairy production often require the introduction of specialized dairy breeds, increased level of inputs including nutrition and health care and good linkages to markets both for dairy sales and input acquisition.

Among the avenues of food production of animal origin in the developing countries, smallholder dairy production has a great potential to lessen the excessive imports of milk and milk products, income generation, household nutrition and poverty reduction (ILRI, 1999; Devendra, 2001). Smallholder dairying has been defined in terms of number of animals per - producer, the resources available to an individual producer, and as a component of an integrated farm and an integrated dairy industry (Falvey,1999). One of the greatest strengths of small-scale urban livestock keeping is its greatest mobility and flexibility. It gives value to municipal and private land that is not used for other purposes momentarily. Many people who do not own land, other than perhaps the very small plot on which they live, do own productive domestic animals. Small-scale landless livestock production systems are common everywhere in the urban areas of the developing countries which are seldom influenced by climate and ecology (Bayer, 1995; Wilson, 1995). However, heavy food imports and aid from industrial nations which lower prices of indigenous agricultural products erode the

economic stimulus by reducing the potential of smallholders to mobilize labour and invest capital productively (Falvey, 1999).

Many countries have aimed to achieve self-sufficiency in the major dairy products by appropriate domestic prices to promote dairy production and raise dairy farmers incomes. Countries restrict imports of much cheaper dairy products from the international market (Malcom, 1999).

The statistics in support of livestock is impressive. Nearly two billion people- a third of the world's population - derive at least some of their livelihood from animals; nearly one person in every eight depends almost entirely on livestock. Domestic animals meet more than 30% of people's food and agricultural needs (ILRI, 1998).Two thirds of the world's livestock are found in developing countries and most are owned by rural smallholders. In Africa as a whole, smallholder dairying generates more regular income than any other rural enterprise (ILRI, 1998). Smallholders play the largest role in East African milk production (Staal and Shapiro, 1996).

Globally, the market value of milk production is second only to rice in the arid and semi-arid tropics of south and south-East Asia, second to beef in the sub humid tropics and sub-tropics of south and central America and exceeds all other commodities, including coffee, in the warm humid tropics of south and central America. Hence, dairying obviously contributes enormously towards alleviating poverty and improving food security in the tropics with still much potential for increasing its contribution (ILRI, 1998).

Modern dairying in Ethiopia dates back before the Second World War when some Island and Fresian breeds were introduced into the country and artificial insemination (AI here after) was introduced by the Italians. Holeta and Shola dairy farms were established in the 1940s through a program of post-war relief and rehabilitation under the Marshal plan to rehabilitate

the war-torn countries of allied forces. Establishment of a dairy processing plant in Addis Ababa followed in 1950. Modern dairying practices continued to expand with the establishment of agricultural colleges starting with Ambo Junior College in 1939 followed by Jimma Junior College in 1954 and Alemaya College of Agriculture in 1955 conducting some dairy research activities as part of their academic exercises.

Comprehensive package projects with holistic nature started with the Chilalo Agricultural Development Unit (CADU) in 1968 and the Walaita Agricultural Development Unit (WADU) focusing on the distribution of crossbred heifers to smallholder framers to improve the milk production potential of the country and raise the incomes of farmers, research and extension programs, marketing services, credit and input supplies, bull service stations and AI. These projects had made great impacts in dairy development at smallholder level in the vast project areas. Another major effort made was with the Dairy Development Project that had been launched in 1970 which was planned to set up large, medium and small scale private dairying and to provide AI, veterinary and extension services together with forage and fodder production components (Alemu et al, 1998).

Nowadays, three major milk production systems are identified in Ethiopia: the traditional smallholder subsistence type of production accounting for over 97% of the total national milk output and 75% of commercial liquid milk using indigenous breeds of Zebu; state dairy farms using grade animals mainly within the radius of 120 km from Addis Ababa whose importance is declining as state farms are on the process of privatization; and urban and peri urban dairy farms which are expanding using purebred exotic breeds and their crosses and indigenous breeds serving as a major supplier to the urban market (Staal & Shaptiro, 1996 Abaye et al, 1998; Alemu et al,1998).

Dairy production in Addis Ababa is an activity carried out in the backyards of the household (Kassahun 1984 in Asrat 1996; Belachew et al 1996; Abaye et al1998). Most of the

producers obtain the major portion of their incomes from the sale of milk and animals. A study by Kassahun (1984) as quoted in Asrat (1996) indicated that the decline or loss of income of landlords as a result of the 1974 revolution and the high price of milk in the city due to limited supply have contributed to the establishment of dairy farms.

Specific Features of Dairy Production

The diary industry has specific features which distinguish it from other sectors of agriculture. Milk is a liquid consisting of about 90 percent water, which means that it is a bulky and heavy commodity. Hence, it requires high cost of transportation and there is a cost limit on the range over which it can be sold. Furthermore, milk will only keep for a few days which places a time limit on the period during which it must be used or processed and transformed into a more stable, longer keeping form. Milk is highly perishable and also potentially subject to adulteration.

The vast majority of dairy farmers are small-scale producers with a weak and vulnerable position on the market. They keep the milk for a few days and unlike grain producers, they are unable to defer selling their product until a more favourable moment. They adjust to market changes in a limited and gradual way. Milk is produced every day and is a regular source of income to the producer. Milk production is a highly labour intensive production activity which provides many employment opportunities.

Factors Affecting Producitvity

The productivity of a dairy cow and a dairy farm can be influenced by different factors. Some of these factors are considered in the following paragraphs.

The productivity of dairy cows is affected by the breed type. The breed of the animal bears a distinct relation to the quantity of milk produced and to its fat content. For example, in

Ethiopia local breeds produce about 809kg of milk per cow per lactation length of 272 days with improved management (Kilwula, 1983 in Daniel 1993). However, local breed cows require lower feed quantity, labour input and veterinary services. They have also better resistance to disease. On the other hand, the milk production potential of cross-breed cows is higher than that of the local breeds (MOA 1991, in Daniel 1993).

For the dairy animal the lack of feed of adequate quantity and quality affects milk production both directly and indirectly. The problem of having sufficient labour in conducting a dairy farm affects its productivity. The prevalence of animal diseases and the lack of infrastructural and veterinary services also affect productivity of dairy farms.

A study conducted on the effect of shelter on milk production and feed requirement of dairy cows shows that a good shelter specially from cold, reduces feed consumption and increases milk yield. The milking process is also another factor where some milkers get more milk from a cow than others. The inability to have good waste management also influences productivity as it influences the health of the animals and the operators and also the quality of milk.

Dairy Farming and Environment

Solid waste management experts and researchers in Africa are increasingly recognizing the great potential of waste reuse into urban farming to help reduce solid waste collection and disposal problems, avoid pollution and contribute to environmental sanitation (Gumbo 1993; G/Egziabher 1994; Smith 1994; ILRI 1998; Abutiate 1995 in Haight1999, Brock 1999).

The role of livestock in helping put nutrients back into soil is well known by small-scale farmers and soil and livestock experts. With rising population density and higher rainfall, there is increasing interaction between livestock and crops. Livestock can rely on crops for

part of their food, while crops benefit from nutrients delivered as faeces and urine from livestock (ILRI, 1998).

As animals eat the palatable parts of crop residues and grass, the inedible fractions such as the stems are tramped underfoot, specially if animals are stall-fed, where they mix with faeces and soak up urine which speeds up the decomposition process and compost faster making the nutrients in them available sooner (ILRI, 1998). As livestock can turn urban wastes into resources, wastes from livestock keeping can become a valuable input for urban growing of staple foods, vegetables and fruits. Animal excreta is valued both for the nutrients it contains and also for the way it improves the soil, adding organic matter, imparting structure and boosting water-holding capacity (ILRI, 1998, Bayer, 1995).

Organic material forms 50-90 percent of urban refuse in African cities which include kitchen waste generated in the preparation of food, food leftovers, fruits and vegetables, leaves, crop residues (Haight, 1999). On the other hand, studies indicate that in many countries UA is a major user of human and other organic wastes. For example, meal or food waste is collected from restaurants and food processing plants to feed pigs and stored meal leftovers are used to feed cows, lambs and pigs (Natura 1993, in Mougeot 1994).

Urban waste water can also be a resource for urban animals and crops. In some cities irrigated fields produce animal feed that is sold to livestock producers who in turn sell the manure to the urban growers of vegetables and flowers. Waste water is also used to irrigate pastures for grazing herds, flooding the area and produce green pasture for their cattle (Bayer, 1995).

2.1.4 Food Security

At present, food security has become one of the burning issues of the world. How to feed the rapidly growing world population has become one of the prominent discussion points of

politicians and academicians. Food security is defined as access to all people at all times to the food required for a healthy life and the ability to meet the minimum amount of food consumption that is sufficient for an active healthy life. (Tinker, 1994; Chingarande, 2001). Population pressure, drought, environmental degradation, massive unemployment, and famine are threats to food security. Food security requires an increase in domestic production to meet domestic demand, thus reducing the need for food imports and food aid (Axumite, 1994). Similarly, a society where the majority of people depend on production by a minority is not sustainable (RUFA, 2001).

Urban food security depends on many factors like the availability of food which in turn depends on food production in rural and urban areas, food imports, marketing and distribution, infrastructure; access to food which depends on purchasing power of urban households as the ability to earn cash income is a significant determinant of urban food security, subsistence production, rural- urban linkage; and quality of food depending on preservation of food, quality production, sanitary conditions on market (Drescher, 2000). Factors like low income levels, lack of physical access to food, high relative prices of food, limited job opportunity, absence of food subsidies and currency devaluations affect food security (FAO, 1998).

Food security should be part of the preoccupation of city authorities because a city will be less vulnerable the more its inhabitants are able to adequately feed themselves. People in the urban areas are more dependent on food purchase. However, the majority of urban dwellers of the Third World are highly disadvantaged with limited purchasing power, as most are engaged in very low paying employment in the informal sector where working conditions are uncertain and job tenure insecure. If food needs of low income groups are not met, segregation will be strengthened and food access difficulties have been among the major causes of urban violence. The urban consumers more vulnerable to food insecurity mainly

include the unemployed, the newly urbanized people, single mothers with dependent children and people living on small-scale activities often in the informal sector (FAO, 1999).

Nowadays, the great majority of the poor reside in urban centers and the proportion of marginalized people continues to grow. Poor urban dwellers usually have trouble purchasing adequate amounts of food. On the other hand, rising food prices are coming up against a fall in purchasing power whereby most poor families spend more than half of their income on food. Household food insecurity grows with the share that purchased food takes off the household budget. For the urban poor, a large and growing segment of the population, food is turning into a 'basic luxury.' The fewer the household's alternatives in buying food, the more serious will be its insecurity. In African cities to eat a single daily meal is becoming common place. Per capita energy consumption is generally higher in rural than in urban areas and malnutrition is often likely to be higher in urban slums than in typical rural areas. Intra-urban difference in calorie intake is greater than rural-urban differences. (Tinker1994; FAO, 1998; FAO, 2001).

Urban agriculture has tremendous potential to improve the livelihoods of the urban poor and to make an important contribution to food security in developing countries (Gundel, 2000). Given the potential of higher productivity of UA, policies to improve food security should consider production in urban areas. UA can contribute much to regulate the problem of undependable supplies of food in cities (Axumite, 1994). Urban agriculture is also important to bring food prices down by increasing production and undercutting the farmers markets where food is more expensive. It is also noted that when crises arise urban areas are the hardest hit because it is difficult to transport produce into the city (Bourque, 2000). However, there are also researchers who believe that UA alone will not be enough to provide food security for the urban population (RUFA, 2001).

2.2 Urbanization, Population Growth and Food Supply

High levels of urbanization, population growth and rapid expansion of urban areas represent a new dimension for development and food security policies in many developing countries (FAO, 1997). There is increasing concern about the impact of growing levels of urbanization; by the year 2025, 61 per cent of the world population will be living in urban areas. Many will be living close to or below the poverty line. How to adequately feed this rapidly expanding urban population is a challenge (FAO, 2001).

Urbanization is an inevitable consequence of socio-economic development but in many countries it is proceeding at such a fast rate that it is out-pacing the growth of services and employment (FAO, 2001). Major concerns of rapid urbanization include inaccessibility of clean drinking water, inadequate food supplies, lack of housing, air, soil and water pollution and increasing production of solid waste (Sawio, 1998). Rapid urban population growth and unmanaged expansion are also degrading the environment of cities and their surrounding bio-regions. Soil erosion, increased temperature, reduced bio diversity, increased vulnerability to disasters such as flood are consequences of these (Mohammed, 2002).

Many African cities have urban growth rates which will double their population in less than twenty years. Urban poverty has been on the increase with increasing urbanization for reasons like rapid population growth, economic recession and structural adjustment policies. Hence, the challenge for countries is represented by the need to organize food production, processing and marketing facilities so as to satisfy an urban demand characterized by growing poverty levels (FAO, 2001).

Urbanization influences the aspects of food production and consumption. Urban populations are growing fast because of natural growth and rapid migration to the cities as people escape rural poverty, land degradation, famine, war and landlessness thereby necessitating high demand of food for the rapidly growing population. This has put enormous pressure on food

supply systems in both urban and rural areas. (Axumite 1994; Sawio 1994; FAO 2001). Despite the increasing urban population, world milk production is declining and nominal world milk prices continued their upward trend and urbanization in Africa promises growing domestic demand (Staal and Shapiro, 1996). The output of milk in developing countries scarcely kept pace with the increase in their population, despite efforts made, with the assistance of international agencies and bilateral aid programs to raise production (Payne, 1987).

Urban growth has a number of direct and indirect consequences on food supply and distribution which are relevant in the assessment of urban food security. Urban growth increases marketed food demand but reduces the availability of productive land. It modifies food purchasing habits and makes existing market areas and infrastructure inadequate; it increases the price of available land, intensifies traffic, alters the location of consumers and modifies their food consumption habits, increases the distance of consumers from their work sites and the cost of food transport (FAO, 2001)

Rapid urbanization in the developed countries has created domestic demand for high value food items creating market opportunity for indigenous production, particularly milk and milk products (Malcom, 1999). As urbanization, population and incomes increase, the demand for food of animal origin will rise and create market for animal products and encourage commercialization of agriculture (Ehu and Nega, 2000). However, existing production and rural marketing systems cannot readily respond to the rising demand, and local governments resort to an easy option of importing milk and milk products from developed countries either as food aid or commercially (Malcom, 1999).

Population growth is an important element in the growth of demand for food in the city as a rapidly growing population requires a fast increase in agricultural production to maintain the current level of consumption (Bogalech, 1998). Population pressure not only directly

increases the demand for food, but also indirectly reduces its supply through building development, environmental degradation and marginalization of food production. In sub Saharan Africa (SSA), for example, per capita food production shows a declining trend and the number of absolute poor and chronically undernourished people has more than doubled (Drechsel, 1999). In Ethiopia, the human population growth rate is estimated to be 3 percent whereas annual milk demand grows at 2.5 percent indicating a disproportionate match between human population and milk demand (Staal and Shapilo, 1996). The proportion of undernourished people is on the rise due to rural-urban migration. As a reaction to the increasing urban population, urban and peri-urban farming systems have emerged and are expected to assume greater importance and intensification (Drechsel, 1999).

On the other hand, the demand of an expanding world population for increased quantities of food tend to overshadow a parallel need for food qualities necessary to meet nutritional requirements. High quality protein is the major deficiency in the food consumed by half the world's population. The most vulnerable segment of the population is the pre-school child and malnutrition in this group has been the primary deterrent to human progress. Malnutrition in this group is responsible for the early deaths of millions of children, impaired growth and irreversible mental and emotional damage and weakened productive capacity of those who survive to adulthood (FAO, 1972).

Population concentration in urban and peri-urban areas often coincides with intensive agricultural production. The Prussian geographer and agricultural economist J.H. Von Thunen formulated the concentric zone of successively less intensive land use around cities. Closest to the city are areas where perishable dairy products and garden vegetables are produced by very intensive means. Here, the value of production per unit of land is highest and the cost of transport to market is lowest. The next closest will be the area of manured, annually tilled field and then grain fields with a short fallow rotation. The most distant lands are devoted for extensive grazing or shifting cultivation. However, transportation lines

influence the concentric rings (Netting, 1993). Hence, UA is based on the intensified urban and peri-urban livestock production systems where it is currently becoming one of the major practices of food production and sources of supply within a city boundary or on the immediate periphery of a city contributing much towards satisfying the basic needs of the urban population (Gundel, 2000).

Intensification of livestock systems is generally concentrated in areas with good infrastructure close to major cities (Leeu, 1999). It is no coincidence that cattle and human population densities are highly correlated (Kruskal, 1997; in Leeu, 1999) and in areas where population pressure on land resources are greatest, there is also a tendency for production to be more market oriented in nature (Smith, 1991; KARI, 1994).

Smallholder and large-scale dairy farms are generally located close to or within major markets or more distant when there is efficient market structure (Leeu, 1999). Milk production in urban areas is advantageous because of better access to markets, the unit cost of support services such as input supply and animal health services. The greatest demand for milk and milk products is in the urban centers. Because of the difficulty of transporting milk from distant areas, about sixty to seventy per cent of milk supplied to urban population is also produced within the municipal area (Egan, 1999).

With the increasing concentration of population in cities and as urban food demand rises, food supply and distribution systems have to supply the inhabitants of cities with increasing amounts of food coming from more distant production zones and/or from more intensive production systems. The linkage between consumption and production areas should be strengthened (FAO, 2001).

Urban food supplies in developing countries are at precarious situations (FAO, 2001) and in many developing countries, UA is a necessity as it is practiced to supplement household food

supplies, unlike in developed countries where it is practiced as a leisure activity (Smith 1991; RUFA, 2001). Urban produced food increases the overall supplies and lessens the seasonality of food available for urban residents. The availability of food from UPA during severe drought or other stress conditions implies that an important rural – urban linkage is created through the production capacity of urban farmers. Some consumers also choose locally grown food (Gundel, 2000).

With regard to the supply and consumption of dairy products, conditions are not promising. Studies indicate that in most countries of the developing world the per capita consumption of milk is very low. The higher price of milk in relation to the earning capacity of the consumers is a factor. Milk is also considered as a luxury purchase (FAO, 1999). Per capita milk consumption in Addis Ababa, for example, has dropped from 24 litres to less than 16 litres over the last two decades (ILCA, 1993). This can be contrasted with the USA where per capita consumption is about 400 kg (Azage and Alemayehu, 1998; Bogalech, 1998).

Although the supply and consumption of dairy products are very much limited in the developing countries where Ethiopia is a part, the fact is that livestock products, and especially dairy products, can make unique contributions to nutrition, and especially the micro nutrient and health status of the producers. Higher milk consumption as a result of milk production has a positive impact in improving the nutritional status of households. In addition, because of increased income from dairy production, households with dairy cattle can afford to purchase more food and a wide variety of foods whereby the income effect also contributes to improving the nutritional status of households with cattle (Bogalech, 1998; ILRI, 1999).

Generally, from the foregoing review it is evident that there are intricate relationships which exist among urban population growth, food supply and consumption, household income levels and purchasing power, and ways of having access to food.

2.3 Milk, Its Constituents and Factors Affecting Its Composition.

A/ Milk and Milk Products as Food

Milk is secreted by the mammary glands of mammals to feed their young. Milk is the sole source of nutrients for most young mammals for lengths of time which vary with the species. In many animals the link between mother and offspring is not suddenly broken by the act of egg-laying or birth and the mother continues to tend and nourish the young (Kon, 1972). Cow milk, a white fluid of low viscosity and slightly sweet taste, is most commonly used as human food.

Milk, according to Skumer 1980, is defined as the whole, fresh, clean, lacteal secretion obtained by the complete milking of healthy milk animals, excluding that obtained within 15 days before or five days after calving or such periods to render the milk practically colostrum-free, and containing the minimum prescribed percentages of milk fat and milk solids-non-fat.

Milk is the only natural material which is a complete source of food; its nutritional potential is unsurpassed by any other food used by human beings (FAO, 1972). Milk provides more essential nutrients in significant amounts than any other single food (Mahony, 1988). Although milk is surpassed by some other foods in its content of any one specific nutrient, it is almost unique as a balanced source of most of human's dietary needs (Kon, 1972). For both young and old ,milk serves important functions which include growth, reproduction, supply of energy, maintenance and repairs and appetite satisfaction though the requirement may vary with the individual. Milk consumption is found to be important for healthy

physical and mental development (ILRI, 1999). Milk contains various nutritionally important components, namely, proteins, carbohydrates, lipids, minerals, vitamins and water.

B/ Milk Constituents and Factors Affecting its Composition

The quantities of the main milk constituents can vary considerably depending on the individual animal, its breed, stage of lactation, age and health status. Herd management practices and environmental conditions also influence milk composition.

Water is the main constituent of milk, and milk processing is usually designed to remove water from milk or reduce the moisture content of the product. In addition to the major constituents, milk also contains a number of organic and inorganic compounds in trace amounts (ILRI, 1995).

Table 2.1 : Composition of Cow Milk

main constituent	range %	mean %
Water	85.5-89.5	87.0
Total solids	10.5-14.5	13.0
Fat	2.5-6.0	4.0
Proteins	2.9 -5.0	3.4
Lactose	3.6-5.5	4.8
Minerals	0.6 - 0.9	0.8

Source: ILRI, 1999

Factors Affecting Milk Composition

I. Genetic Factors

Breed and Individual Cow - Milk composition varies considerably with breeds of dairy cattle. For example, Jersey and Guernsey breeds give milk of higher fat and protein content than Shorthorns and Friesians. Zebu cows can give milk containing up to 7% fat.

Variability among cows within a breed - The potential fat content of milk from an individual cow is genetically determined. Heredity also influences the potential milk production of the animal. Thus, selective breeding can be used to upgrade milk quality.

II. Environment

Interval Between Milkings - The fat content of milk varies considerably between the morning and evening milking as there is usually a much shorter interval between the morning and evening milking than between evening and morning milking.

Stage of lactation - The fat, lactose and protein contents of milk vary according to the stage of lactation. Solids-non-fat content is usually highest during the first two to three weeks, after which it decreases slightly. Fat content is high immediately after calving but soon begins to fall for about twelve weeks, after which it tends to rise again until the end of the lactation.

Age - As cows grow older the fat content of their milk decreases by about 0.02 percentage units per lactation.

Feeding Regime and Disease - Underfeeding and diseases particularly mastitis reduce both the fat and the solid-non-fat content of milk.

Completeness of Milking - The first milk drawn from the udder is low in fat while the last milk or strippings is always quite high in fat. Thus it is essential to mix thoroughly all the milk removed.

2.4 Major Types of Dairy Products

Milk and milk products have been used by humans since prehistoric times. It is thought that cheese making was discovered accidentally and initially developed in Mesopotamia- 7000-6000 B.C. and spread with the migration of populations due to famines, conflicts and invasions. There is evidence that butter was made as far back as 2000B.C. Fermented milk has been prepared for more than 2000 years which naturally produces an acid product so that it doesn't putrify but is wholesome and readily digestible (Mahony, 1988; Connor, 1995). Milk is processed primarily to convert it into a more stable product. Milk products are more stable than fresh milk because they are more acidic and/or contain less moisture, preservatives may also be added.

The nutritive value of milk products is based on the high nutritive value of milk as modified by processing. Over processing and, in particular, severe heat treatment reduces the nutritional value of milk. Butter making concentrates the fat-soluble nutrients, while cheese-making concentrates the milk fat and the major protein fractions (Mahory, 1988).

The economic profitability of producing other dairy products from milk depends on the price of milk, the out-turn of these products from a given quantity of milk, the cost of extracting and the price of the product. Milk processing becomes appropriate in situations where transportation is a constraint or immediate neighbourhood demand is low. Processing reduces the risk of wastage. The major dairy products are treated in the following paragraphs.

Butter and ghee- Milk for churning is accumulated over days and will turn sour. Butter is made by agitating the sour milk until butter grains form and then rotated slowly until the fat coalesces in to a continuous mass and is taken out from the churn.The butter is heated in an open pan to evaporate its moisture. The non-fat milk solids then settle to the bottom and the butter fat or ghee can be decanted off other constituents. Butter fat ususally deteriorates more slowly than other solid constituents of milk. Because of its longer keeping quality and high

value per unit of weight, it permits economic transport from a home or village to longer distances.

Cheese- cheese is a concentrate of the milk constituents, mainly fat and insoluble salts, together with water in which small amounts of soluble salts, lactose and albumn are found. There are different varieties of cheese. Cheese can not be kept for longer periods of time in tropical areas as in the temperate parts of the world.

curd- curd can be made from whole milk or skim-milk. The milk is boiled and allowed to cool. It is then inoculated until the desired fermentations are complete. Solid curd can be enjoyed plain or may be flavoured with sugar, salt, spices.

Dried Milk - the milk is concentrated by removing much of its water by evaporation and then dried by heating. Imports of milk powder have been increasing in many developing countries.

Ice Cream - This product is greatly increasing in popularity in many countries. It has a very high fat content.

2.5 Demand for and Supply of Dairy Products in Addis Ababa

A/ Demand for Dairy Products

The demand for food items depends upon population size, age distribution of the population, size of household, percapita income, asset position of consumers, product innovation, promotion, knowledge about nutrition and health, occupation, educational level of consumers, religious beliefs, consumer tastes and preferences, price of the product and price of substitutes and complements, special events (Kon, 1972; FAO, 1998, Devendra, 2001). The demand for milk is very high and can be expected to grow in Addis Ababa because of the fast rate of growth of the population, the high income elasticity of demand for milk and the development of social values favourable for the development of tastes for milk (Staal and

Shapilo, 1996; Belachew, 1998). Most humans demand a mixed diet as man is omnivorous and the majority are willing to pay higher prices for foods of animal origin which are very palatable and possess high protein, fat and minerals. Domestic supplies are insufficient because of the excess demand and hence dairy products are also imported to satisfy some of the demand.

Generally, the demand for fresh milk in Addis Ababa exceeds the supply. A study undertaken by the Dairy Development Enterprise indicated that the excess demand for milk in Addis Ababa was on average 15.5 million litres per annum between 1991-1994 (Belachew, 1998). The increased demand will enable smallholder livestock producers to increase their income. To fulfil the growing demand for milk and milk products of the city, urban and peri urban dairy farms, which are the main suppliers of dairy products of the city, should be assisted to increase the level of intensification and increase total milk output to achieve higher milk production per cow. The avenues for increased milk production involve the use of high grade dairy animals and improved and higher levels of feeding and management.

B/ The Supply of Dairy Products

Milk Supply sources of Addis Ababa can be broadly divided into domestic sources and imports. Studies indicate that about 77% is supplied by domestic sources while 23% is imported. From the domestic sources, intra and peri urban producers supplied about 82 percent while the remaining 18 percent is from the Dairy Development Enterprise and private enterprises. These producers supply milk to the city through various channels and the total fluid milk supplied to the city from the producers represents the excess milk produced on the farms over total milk allocated for animal feeding, home consumption and home processing.

Milk supply of Addis Ababa from the domestic sources shows a temporal variation as there is a wide fluctuation of dairy products at different seasons. The supply mainly depends on rainfall. Studies indicate that milk production during the rainy season is much higher than that of the dry season, chiefly because of better feed available during the period. There is also apparent excess supply of milk during the long fasting period from March - April when demand apparently drops (Belachew 1998; Alemayehu 1999).

C/ The Demand and Supply Gap

The foregoing discussions indicate the existence of considerable gap in the demand and supply condition of dairy products in Addis Ababa. A study by the Region 14 Agricultural Bureau indicated that the total amount of milk available to Addis Ababa is about 43,849,675 litres per annum. Considering the total population of about 2.3 million in Addis Ababa, the annual per capita consumption is 19.07 litres. However, considering milk that is used to feed calves, the total milk available will be 36,771,957 litres and this will further reduce the percapita consumption to 16 litres. Considering a minimum consumption of 250 ml per head per day (91.25 litres per year), a minimum total of 209.8 million litres will be required per year to satisfy the demand. This shows a minimum demand supply variance of about173 million litres per year (Region 14 Agricultural Bureau, 1995). A report by ILCA in 1993 also indicated that if demand for fluid milk alone is to be met, production should grow by 4% annually until the year 2025 (Azage and Alemu, 1998).

The lag in the domestic supply of milk relative to demand can be explained both in the demand and supply sides. In the demand side large increase in population, a relative increase in per capita income and high income elasticity's of demand; and in the supply side low animal productivity, inappropriate technologies, inadequate research and extension support, poor infrastructure and unfavourable external conditions have contributed to the poor performance and hence the existing huge gap.

CHAPTER THREE

PHYSICAL, DEMOGRAPHIC AND SOCIOECONOMIC CHARACTERISTICS OF ADDIS ABABA

Emperor Menelik and his wife Taitu established Addis Ababa in 1886. This was a significant landmark in the history of urbanization in Ethiopia. The foundation and growth of Addis Ababa represented a break from the tradition of wandering capitals (Garreston, 1974). The city continued to sprawl from a camp into a metropolis. Today, Addis Ababa is the diplomatic capital of Africa (City Hall, 1989).

A study on the production, distribution and consumption of food, particularly dairy products, that doesn't take into consideration the physical, demographic and socio-economic characteristics of the area will only be partial. The physical environment influences the activities with regard to the production, distribution and consumption of dairy products. A study by Abaye et al (1989) divided Ethiopia into high potential dairy area with an altitude between 1800-2500m has temperate climate and well distributed rainfall and good feed availability from pasture, crop residues and by-products, low disease incidence, well developed infrastructure, market and extension services. The medium potential area is where the altitude is between 1500-1800 and 2500-2800 where temperature and rainfall constraints are prevalent, infrastructure is not well developed and vector-transmitted diseases in lower altitude is a problem. Low potential area outside the limits mentioned above is where extreme temperature and low rainfall prevails.

Dairy production, distribution and consumption aspects are also greatly affected by the demographic and socio-economic characteristics of the area. Basically, complex factors influence production and consumption of milk and milk products which include climatic

conditions, milk yields, transport facilities, availability of dairy machinery and equipment, marketing systems, and the purchasing power of consumers. Social and cultural factors such as food habits and preferences also play an important role (Kon, 1972). Demographic factors like age structure of the population and fertility rates determine food demand (FAO, 1998). Hence, this chapter gives a brief background information on the city which is vital to better understand the issue under consideration.

3.1 Physical Characteristics

A/ Location

Addis Ababa, the capital city of Ethiopia and the commercial and industrial center of the country, is located in the central Ethiopian highlands. It is an autonomous administrative city that comprises 6 zones and 28 'weredas'. The city is located near the geographical center of the country between $8^{o}55'$N and $9^{0}3'$N and $38^{0}40'$ E and $38^{0}50'$E. The city limits enclose an area which stretches for more than twenty kilometers from east to west and over twenty five kilometers from north to south and the area of the city covers more than six hundred square kilometers. The northern boundary of the city runs along the crest of the Entoto hills and the western limits are found along the flanks of mount Wechecha. To the south the city extends over the plain towards the Akaki river, where as on the eastern limits it extends towards the plateau of Northern Shewa (EMA, 1988; CSA, 1999). There have been changes in areal extent from time to time.

The site of Addis Ababa is made up of slopping terrain dissected by numerous streams and rivers with scattered hills and valleys. The major streams start from the hills north of the city and drain to different parts of it before joining the Big and Little Akaki Rivers which inturn join the Awash River. Elevation in Addis Ababa ranges from about 2000 meters in the southern limit to over 2800 meters in the north with an average elevation of about 2400 meters above sea level (EMA, 1988).

The situation of the city is also extremely important. Addis Ababa serves not only as a crucial point of contact from the different corners of the country but also as a point of access and distribution to the other parts of the country for products and services. Its central location in the country has a significant functional importance in the integration of the activities of the country.

B/ Climate

Addis Ababa lies within the tropics, a zone of maximum insolation where the overhead sun is experienced twice in a year. However, because of the high elevation tropical temperature conditions are not experienced and the city enjoys temperate climatic conditions. Temperatures are mild and relatively constant throughout the year. It averages approximately 15^0c, within normal daily highs and lows varying between 25^0c and 5^0c. Higher and lower temperatures are occasionally reported (EMA, 1988).

Though it is possible to have precipitation during all the seasons of the year, with maximum from June to September the rain occurs during the seasons of summer, autumn and spring. Summer is the main rainy season which accounts for about 63 percent of the annual average rainfall of 1200 mm (CSA, 1995).

Climate has a direct and an indirect effect on dairying, primarily on account of its effect on the feed supply, on the incidence of diseases and on the transportation and storage of milk and milk products. All domestic livestock are homeotherms and hence maintain their body temperatures within a range most suitable for optimal biological activity and the normal range in mammals is 37^0c -39^0c. These animals preserve a thermal balance between their heat production or gain from the environment and their heat loss to the environment. The ambient air temperature, amount of available moisture, absolute humidity of the air surrounding the animal and the degree of air movement are important climatic

considerations. These variables affect the food and water intake of the animals. If climatic stress depresses appetite, reducing feed intake and grazing time, then it is likely to affect productivity (Payne, 1987).

The major indirect effect of climate on livestock is on the quantity and quality of the feed available; the climatic factors being temperature, rainfall, length of day light and intensity of solar radiation. Climate has also an impact on the prevalence of parasites and diseases. High ambient temperature and humidity provide a favourable breeding environment for internal and external parasites, fungi and disease causing vectors which tend to increase disease incidence and mortality (Abaye et al, 1989). Climate also influences storage and handling of animal products. Tropical climate, for example, favours the rapid deterioration of stored animal products, thus increasing processing and handling costs (Payne, 1987). Studies also indicate that calving is seasonal in most areas of Ethiopia and differs between regions and it is also likely that conception is related to rainfall and thus to the availability of feed and cow nutritional status. The seasonal milk production peaks also coincide with the main rainy season because of better feeding available during this period (FAO, 1998). As studies indicate, the climate of Addis Ababa and its immediate environs is considered to be favourable for dairy production activities.

3.2 Demographic Characteristics

Population occupies a central place in various activities and everything derives meaning and significance in so far as there exists the human population. The World Bank has clearly indicated the central position occupied by people. What is the city if not the people? Whether by Shakespeare or other claimants to his writings, the phrase rightly places human achievement at the forefront of city endeavours. When we talk of the city economy, it is redolent of the myriad efforts of all the people who make the city thrive (World Bank, 1999).

The size of a population is a very important demographic data that should be obtained within the territory of a given governing body for a number of undertakings. For Addis Ababa reliable data on population was available for the first time in September 1961 when the first census was carried out which was followed by another census in September 1967. In 1978 a demographic sample survey was conducted which was followed by the 1984 population and housing census. Thus, the population of the city for the years 1961, 1967, 1978 and 1984 were 443,728; 683,530; 1,167,315; and 1,423,111 respectively. The recent reliable source of demographic data for the city is the 1994 census result, where there were 2,112,737 persons of which 1,023,452 were males and 1,089,285 females and the population has been growing at an average annual growth rate of 3.8% between 1984 and 1994(CSA, 1999).

Addis Ababa, being the capital city and the major center for economic, political and social affairs of the country as well as the seat of international organizations and agencies, has attracted a large number of people. According to the 1994 census result, nearly half (about 47%) of the total population of Addis Ababa is an in migrant and the main form of migration is rural-urban which constitutes 57.8 percent of the total in migration to Addis Ababa (CSA, 1999).

The age structure of the population of the city indicates that the proportion of the population under 15 years was about 32% while the age group 15-64 years comprised about two-thirds of the population. The population above 65 years was very low (about 3%). The literacy rate of the population indicated that 89% of the males and 76% of females above10 years of age were literate. The total fertility rate, infant mortality rate and life expectation at birth were indicated to be 1.8, $78/_{00}$ and 58 years respectively (CSA, 1999).

The distribution of the population in the city bounds shows a significant variation. Population density decreases with distance from the center of the city. In the city, almost all the ethnic groups are represented, the predominant ones being Amhara, Oromo, Gurage and Tigre.

3.3 Socio - economic Characteristics

It is generally believed that urban centers are relatively more privileged than rural areas. The cities and towns are relatively more endowed with the necessary establishments and urban services than rural areas. It is in the cities and towns that industries, hospitals, banks, schools, transportation and communication facilities and other urban amenities are concentrated.

Addis Ababa is the economic metropolis of the country in the sense that most kinds of products of the country concentrate in it for trade as well as transit. It is the largest center of trade in Ethiopia with a large wholesale business and has the majority of the industrial establishments, industrial employment and industrial out put and is also the administrative center of the country. Hence, it has the largest urban population of the country.

In the city, a variety of economic functions are performed by its labour force. In it both the basic productive and non productive functions are undertaken. Activities ranging from primary to tertiary are carried out in the city and people are engaged in them in varying proportions (CSA, 1999). Urban agriculture within the city boundary is an important employer and source of income for many households (Asrat, 1996).

From the population in the age group 15-64 years (1,376,848), 63 percent is economically active and 37 percent is economically inactive. Out of the economically active persons of (863,051); 563,147 were employed while 299,904 were unemployed which indicated that the rate of unemployment was 35 percent of the economically active population aged 15-64 years. The rate of unemployment was also found to be higher for females (41.1%) as compared to the males (30.3%) (CSA, 1999). However, these age groupings may not be true

representatives of the active/inactive population in Ethiopia as people below the age of 15 and above 65 are engaged in various activities. Therefore, it seems that the economically active population is higher than the above age groupings indicate.

As available data indicate concerning the conditions in which the residents live, their level of housing is very low and the amenities of life available is no better. It is an urbanization of very high density, where individuals live under conditions that may be even worse than the rural areas from where they have come,and not having the kind of work or the means of support which will permit them to do more than merely survive (Health Bureau, 1997). The World Bank (1992) indicated that if 244 birr per month for a family of five is considered as poverty line for urban areas, 60% of the estimated two million population of Addis Ababa were poor (Daniel, 2001).

About 88 percent of the houses are traditional type non planned housing with low service levels in the densely populated areas. In most cases the same room is used for working and living. About 68 percent of housing units use traditional type of kitchen and 26 percent lack any sort of separate cooking room and about 90 percent do not possess any sort of bathing facilities. Lack of toilet facilities are also prominent (Health Bureau, 1997). There are also considerable segments of the population using unprotected, usually polluted, rivers, ponds and water wells for different purposes (CSA, 1999). Hence, from the foregoing discussion it is evident that the socio-economic infrastructural amenities required for living are very meagre.

CHAPTER FOUR

PRODUCER CHARACTERISTICS AND BENEFITS OF URBAN DAIRY FARMING

4.1 Demographic and Socio-economic Profile of the Dairy Farming Households

The urban dairy farmers were requested to answer questions pertaining to their demographic and socio economic characteristics. The practice of urban farming is related to factors that include age and sex, cultural ethnicity, place of origin and migration, household size and composition, educational status and occupational characteristics of the households under consideration. The results are presented as follows.

4.1.1 Age, Sex and Marital Status

The great majority of the urban dairy farmers (70.4%) belong to the age group above 50 years. Infact, slightly more than one-third (35%) of the dairy farmers are over 60 years of age. On the otherhand, the proportion of the dairy farmers below the age of 40 and 30 years comprise only about 7.5% and 2.1% respectively. Hence, it is safe to say that most of the participants in the activity belong to the higher age groups. It is also evident that young adults below 40 years tend to predominate in the central location (10.9%) as compared to the periphery (5.4%). On the otherhand, dairy farmers above the age of 60 years predominate in the periphery (39.9) as compared to 27.2% in the center.

As regards the distribution of the urban dairy farming households by sex, males predominate in the activity (85.8%). The fact that there are more men than women in UA ventures doesn't confirm similar findings of other studies of UA where subsistence urban food production is found to be an activity usually practiced by females. However, there are

also studies that indicated commercialized UA being mainly practiced by males. The finding further indicates the spatial variation in the involvement of females in urban dairy farming whereby most of the female urban dairy farmers are found in the peripheral location (see table 4.1).

More than three - fourth (76.2%) of the urban dairy farmers in the sample are married. The proportion of widowed household heads takes the second position (16.3%) followed by divorced /spearated (4.2%) and single household heads (3.3%). It is also vital to note that single household heads predominate in the central location (62.5%) as compared to 37.5% in the periphery while widowed, divorced and married household heads tend to predominate in the peripheral location (see table 4.1).

Table 4.1 : Number and Percentage Distribution of Urban Dairy Farmers by Age, Sex, Marital Status and Location

Characteristics of HHHs	Location				Total Sample HHH	
	Central		Peripheral			
	No	*%*	*No*	*%*	*No*	*%*
Age of HHH						
20-30	2	2.17 (40)	3	2.03 (60)	5	2.08 (100)
30-40	8	8.7(61.5)	5	3.38 (38.5)	13	5.42 (100)
40-50	17	18.48 (32.1)	36	24.32 (67.9)	53	22.08 (100)
50-60	40	43.48 (47.1)	45	30.41 (52.9)	85	35.42 (100)
60-70	15	16.3 (21.4)	55	37.16 (78.6)	70	29.17 (100)
70 and above	10	10.9 (71.4)	4	2.7 (28.6)	14	5.83 (100)
Total	***92***	***100***	***148***	***100***	***240***	***100***
Sex of HHH						
Male	83	90.22 (40.3)	123	83.11 (59.7)	206	85.83 (100)
Female	9	9.78 (26.5)	25	16.89 (73.5)	34	14.17 (100)
Total	***92***	***100***	***148***	***100***	***240***	
Marital Status of HHH						
Single	5	5.43 (62.5)	3	2.03 (37.5)	8	3.33 (100)
Married	74	80.43 (40.4)	109	73.65 (59.6)	183	76.25 (100)
Widowed	10	10.87 (25.6)	29	19.59 (74.4)	39	16.25 (100)
Divorced/separated	3	3.26 (30)	7	4.73 (70)	10	4.17 (100)
Total	***92***	***100***	***148***	***100.00***	***240***	***100.00***

4.1.2 Ethnic Background and Religion

The sample household heads were approached to reveal about their ethnic origin and the religion they practice and the results are presented in table 4.2. Accordingly, the ethnic groups most involved in urban dairy farming are the Amharas (48.3%) followed by the Oromos (39.6%). These two ethnic groups alone comprise about 88% of the total sample households involved in the activity. The Amharas tend to predominate in the central location (57.6%) followed by Oromos (26.1%) while in the periphery the Oromos are the predominant ones (48.0%) followed by the Amharas (42.6%). A close examination of table 4.2 reveals a striking spatial variation in that about 75% of the Oromo dairy farmers are found in the periphery while the remaining 25% of the Oromos are in the center. This variation might be attributed to the city's expansion in which it engulfed the surrounding Oromo lands, thus, these people continue with the agricultureal practices.

As for religion ,the overwhelming majority of the households (93.3%) belong to the Orthodox religion. It appears from table 4.2 that about 73% of the Protestants are located in the center as compared to 27% in the periphery.

Table 4.2: Number and Percentage Distribution of Urban Diary Farmers by Ethnic Background and Religion and Location

Characteristics of HHHs	Location				Total Sample HHH	
	Central		Peripheral			
	No	*%*	*No*	*%*	*No*	*%*
Ethnic Origin of HHH						
Amhara	53	57.61(45.7)	63	42.57(54.3)	116	48.33(100)
Oromo	24	26.09(25.3)	71	47.97(74.7)	95	39.58(100)
Guraghe	11	11.96(57.9)	8	5.41(42.1)	19	7.92(100)
Tigre	3	3.26(42.9)	4	2.7(57.1)	7	2.92(100)
Other	1	1.09(33.3)	2	1.35(66.7)	3	1.25(100)
Total	***92***	***100***	***148***	***100***	***240***	***100-***
Religion of HHH						
Orthodox	81	88.04(36.2)	143	96.62(63.8)	224	93.33(100)
Protestant	8	8.7(72.7)	3	2.03(27.3)	11	4.58(100)
Muslim	3	3.26 (60)	2	1.35(40)	5	2.08(100)

Total	***92***	***100***	***148***	***100***	***240***	***100***

4.1.3 Household Size and Composition

One of the most important characteristics of households that need to be considered is household size. The number of persons in a household influences the amount of labour the household can expend on urban agriculture and the amount of food consumed. In this section, the urban dairy farmer's household is described interms of those who compose it: total number, children and adults including relatives and house servants who live in the household.

Out of the total dairy farming households covered by the survey, the proportion of households with household size of 5-6 persons is relatively higher (29.2%) followed by households with household size of 7-8 persons (24.6%). The proportion of households with household size of 2 persons is the smallest (8.3%). It is interesting to note that the great majority of the households (70%) have household sizes of greater than 5 members. Hence, it is safe to say that the activity supports households with large family size.

About half (51.1%) of the households in the central location do have a household size of greater than 7 persons while the proportion for the households located in the periphery is 34.5%. On the other hand, the proportion of households with less than 4 persons is 21.7% in the centrally located households but it is 35.1% in the periphery. Hence, it appears from table 4.3 that the proportion of households with relatively larger household size predominates in the center while households with smaller household size is considerable in the periphery.

Table 4.3: Number and Distribution of Urban Dairy Farmers by Household Size and Location.

Hsousehold Size	Location				Total Sample Households	
	Central		Peripheral			
	No	*%*	*No*	*%*	*No*	*%*
1-2 persons	8	8.7	12	8.11	20	8.33
3-4	12	13.04	40	27.03	52	21.67
5-6	25	27.17	45	30.41	70	29.17
7-8	23	25.0	36	24.32	59	24.58
above 9	24	26.09	15	10.14	39	16.25
Total	***92***	***100***	***148***	***100***	***240***	***100***

An attempt has also been made to investigate the age composition of the households. Accordingly, the total number of persons above the age of 15 (adults) who belong to the households in the central location were 448. This gives an average household size of 4.9. Similarly, there were 171 persons below the age of 15 years (children) which gives an average household size of 1.9 for those under the age of 15. Overall, there were 619 persons who belong to the investigated urban dairy farming households in the central location whereby the total average household size is 6.7. Actual household size in the centrally located urban dairy farming households ranges from a minimum of two to a maximum of 14.

On the otherhand, the total number of persons belonging to the investigated urban dairy farming households above the age of 15 years in the peripheral location were 597 which gives an average household size of 4.0 and the number of persons below the age of 15 were 268 giving an average household size of 1.8 persons of less than 15 years. Overall, there were 865 persons belonging to all the households in the peripheral location whereby the total average household size is 5.8. Household size reported by the respondents ranges from minimum of 3 to a maximum of 13. Hence, from the analysis it seems that households in the central location have larger average family sizes as compared to the peripherally located urban dairy farming households. Likewise, adult family members (15 years and over) are

found to be larger than children per farming household thereby minimizing the shortages of labour.

4.1.4 Educational Status and Occupational Characteristics

The educational level of the urban dairy farmers is presented in table 4.4. As can be seen from the table, 15.4% had not attended school and are illiterate while 28.3% of them can only read and write. Those who had attended post high school level of education were 13.4 percent. An interesting point one may obtain from a careful observation of table 4.4 is that there is a remarkable difference in the distribution of urban dairy farmers by location. About two-third (65.5%) of those who live in the periphery are either illiterate or only attended up to elementary level compared with only 48.9% in the central location. Respondents who attended secondary level education and above comprise about half (51.1%) of the households in the central location while about one-third (34.5) of the respondents who reside in the peripheral location have attended secondary education and above. Hence, it can be safe to conclude that people with low level of education predominate in the periphery than the central location. Above all, the fact that UA benefits people with low level of education is apparent from the analysis. On the otherhand, it is also important to note that urban dairy farming is practiced by people with different educational levels ranging from the illiterate ones to those who attended university. That many people with higher levels of education are involved in UA implies that urban agriculture is not a marginal activity. Involvement of such highly educated people may also suggest that the practice of UA may continue to expand with increasing urban growth and ultimately be legitimized in the urban policy as more educated people tend to protect their investments by influencing policies and regulations in their favour.

Table 4.4 : Number and Distribution (%) of Urban Dairy Farmers by Educational Status and Occupational Characteristics and Location

Characteristics of HHHs	Location				Total Sample Households	
	Central		Peripheral			
	No	*%*	*No*	*%*	*No*	*%*
Educational Level of HHH						
illiterate	10	10.87(27.0)	27	18.24(73.0)	37	15.42(100)
read & write	23	25.0(33.8)	45	30.41(66.2)	68	28.33(100)
primary level	12	13.04(32.4)	25	16.89(67.6)	37	15.42(100)
secondary level	34	36.96(51.5)	32	21.62(48.5)	66	27.5(100)
college diploma	7	7.61(31.8)	15	10.16(68.2)	22	9.17(100)
University degree	6	6.52(60)	4	2.7(40)	10	4.17(100)
Total	***92***	***100 -***	***148***	***100 -***	***240***	***100***
Occupations						
Dairy farmer	23	25.0(30.3)	53	35.81(69.7)	76	31.67(100)
(private) business person	22	23.91(41.5)	31	20.95(58.5)	53	22.08(100)
Public servant	27	29.35(54)	23	15.54(46)	50	20.83(100)
Pensioner	20	21.74(32.8)	41	27.7(67.2)	61	25.42(100)
Total	***92***	***100 -***	***148***	***100 -***	***240***	***100 -***

Table 4.4 also shows the occupational structure of the dairy farm owners of the study area. Of all the urban dairy farming household heads covered by the survey, about 31.7% of them identified themselves as dairy farmers, 25.4% as pensioners, 22.1% as business persons and 20.8% as public servants. Hence, it is evident in that the urban dairy farmers are from diverse occupations. It appears from table 4.4 that urban dairy farming is the major source of livelihood for the greatest proportion of the peripheral urban dairy farming household heads (69.75%), in parenthesis, while the investigated household heads who are solely dependent on dairy farming is limited (30.26%) in the central location. Relative availability of land in the periphery compared to the scarcity in the inner city may explain the situation. Similarly, from the investigated urban dairy farming households public servants predominate in the center compared to the periphery while pensioners and private business persons are widespread in the periphery compared to the center.

4.1.5 Region of Birth and Migration Status

As indicated in the preceding sections of this paper, the practice of urban agriculture is related to factors which include place of origin and migration. Therefore, an attempt has been made to investigate the region of birth and migration status of the respondents. As presented in table 4.5 the overwhelming majority (78.75%) of the interviewed urban dairy farming household heads are migrant while the remaining 21.25% are non-migrants. There is no significant difference in migration status of the households by location. The fact that migrants predominate in the activity may be because the migrants tend to bring agricultural skills with them to the city from rural areas or it can also be because most people in Addis Ababa are migrants.

From table 4.5, it is striking to see that 93% of the urban dairy farming households resided in Addis Ababa for more than twenty years. Migrants who resided in the city for less than twenty years comprise only about 7.0% of the households. Relatively speaking, the percentage of recent migrants in the periphery is higher than in the central location. Hence, it can be concluded that most urban dairy farmers are well established migrants who might have more access to land than the recent arrivals.

Table 4.5: Number and Distribution (%) of Urban Dairy Farmers by Region of Birth, Migration Status and Years of Residence in Addis Ababa and Location.

	Location				Total Sample Households	
	Central		Peripheral			
	No	*%*	*No*	*%*	*No*	*%*
Migration Status						
migrant	74	80.43	115	77.7	189	78.75
non migrant	18	19.57	33	22.3	51	21.25
Total	***92***	***100 -***	***148***	***100***	***240***	***100***
Years (duration) of Residence in AA*						
10-20 years	4	5.41	9	7.83	13	6.88
20-30	20	27.03	26	22.61	46	24.34
30-40	27	36.49	42	36.52	69	36.51
above 40	23	31.08	38	33.04	61	32.28
Total	***74***	***100***	***115***	***100***	***189***	***100***
Place of origin *						
Shewa	43	58.11	59	51.3	102	53.97
Wollo	7	9.46	18	15.65	25	13.23
Wellega	3	4.05	13	11.3	16	8.47
Gonder	3	4.05	6	5.22	9	4.76
Gojjam	5	6.76	4	3.48	9	4.76
Tigray	2	2.7	4	3.48	6	3.17
Sidamo	3	4.05	3	2.61	6	3.17
Arsi	4	5.41	3	2.61	7	3.7
Other	4	5.41	5	4.35	9	4.76
Total	***74***	***100***	***115***	***100***	***189***	***100***

**** for migrants only***

As indicated in table 4.5, most respondents were born in areas contiguous with Addis Ababa. Hence, more than half of the investigated urban dairy farmers (about 54%) came from the Shewa region. This seems to justify the fact that most migrants are involved in short distance migration. Considerable proportion of the urban dairy farming household heads had come from Wollo (13.2%) and Wellege (8.4%). Others had come from the other regions of the country.

4.2 Benefits of Urban Dairy Farming Activities

Literature indicate that urban agriculture benefits the urban population, urban environment and the countries at large. The contribution of urban agriculture in satisfying nutritional requirements of the producers and improving their general health, income generation and cash savings, employment generation, improving the asset position of the dairy farming households and the environmental benefits is considerable. Hence, this section treats the merits of urban dairy farming for the investigated households in particular and the urban environment in general.

4.2.1 Nutritional and Food Security Benefits

As indicated earlier, milk is considered to be nature's most complete food and its nutritional potential is unparalleled by any other food used by humans as it provides more essential nutrients in significant amounts than any other food. Hence, milk production by the dairy farmers tends to increase household milk consumption. The increased milk consumption is therefore assumed to improve nutritional status of the households. Urban dairy farming ensures a regular and dependable supply of food thereby improving the livelihood of the producers.

The food security status of urban households is dependent on many factors, which include availability of food through own production and the ability to access food through purchase depending on the ability to earn cash. Under conditions of rising food prices and a fall in purchasing power, the household food insecurity grows and food takes the lion's share of the household budget. On the otherhand, from production until the moment food reaches the urban table, a series of intervention activities such as assembling, handling, processing, packing, transport, storage, wholesaling and retailing increases its price. This raises food price which further increases the ratio of food expenditure. Hence, the urban dairy farmers are at an advantage as they produce part of their own food, cutting short all those

interventions, whereby the activity is vital in improving the family diet and reducing food costs. On the otherhand, since urban dairy farming is practiced as a supplement for household food supplies acquired from the market, the cash income derived from the sell of dairy products is also used in the purchase of food from the market. The increased income from dairying enables households to purchase more food and a wide variety of foods whereby the income effect contributes to improving the nutritional status of households.

Table 4.6: Producers Responses on the Sufficiency of their Dairy Output for their Family Consumption

	Do you think that your dairy output is sufficient for your family consumption?		
	Central (No &%)	Periphery (No & %)	Total HHH (No & %)
Yes	56 (60.9)	68 (45.95)	124 (51.67)
No	36 (39.1)	80 (54.05)	116 (48.33)
Total	**92 (100)**	**148 (100)**	**240 (100)**

Responses of the urban dairy farming households as to whether the dairy output that they produce is sufficient for their family consumption or not is presented in table 4.6. Of all the investigated households, slightly more than half of the dairy farmers (51.7%) indicated that the dairy output that they produce is sufficient for their family consumption. Careful examination of table 4.6 reveals that the percentage of respondents indicating sufficiency of output for their family consumption is higher in the central location (60.9%) compared to the peripheral location (45.9%). This may be because most of the dairy farmers in the central location allocate most of the output for home consumption and it can also be attributed to the large proportion of exotic and cross bred cows being kept per producer. Similarly, most of the households in the central location reported other sources of income other than dairying compared to the peripheral location producers.

Table 4.7: Producers' Responses on the Shortfall of Dairy Products

	When do you encounter a shortfall of dairy products?		
	Central (No &%)	Periphery (No & %)	Total HHH (No & %)
Wet season (summer)	18 (19.56)	13 (8.78)	31 (12.9)
Dry season (Winter)	33 (35.87)	88 (59.46)	121 (50.4)
when cows get pregnant (especially closer to parturition)& dry	41 (44.57)	47 (31.76)	88 (36.7)
Total	**92 (100)**	**148 (100)**	**240 (100)**

The percentage of investigated dairy farming households who experienced shortfall of dairy products is indicated to be higher during the dry season (50.4%) to be followed by the gestation period of animals specially closer to parturition and when cows are dry (36.7%). It is interesting to note that the shortfall of dairy output is most pronounced during the dry season for the peripherally located dairy producers (59.5%) as compared to the centrally located dairy farming households (35.9%). The writer thinks that the shortage of dairy feed during the dry season for the peripheral dairy farmers who tend to graze their animals may explain the situation compared to the centrally located producers who are almost entirely dependent on stall- feeding. Seasonal variation in the output of dairy products is reported because of shortage of animal feed at different seasons. Hence, the impact of climate mainfests itself in the variation of feed availability which inturn influences dairy output.

Cows during gestation, specially closer to delivery, significantly explains to the shortfall in dairy products. This is so because the dairy enterprises considered in the study are of small scale (1-5 cows) and specially for those dairy farms with one or two cows, if the cows gestate shortage of dairy output is inevitable. Hence, the impact is more pronounced in the center (44.6%) compared to the periphery (31.7%) as the number of animals per farming household is lower in the center compared to the periphery.

Table 4.8: Perception of Informants on the Occurrence of Milk Taste Differences by Breed of Cows and Milk Preference from Breeds.

Is there milk taste difference between local breeds and exotic breeds & their crosses	Central		Peripheral		Total	
	No	*%*	*No*	*%*	*No*	*%*
Yes	56	60.9	115	77.7	171	71.2
No	0	-	4	2.7	4	1.7
Do not know	36	39.1	29	19.6	65	27.1
Total	***92***	***100***	***148***	***100***	***240***	***100***
Milk of which breed is mainly used for household consumption						
Local	51	91.1	92	80	143	83.6
exotic/cross breed	5	8.9	23	20	28	16.4
Total	***56***	***100***	***115***	***100***	***171***	***100***

Table 4.8 shows the perception of respondents as to whether there exists any milk taste differences between exotic/crossbred and local cows. Accordingly, 71.3% of the dairy farming household heads have identified the presence of milk taste difference by breed of cows while 27.1% of the respondents do not know whether there exists milk taste differences by breed of cows or not. Only 1.7% of the respondents experienced no taste differences. Here it should be pointed out that even for those who replied 'do not know' the main reason may be that they either keep local cows only or exotic and hybrids only in their herd so that they have never compared the differences. There are also dairy farmers who indicated milk taste differences being determined by the type of feed the cows are being fed.

The preference for milk for household consumption by breed of cows is also presented in table 4.8. Out of the dairy farming households who indicated milk taste difference by breed of cows, 83.6% preferred the milk of local cows while the remaining 16.4% preferred the milk of exotic breeds and their crosses for household consumption. The percentage of household heads who preferred the milk of local cows is somewhat higher in the center (91.1%) compared to the periphery (80%).

The sample dairy farming households were asked whether they have ever sold dairy cows to feed their family. Accordingly, 11.6% of the dairy farmers have sold dairy cows to feed their family while 88.4% have never sold dairy cows for the sake of meeting the need of their families. Although few of the dairy farmers have reported sell of livestock to meet the need of food consumption, the forced sell to feed their family may be a manifestation of the food insecurity problem. This, surely, has a devastating effect on the well being of the dairy farmers.

4.2.2 Income Generation and Employment Benefits

Most of the dairy farmers obtain the major portion of their incomes from the sale of milk, as considerable percentage of the producers are almost entirely dependent on dairying alone and as many of them are also pensioners (see table 4.4) perhaps with limited alternative sources of income. In almost all the cases, although they also retain unspecified amounts for household consumption, most producers sell a large proportion of the milk they obtain. Milk production is seen as a major and supplemental source of income to meet the family's needs to buy other commodities and purchase inputs for livestock production. Some of the producers also reported keeping pure breed and their crosses for commercial milk production and obtain milk for household consumption from indigenous cows. Generally, the marketing of livestock products, specially milk, provides the households with a regular daily source of income. On the otherhand, sales of livestock occur infrequently by households as individual herd sizes are small and livestock are considered as assets that can only be sold in times of great adversity or critical need for cash.

The dairy farming household is a unit of mobilizing labour, managing productive resources and organizing consumption. The household produces part of its own subsistence and participates in the marketing of the dairy product. Since dairying is a labour intensive activity, it generates significant employment opportunities in production, processing and marketing both for the household heads and their dependents. The activity provides

employment not only for the household heads and their spouses, but also for the children and other household members, and for other people like herders, sellers of animal feed including leaves and grasses and sellers of produce thereby reducing the level of unemployment within the dairy farming household and the community in general.

The dairy enterprises provide permanent as well as temporary employment, most of the employees being family members. In this regard Netting (1993) indicated that although there are costs in food, housing, clothing and time in raising children to the point where they are producing economic benefits for the household, these expenses are less for the farm than for the non-farm families and children are most productive. Smith (1991) also indicated that urban dairy farming can be a part-time activity where household members work in other sectors of the urban economy and Falvey (1999) also indicated that part - time farmers appreciated the peace and contentment that comes from physical work, and the value of raising children with responsibilities in a family sustaining enterprise. On the other hand, most of the dairy farmers indicate that paid labour is fewer compared to the labour of household members and most of the work is done by household members.

4.2.3 Asset Position of Dairy Farming Households

Fixed inputs in dairying include dairy cattle and the dairy shed, as well as such durable inputs as tools, water barrels etc. In addition, the household's possessions which include houses (dwelling units), vehicles, T.V, radio, jewelry, and household equipment are important household's assets. These assets are usually valuable and tradable in the market which can be used in mitigating crisis faced by the households. For the dairy farmers possession of the assets is in one way or another related to the possession of animals. The livestock resources are important assets of the dairy farmers. Those dairy farmers who owned more quantity and quality of animals specially exotic breeds and their crosses, can be at a good stand in many regards. The dairy animals are of crucial importance as a direct source of food and cash income to purchase food or could be sold during consumption shortfalls. The visible assets

of urban dairy farmers in connection with their activity and their personal possessions are treated in this section except their livestock possession which is treated in the next chapter.

Table 4.9: Household Ownership of Establishments for Dairying

Items owned by HHH	Location					
	Central		Peripheral		Total	
	No	% of HH	No	% of HH	No	% of HH
Dairy housing	92	100.0	148	100	240	100
Separate milking parlour	6	6.5	17	11.5	23	9.6
hay shade	65	70.7	87	58.9	152	63.3
Cattle shade	41	44.6	36	24.3	77	32.1
Feed shade	74	80.4	88	59.5	162	67.5

From table 4.9, it can be clearly observed that dairy housing is an item owned by all the dairy farmers in both locations. Feed shade and hay shade are owned by dairy farmers in significant proportions, 67.5% and 63.3% respectively in both locations while separate milking parlour is owned by very few of the dairy farmers (9.6%). With regards to the spatial variation, more of the dairy farmers in the peripheral location (11.5%) do have separate milking parlor as compared to those in the center (6.5%). This may be because land for dairying is relatively abundant in the peripheral location as compared to the center. Cattle shade tends to be more common in the center than the periphery perhaps because the animals in the periphery are usually out for grazing thereby the necessity of cattle shade is minimal. Hay shade and feed shade predominate in the center. This might be because storage of animal feed is more pronounced in the center and significant quantity of stored feed should be there as animals do not usually graze. In the periphery, dairy farmers tend to purchase animal feed usually for shorter time durations either from the nearby producers or local animal feed markets and animals are usually grazing in the communal grazing lands thereby the necessity of feed shade is slightly lower.

Table 4.10: Household Possessions of the Sample Dairy Farmers

Items owned by HHH	Location					
	Central		Peripheral		Total	
	No	% of HH	No	% of HH	No	% of HH
Private house	90	97.8	145	98.0	235	98.0
Vehicle	14	20.7	15	10.1	29	12.1
Telephone & TV	43	46.7	61	41.2	104	43.3
radio, piped water	91	98.9	135	91.2	226	94.2

From table 4.10, it appears that the urban dairy farmers are at good stands in many regards. An overwhelming majority of them do have private houses of their own and piped water. Significant proportion of them (43.3%) have telephones and televisions. The vehicle possession of the households is found to be lower (12.1%). With regards to the spatial variation, considerable variation between the dairy farmers is not observed by location in the possession of private houses. The possession of vehicles, piped water and television is a bit higher for the central than the peripherally located dairy farmers. The variation in the duration of occupancy of the land may explain part of the situation as the peripheral locations tend to be relatively newly built up areas where infrastructures are not widspread. Occupational structure and access to other sources of income can also partially explain the differences.

Although other sources of income are likely available to the dairy farmers, as most of the dairy farmers are involved in other sectors of the urban economy and where dairying is a source of supplementary income, it is clear that the economic and nutritional benefit accruing to the dairy farmers from the activity is so tremendous in many regards. Hence, it can be presumed that the farming households can be much better off than the non farming households.

4.2.4 Environmental Benefits

Studies conducted on urban agriculture indicated positive effects of the activity for environmental improvement if carried out in a manner that is appropriate. With regards to

urban dairy farming, it is found to be beneficial for the sake of waste recycling as organic wastes form households, streets, agroindustries are valuable feed for the dairy cattle. The dairy farmers have the practice of feeding food leftovers or reject food for their dairy animals which otherwise could have been wasted and contributed to an increased waste generation. As indicated in the following chapter, industrial by products which include wheat bran, oil seed cake, cotton seed and agricultural by products which include teff, barley and wheat straws and household by products like 'atela' are major sources of animal feed which are wastes.

For the dairy farmers who also practice market gardening in the wetlands, the role of livestock in bringing nutrients back into soil is well understood as the soil is enriched by faeces and urine from livestock. Similarly, many of the dairy farmers, specially in the peripheral location, utilize manure to fertilize the soil and grow crops in the backyards. The writer believes that there should be a mechanism of delivering manure and wastes from animal processing to nearby gardens and farms. The rapid recycling of animal wastes also helps reduce the health risks caused by livestock in the city. However, there are also negative effects of urban dairy farming on the environment which will be treated in later sections of the paper.

The overall discussions of this chapter reveal that, most of the dairy farmers belong to higher age groups and males dominate in the activity. Two ethnic groups, Amhara and Oromo, are major participants. The majority belong to Orthodox religion. Most of the dairy farming households have more than five family members and people with low level of education dominate in the activity. It is also noted that urban dairy farmers are from diverse occupations and most of them are well established migrants. Urban dairy farming benefits the producers in satisfying their nutritional requirements, as a source of income and in creating permanent and temporary employment for family members as well as for environmental improvement. The producers are at good asset position nearly all of them possessing private house and other visible assets.

CHAPTER FIVE

DAIRY PRODUCTION INITIATIVES, PRODUCTION INPUTS AND PROCESSES AND CONSTRAINTS

5.1 The Move to Urban Dairy Farming

5.1.1 Reasons for Practicing Dairy Farming

There is a need to investigate the factors that motivated urban dairy farming households to start the activity and it is also vital to point out the time when the diary farmers started their operation. As presented in table 5.1the major factors that motivated the dairy farming households to start the activity include the need to feed their families (59.2%) followed by rural background (27.5%), market (17.1%) and business close to home or residence (9.2%). It is interesting to note that the need to feed family is a major motivating factor for the centrally located urban dairy farmers (70.7%) compared to 52.0% for the peripherally located dairy farms; while for those of the dairy farmers rural background as a motivating factor predominates in the periphery (35.8%) compared to 14.1% in the central location.

As regards age of the enterprises, about three-fourth (74.2%) of the dairy enterprises were established between five and twenty-five years ago whole 10.4% of the farms are below 5 years of age and 15.4% of them are above 25 years. Similarly, 31.7% of the dairy enterprises in the periphery are 10 years old while the proportion is 43.5% in the center. On the other hand, 8.6% of the dairy enterprises in the inner city have been operating for over 25 years as compared to 19.6% in the periphery.

Table 5.1: Factors Motivating the Urban Dairy Farmers to Start Dairying and the Age of Enterprises

	Location				Total HH	
	Central		Periphery			
	No of HHH	% of HHH	No of HHH	% of HHH	No of HHH	% of HHH
Motivating Factors						
Feed Family	65	70.7	77	52.0	142	59.2
Market	18	19.6	23	15.5	41	17.1
Rural background	13	14.1	53	35.8	66	27.5
business close to home (residence)	7	7.6	15	10.1	22	9.2
Training in dairying	1	1.1	8	5.4	9	3.8
Love for Dairying & Cows	5	5.4	9	6.1	14	5.8
no other option	-	-	12	8.1	12	5.0
Age of Enterprises (year)						
1-4	14	15.2	11	7.4	25	10.4
5-9	26	28.3	36	24.3	62	25.8
10-14	18	19.6	29	19.6	47	19.6
15-19	16	17.4	20	13.5	36	15.0
20-24	10	10.9	23	15.6	33	13.8
25-29	3	3.2	14	9.5	17	7.1
30 and above	5	5.4	15	10.1	20	8.3
Total	***92***	***100***	***148***	***100***	***240***	***100***

The factors that need to be considered in the choice of location for the dairying activity and change of location are important spatial aspects to be treated. As can be seen from table 5.2 about three -fourth of the dairy farmers have considered business at residence as the most important factor for the choice of location. Hence, the residential compound is a unit of dairying operation and residence. The shared residential unit has the advantage of minimizing land costs. Nearness to sources of animal feed is considered by 23.8% of the dairy framers in the choice of location. Availability of water and transport are found to have minimal effetcs on the choice of location as such utilities tend to be ubiquitous. At this point it should be made clear that availability of grazing land has never been a factor in the choice of location by the dairy farmers in the central location while 29.7% of the households in the periphery considered availability of grazing land to start dairying at the location considered.

An attempt was also made to see whether the dairy farmers had changed their initial locations where dairying was carried out and the results were presented in table 5.2. Accordingly, an overwhelming majority of the investigated dairy farming households (91.7%) have never changed initial locations. From those households who indicated changes of initial locations, the peripheral producers tend to predominate in doing so as it is likely that producers change location from the land scarce inner city to the periphery. Although changes of locations by the centrally located urban dairy farmers are least reported, even those who changed locations might have moved to the nearby areas which were once vaccant but are now crowded and are ofcourse in the center.

Table 5.2: Factors of Site Selection and Change of Location of the Dairy Enterprises

	Location				Total HH	
	Central		Periphery			
	No of HHH	% of HHH	No of HHH	% of HHH	No of HHH	% of HHH
Factors for Choice of Location						
Residence	85	92.4	95	64.2	180	75.0
Nearness to source of feed	14	15.2	43	29.1	57	23.8
Nearness to Consumer	19	20.7	19	12.8	38	15.8
Availability of grazing land	-	-	44	29.7	44	18.3
Availability of transport	6	6.5	7	4.7	13	5.4
Availability of water	5	5.4	9	6.1	14	5.8
Have you changed initial location?						
Yes	5	5.4	15	10.1	20	8.3
No	87	94.6	133	89.9	220	91.7
Total	***92***	***100***	***148***	***100***	***240***	***100***

5.1.2 Source of Initial Capital, Animals and Information and Skills

The initial source of capital to start dairy farming, procurement of the dairy cows to start operation and the source of information and skills in conducting the dairying activity were considered in the study. Accordingly, the largest proportion of the dairy farming households

(82.1%) have used their own money to start the activity followed by borrowing from relatives and friends (11.3%), inheritance and gift (3.7%) and borrowing from banks (2.9%). As far as the procurement of the initial dairy cows to start dairying operation is concerned, 80.8% of the dairy farming households initially purchased dairy cows, while 12.1% inherited and 7.1% acquired them as gifts. As regards the source of knowledge and skills for conducting the dairying activity, 80.8% of the households have the know-how learned from relatives and friends and short training (8.4%), employed in similar activity (7.9%) and college training (3.0%) were also considered in order of importance. From the analysis it appears that rural background and family apprenticeship are important sources of knowledge and skills in carrying out a dairying activity.

Careful examination of table 5.3 reveals that inheritance of capital for dairying is found to be more pronounced among the centrally located dairy farmers (5.4%) compared to 2.7% in the periphery. Purchase of dairy cows by households is indicated to be more in the center (90.2%) compared to 75% in the periphery while inheritance of initial dairy cows is more in the periphery (17.6%) compared to 3.3% in the center. It is also evident that short training in dairying and college training are important sources of knowledge and skills for the dairy farming households to carryout dairying in the periphery compared to the center.

Table 5.3:Number and distribution of producers by Sources of Start up Capital, Initial Dairy Cows and Information and Skills for Dairy Farming

	Location				Total HH	
	Central		Periphery			
	No of HHH	% of HHH	No of HHH	% of HHH	No of HHH	% of HHH
Source of Start-up Capital						
Private (own money)	76	82.6	121	81.8	197	82.1
Borrowed from friend Relatives	8	8.7	19	12.8	27	11.3
Borrowed from bank	3	3.3	4	2.7	7	2.9
Inheritance /gift	5	5.4	4	2.7	9	3.7
Total	***92***	***100***	***148***	***100***	***240***	***100***
Source of initial dairy cows						
Purchase	83	90.2	111	75.0	194	80.8
Inheritance	3	3.3	26	17.6	29	12.1
Gift	6	6.5	11	7.4	17	7.1
Total	***92***	***100***	***148***	***100***	***240***	***100***
Source of knowledge & skills						
relative & friend	79	85.9	115	77.7	194	80.8
previous similar employment	10	10.9	9	6.1	19	7.9
short training	3	3.2	17	11.5	20	8.3
college training	-	-	7	4.7	7	3.0
Total	***92***	***100***	***148***	***100***	***240***	***100***

5.2 Dairy Production Inputs

5.2.1 Dairy Breed Types and Composition and Factors of Breed Selection

As it is discussed earlier, the majority of Ethiopian cattle are of indigenous breeds while the population of exotic and cross breed cattle is small and is mainly found in the urban and peri urban areas of the country. Even if the milk production potential of the exotic cows is superior to the local breeds, the indigenous breeds have evolved and adapted over many centuries to the climate, altitude, available feed supply, endemic diseases and parasitesa. The local breeds posses survival traits exhibited by small size, low milk production, slow

maturing rate, moderate levels of immunity, tolerance to the prevalent disease organisms and parasites, excellent mothering and foraging ability, heat tolerance and minimal water requirement (Sendros and Tesfaye, 1998). It is also pointed out that unavailability of suitable animals for dairy enterprises either as foundation stock or as replacements and lack of adequate characterization of cattle breeds (indigenous, cross breeds, exotic breeds) for milk production are constraints to improved dairying (Abaye et al, 1998).

As shown in table 5.4 the dairy herd in both locations are composed of local (indigenous), crossbred and pure exotic animals. The average number of cattle kept per household is 7.32. This average consists of cows both milking (2.83) and dry (1.65); heifers, bulls, calves and oxen (2.84). The central zone dairy farmers keep on the average 6.3 cattle with 2.63 milking cows; 1.11 dry cows; and 2.57 heifers, bulls, calves and oxen. The peripheral dairy farmers keep on average 7.95 cattle consisting of 2.95 milking cows; 1.99 dry cows; and 3.01 heifers, bulls, claves and oxen. The relatively high average cattle holding observed in the peripheral zone might be attributed to the availability of land and low land prices; while the predominance of exotic breeds and their crosses in the central zone is a manifestation of the relatively high level of intensification of the farms on the land scarce inner city.

The ratio of dry to milking cows in a dairy herd is said to affect the profitability of a dairy business. Infact total milk production depends on the breed type, the number of lactating cows in the herd and the amounts and quality of feed fed (Debrah & Birhane, 1991). The output of milk, as a major product and source of income, is determined by the number of cows in milk and their productivity in relation to the number of dry cows in the herd. The accepted (recommended) ratio of dry to milking cows in a dairy herd is between 20-25: 80-75 (Belachew et al, 1994). The ratio of dry to milking cows is over the accepted level indicating that the dairy farms are better managed and more productive. In addition to a strong effort in improving the genetic potential of the cows to increase milk production per animal, there must be an attempt to increase the number of animals so that there will be

minimum non-lactation time inorder to sustain products for home consumption and for market.

Table 5.4: Herd Size and Composition Owned by the Dairy Farming Households

Herd Size Owned by HH	Location				Total HH	
	Centeral		Periphery			
	No	average/farm	No	average/farm	No	average/farm
Milking Cows						
Pure local (indigenous)	12	0.13	169	1.14	181	0.75
crossbred	85	0.92	125	0.84	210	0.88
pure exotic	145	1.58	143	0.97	288	1.2
Sub total	***242***	***2.63***	***437***	***2.95***	***679***	***2.83***
Dry Cows						
pure local	7	0.08	110	0.74	117	0.49
crossbred	27	0.29	62	0.42	89	0.37
pure exotic	68	0.74	123	0.83	191	0.80
Sub total	*102*	*1.11*	*295*	*1.99*	*397*	*1.65*
Total cows	*344*	*3.74*	*732*	*4.95*	*1076*	*4.48*
Heifers, bulls, calves, oxen	*236*	*2.57*	*445*	*3.01*	*681*	*2.84*
Total Herd	***580***	***6.30***	***1177***	***7.95***	***1757***	***7.32***

An important aspect that needs to be considered by way of undertaking a sustainable and profitable dairying enterprise is the careful selection of breeding stock. When one chooses a breed, it is advisable to choose a breed according to one's preference, ability to feed and manage and availability of stock (Kinsey, 1993). As can be seen from table 5.5, more than three-fourth (76.3%) of the households consider average production of milk and fat as the basic factor in breed selection. Other factors considered by the dairy farmers in breed selection include original cost (34.2%), feed supply (30.4%), beef value of discarded cows (20.4) and preference of the breeder (5%). It is also vital to note that 19.2% of the dairy farms didn't use any criteria to select the initial dairy cows as they are inherited and/or gifted. Careful scrutiny of table 5.5 reveals that relatively larger proportion of the dairy farmers in the central location consider average production of milk and fat in breed selection than

peripheral dairy farmers; while original cost and feed supply were considered mainly by the peripheral zone dairy farmers compared with the center.

An attempt was made to understand how the dairy farmers replace discarded cows from the herd. It is found out that dairy farmers raise calves to replace cows and buy from the market or use both methods. About 95.8% of the dairy farmers raise calves to replace cows and 12.1% of the dairy farming households buy from the market. Studies indicate that there are numbers of disadvantages in replacement buying. Failure to raise any calves as milk producers by being dependent up on buying cows to replace those discarded from the herd is not recommended. Cows might be purchased from a dealer without any information available regarding the merits of the animals beyond what can be determined from appearance. In the practice of replacing cows by purchase, the cows can be of ordinary grade, usually a cow whose value as a milk producer is known is not offered for sale at the market price. In addition, there is also the danger of introducing disease which may result in the lose of the entire herd.

Table 5.5: Factors Considered in Initial Breed Selection and Replacement of Discarded Cows by the Dairy Farming Households

	Location				Total hh	
	Central		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Factors Considered in Breed Selection						
Average production of milk & fat	80	86.9	103	69.6	183	76.3
Original Cost	25	27.2	57	38.5	82	34.2
feed supply	19	20.6	54	36.5	73	30.4
beef value of discarded cows	18	19.6	31	20.9	49	20.4
preference of the bleeder	8	8.7	4	2.7	12	5.0
other*	9	9.8	37	25.0	46	19.2
Replacing Discarded Cows						
Buying from market	13	14.1	16	10.8	29	12.1
raising calves to replace cows	85	92.4	145	98.0	230	95.8

**** no criteria is used as cows are inherited/gifted***

5.2.2 Access to Land and Labour in Dairying

Land and labour are important inputs in a dairying enterprise. Accessibility to urban land for urban agriculture is curtailed by intense competion from other urban land uses such as housing and industrial development (RUFA, 2001). But urban dairy farming is better off in such regards compared say to urban market gardening as the animals tend to be stall- fed and production takes place in the residential units as evidence from the survey reveals. It is also important to note that usually poor households and newest arrivals in a city often do not have access to land to practice urban agriculture (Smith, 1991).

Although land constraints have always been there in an urban area, it is surprising to see that urban dairy farming is practiced in very crowded sections of the city. The fact that urban dairy farming is practiced in all the 'weredas' of Addis Ababa can be a very good testimony. However, clear spatial variations are observable in the distribution of the dairy farming enterprises. For example, Asrat (1996) indicated that the concentration of the enterprises increases from the center to the outskirts and even from the periphery, the density of dairy enterprises is least marked in the north. The high density in the periphery is said to be related to the availability of open land for grazing.

The study attempted to have an insight of the land area that the urban dairy farming households have to conduct the dairying activity. Surprisingly enough, the largest proportion of the dairy enterprises (37.5%) have a land area ranging between 100-200 m^2. About three-fourth (75.8%) of the dairy farming households possess a land area of less than 400 m^2. Less than 10 percent of the dairy farmers have land area of more than 500 m^2. It seems from table 5.6 that relatively larger land area is possessed by the peripheral dairy farmers compared to the center. Fifty Percent of the dairy farming households in the central location possess an area of less than 200 m^2 compared to 29.7% in the periphery while only 4.3% in the center have more than 500 m^2 land area compared to 12.2% in the periphery. At this point it should

be noted that the land area possessed by the dairy farming households is mainly both a residential unit and a unit of dairying operation.

Table 5.6 also shows the place where dairying is conducted. The vast majority of the dairy farming households (92.1%) use their residential unit as a place where dairying is carried out. Of the total respondents 7.9% only have a separate land area where dairying is conducted. From the analysis it seems that relatively larger proportion (11.5%) of the dairy farmers in the periphery do have a separate dairying area compared to 2.2% in the center.

In dairy housing most cowsheds are built of cheap locally available materials with walls made of corrugated iron sheet or mud and wattle. In some of the dairy houses it is observed that the walls are plastered with manure which has a dual purpose; it is used to close openings thereby warming animals and when dry it is taken off and is used as fuel. The roofs are in all cases made of corrugated iron sheets. The dairy sheds in most cases have earthen floors and in some cases are floored with blocks of stone. Studies made indicate that good dairy housing bears a relationship with increased productivity of the dairy cows.

Table 5.6: Land Area (premises) Used for Dairying by the Enterprises

Area (m^2)	Location				Total hhs	
	Central		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
100-200	46	50.0	44	29.7	90	37.5
200-300	18	19.6	33	22.3	51	21.3
300-400	13	14.1	28	18.9	41	17.1
400-500	11	12.0	25	16.9	36	15.0
500 and above	4	4.3	18	12.2	22	9.2
Total	***92***	***100***	***148***	***100***	***240***	***100***
Place where dairying is conducted						
Residence	90	97.8	131	88.5	221	92.1
Separate area	2	2.2	17	11.5	19	7.9
Total	***92***	***100***	***148***	***100***	***240***	***100***

An attempt has been made to investigate whether the dairy farming households do have sufficient land for dairying. As summarized in table 5.7 more than half (59.2%) of the dairy farming households believe that they do not have sufficient land area for their activity. Although dairy farmers in both locations have strongly felt the restriction of physical space for dairying, it is more conspicuous in the center (64.1%) compared to the periphery (56.1%). The apparent restriction of physical space is related with animal welfare and comfort related to space availability. Studies indicate clear trend for cows to display more aggressive behaviour (fighting, pushing and butting) in smaller areas compared with more friendly behaviour in larger areas such as licking (Vieyra et al 1994, in Losada et al 1996).

The investigated dairy farmers were asked whether they have any intention to expand their activities and where they want to have the expansions. Interestingly enough, it is found that the vast majority of the dairy farming households in both locations (80.8%) have the intentions to expand their activities. As it may be expected, the majority of the dairy farmers in the central location (88%) have indicated their intention to expand compared to 76.4% in the periphery. Similarly, more than two-thirds (69.1%) of the dairy farmers want to relocate and carryout their dairying activities in places where there are convenient and large land areas at the outskirts of the city while 30.9% of the dairy farmers want to expand their activities at the present locations. It is also evident from table 5.7 that relocating the enterprises are considered more by the central dairy farmers (85.2%) compared to 57.5% of the periphery while expansions at present locations are considered more by the peripheral dairy farming households (42.5%) compared to 14.8% by the dairy farmers in the center.

It is recognized that the restriction of physical space has a direct effect on the potential for increasing the number of dairy cattle. However, evidence has shown that when demand for milk increases beyond the production of the unit, the producer searches for another place to keep a large numbers of cows and thereby increases milk production to fulfil the demand (Losada et al, 1996). Why an overwhelming majority of the investigated dairy farming

enterprises want to expand their activities even by relocating to new sites might be good indicators of the benefits that they have been obtaining and the high demands for milk in the city.

Table 5.7: Number and Distribution (%) of Respondents who replied that their land Area is Sufficient for Dairying; who have an Intention to Expand their Activity and the Area they Choose for the Expansion.

Area (m^2)	Location				Total hhs	
	Central		Periphery			
	No	%	No	%	No	%
Do you have sufficient land for dairying?						
Yes	33	35.9	65	43.9	98	40.8
No	59	64.1	83	56.1	142	59.2
Total	***92***	***100***	***148***	***100***	***240***	***100***
Do you have any intention to expand your activity?						
Yes	81	88.0	113	76.4	194	80.8
No	11	12.0	35	23.6	46	19.2
Total	***92***	***100***	***148***	***100***	***240***	***100***
Where do you want to have the expansion?						
Convenient & large area at the outskirts of the city ..	69	85.2	65	57.5	134	69.1
At present location	12	14.8	48	42.5	60	30.9
Total	***92***	***100***	***113***	***100***	***194***	***100***

Labour input in dairy farming includes feeding and watering animals, milking, barn cleaning, herding, processing milk to butter and cheese; input acquisition and marketing of products. Labour on the dairy farm is distributed throughout the year. Dairying gives the producer an opportunity to use his time regularly throughout the year. However, the problem of securing sufficient and satisfactory labour is usually regarded as a great difficulty encountered in conducting a dairy farm. This difficulty arises from the necessity of treating the cow carefully at all times and the work is somewhat monotonous because it has to be done regularly every day.

As summarized in the table 5.8, most work on the majority of the farms is done by the family making labour problems minimal. Both men and women are found to be active participants in the activity. Household members find work adapted to their age and strength. At this point it is vital to note that, there seems to be a sort of division of labour. Hence, herding is an activity almost entirely carried out by employees in the peripheral locations who are predominantly males and milk deliveries to consumers are mainly conducted by children of both sexes. Activities like cleaning the barn and processing milk to butter and cheese are almost entirely carried out by females.

Most of the dairy farmers (65.8%) pay cash to labour. Relatively higher percentage of dairy farmers in the periphery (72.3%) pay cash to labour compared to 55.4% in the center. It is also evident from table 5.8 that more than half of the employees in the dairy farms are illiterates (56.3%) and 21.5% of them can only read and write. Hence, it can be concluded that urban dairy farming benefits people with low level of education and therefore low mobility.

Table 5.8: Labour Input in the Investigated Dairy Farming Households

Area (m^2)	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Who performs the activity?						
Family members only	41	44.6	41	27.7	82	34.2
employees only	15	16.3	25	16.9	40	16.6
both	36	39.1	82	55.4	118	49.2
Total	***92***	***100***	***148***	***100***	***240***	***100***
Do you pay cash to labour?						
Yes	51	55.4	107	72.3	158	65.8
No	41	44.6	41	27.7	82	34.2
Total	***92***	***100***	***148***	***100***	***240***	***100***
Educational level of employees?						
illiterate	16	31.4	73	68.2	89	56.3
read and write	13	25.5	21	19.6	34	21.5
primary	17	33.3	13	12.2	30	19.0
Junior Secondary	5	9.8	-	-	5	3.2
Total	***51***	***100***	***107***	***100***	***158***	***100***

5.2.3 Types and Sources of Animal Feed and Water

Production of milk in any given dairy herd is influenced by environmental factors, of which feed is the most important variable, and the genetic make up of the herd. Inavailability of feed of adequate quality and quantity probably limits the milk production potential of cows with good milk producing ability more than any other single factor and is the most serious constraint to improved dairying (Belachew et al, 1994; Staal & Shapiro, 1996). Poor nutrition increases the susceptibility of dairy cows to health problem and physiological stress which results in lower production, much longer calving intervals, as well as problems in fertility (Bore, 1999; Tsehay, 1999).

A dairy cow requires feed for body maintenance and growth, the growth of the calf and for milk production. The dairy cattle should be fed a balanced ration in various nutrients which include proteins, carbohydrates, fats, minerals, vitamins and water. The animal feed can be a concentrate like grain, bran, oil seed cake etc or it can be roughage which include grass, hay, straw and others.

According to this research findings 49.6% of the dairy farming households depend both on stall feeding and grazing of their animals while 48.7% are entirely dependent on stall feeding. Only about 1.7% of the dairy farmers are dependent on grazing alone. With regard to the geographical variations in the method of feeding animals, it appears that 95.3% of the dairy farmers in the inner city depend only on stall feeding as compared to 20.9% in the periphery. On the otherhand 2.7% of the dairy farmers depend on grazing alone while the dairy farmers in the center do not. Of the dairy farmers in the periphery, 76.4% use both methods as opposed to 6.5% in the inner city. The difference in the proportion of producers using grazing might be attributed to scarcity of grazing land in the central zone.

Table 5.9: Method of feeding Animals, Grazing Area and Type of Feed Used by the Dairy Farming Households

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Method of feeding animals						
stall feeding only	86	93.5	31	20.9	117	48.7
grazing only	-	-	4	2.7	4	1.7
both	6	6.5	113	76.4	119	49.6
Total	***92***	***100***	***148***	***100***	***240***	***100***
Grazing land used						
Private	-		12	12.3	12	9.8
communal	6	100.0	105	89.7	111	90.2
Total	***6***	***100***	***117***	***100***	***123***	***100***
Type of feed*						
Hay (grass)	92	100.0	137	92.6	229	95.4
wheat bran	75	81.5	84	56.8	159	66.2
Concentrate oil cake	70	76.1	99	66.9	169	70.4
cotten seed	25	27.2	32	21.6	57	23.7
teff straw	9	9.8	15	10.1	26	10.8
Barley straw	9	9.8	17	11.5	26	10.8
Wheat straw	8	8.7	33	22.3	41	17.1
' atela'	45	48.9	97	65.5	142	59.2

* ***very infrequently used feed types include concentrates, pea straw, beer brewery residue used only by very few of the dairy farmers.***

For the dairy farmers who graze their animals, the vast majority of them (90.2%) use communal grazing land. In an urban system, there is normally insufficient feed available for the dairy cows to produce satisfactory amount of milk and some degree of intensification takes place through the purchase of concentrates or hay and crop residues brought in form the urban hinterland (Wilson, 1995). The feed resource markets provide grain milling by - products, oil seed cake, commercial mixed concentrate feeds made up of grain and mill by-products, natural hay, as well as wheat and barley straw (Staal & Shapiro, 1996). As far as feed types of the dairy farms is concerned, the great majority of the dairy farming households in both locations use hay (95.4%) followed by concentrate oil cake (70.4%), wheat bran (66.2%) and brewer's grain ('atela') (59.2%) as major feed types for their dairy herd. Other feed sources include cotton seed; wheat barley and teff straw. The dairy farms use hay as a major feed source as hay is available to purchase at relatively lower prices compared to other

industrial by-products and as feeding hay (roughage) is a physiological necessity even if other feed types are available as indicated in Belachew et al, 1994. With the exception of agricultural by-products and 'atela', the central dairy farmers purchase more feed than the peripheral farmers who may benefit from grazing. Dairy farmers purchase feed from producers (peasants and factories), the local market and from itinerant traders as conditions demand. In most cases 'atela' is obtained free from the neighbourhood or in exchange for manure.

Table 5.10: Number and Percentage Distribution of Producers that Rate the Current Cost of Animal feed, who Encountered Shortage by Season and Identified the Season when the Shortage is Severe.

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Cost of animal feed						
is beyond my capacity	29	31.5	31	20.95	60	25.0
High but I could buy	57	62.0	72	48.7	129	53.75
Fair	6	6.5	45	30.4	51	21.25
Cheap	-	-	-	-	-	-
Total	***92***	***100***	***148***	***100***	***240***	***100***
Is there feed shortage by season?						
Yes	85	92.4	145	98.0	230	95.83
No	7	7.6	3	2.0	10	4.17
Total	***92***	***100***	***148***	***100***	***240***	***100***
When is feed shortage severe?						
Winter	16	18.8	97	66.9	113	49.13
Spring	5	5.9	3	2.1	8	3.48
Summer	64	75.3	45	31.0	109	47.39
Autumn	-	-	-	-	-	-
Total	***85***	***100***	***145***	***100***	***230***	***100***

An attempt has been made to investigate the cost of animal feed and whether producers have been experiencing shortages in the supply of feeds at different seasons. As studies indicate, when feed resource markets can not supply adequate feed to the dairy producers, prices rise especially of concentrates. In milk production systems which do not rely heavily on pasture grazing or fodder crops, the milk price/feed price is an important indicator of the economic

viability of the dairying activity. Inadequate feed resource markets may lead the ratio to fall to uneconomic levels (Staal & Shapiro, 1996). Regarding the current cost of animal feed, 53.7% of the dairy farming households replied that it is high but they could buy and 25.0% of the respondents rated feed cost to be beyond their capacity and 21.3% of them rate it as fair. No any dairy farm dares to say cheap. It appears from table 5.10 that the high feed cost is felt more by the dairy farmers in the center compared to the periphery and this might be because the dairy farmers in the center purchase more animal feed compared to those in the periphery who benefit from grazing. Seasonal variations in the availability of feed is indicated by 95.8% of the dairy farmers in both locations. It is interesting to note that 66.9% of the dairy farming households in the periphery have felt that feed shortage is severe during winter (dry season). This might have resulted from the shortage of rainfall and the consequent paucity of pasture for grazing. On the other hand, 75.3% of the dairy farming households in the inner city have felt feed shortages during summer. The general rise in the price of grain used for making concentrates and soaring prices in food processing factories during summer tends to increase animal feed. All in all, from the analysis it appears that animal feed is not only costly for the producers, its availability is also seasonal.

Table 5.11: Time when Feed is Bought, Method and Means of Transporting Feed Used by the Dairy Farmers

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
When do you buy hay?*						
Throughout the year	49	53.3	89	65.0	138	60.3
During the dry season	20	21.7	25	18.2	45	19.7
During harvest period	21	22.8	23	16.8	44	19.2
during the wet season	2	2.2	-	-	2	0.8
Total	***92***	***100***	***137***	***100***	***229***	***100***
How is the feed transport to your farm?						
Own transport**	19	20.6	37	25.0	56	23.3
Hired transport	48	52.2	78	52.7	126	52.5
Delivered by supplier	28	30.4	39	26.4	67	27.9
Means of transport used to bring feed to farm?						
Vehicle	57	62.0	55	37.2	112	46.7
Donkey	43	46.7	78	52.7	121	50.4
Human porter	17	18.5	39	26.3	56	23.3

**** Other feed types are reported to be bought almost throughout the year by the producers***
***** includes vehicle, donkey, human proter***

As summarized in table 5.11, the majority (60.3%) of the dairy farmers purchase hay throughout the year while an insignificant proportion (0.8%) of them purchase it during the wet season. This again is a manifestation of the variations in the supply of hay, the major feed source, at different seasons owing to climatic conditions. As regards the methods and means of transport used to bring feed to the dairy farms, 52.5% of the dairy farming households use hired transport to bring feeds to their farms while in the 27.9% of the dairy farming households animal feed is delivered to them by the suppliers and 23.3% of the dairy farmers use their own transport to bring feed to their farms. Slightly more than half (50.8%) of the dairy farmers use donkeys to bring feed to their farm, 46.7% use vehicles and 23.3% use human porters in bringing feed to the dairy farms.

A careful examination of table 5.11 reveals that more of the dairy farmers in the periphery buy hay throughout the year (65.0%) as compared to 53.3% in the center. This may be because frequent purchase from the producers themselves is likely as opposed to inner city dairy farmers who tend to purchase when hay is relatively cheaper and store it for later use. The use of vehicles in bringing feed to the farmers is more pronounced in the center (62.0%) compared to the periphery (37.2%) while the use of donkey is a bit higher in the periphery (52.7%) compared to 46.7% in the center. About 26.3% of the dairy farms in the periphery as opposed to 18.5% in the inner city use human porters to bring animal feed to the farm.

Table 5.12: Source of Drinking Water, Frequency of Watering the Dairy Animals and Problems of Drinking Water Faced by the Dairy Farmers

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Source of drinking water						
River/stream	-	-	21	14.2	21	8.8
Water well	-	-	7	4.7	7	2.9
Piped system	92	100	120	81.1	212	88.3
Total	***92***	***100***	***148***	***100***	***240***	***100***
Frequency of watering animals						
Once in a day	25	27.2	33	22.3	58	24.2
Twice in a day	44	47.8	87	58.8	131	54.6
Three times in a day	20	21.7	6	4.0	26	10.8
Whenever they need	3	3.3	22	14.9	25	10.4
Total	***92***	***100***	***148***	***100***	***240***	***100***
Is there a problem of drinking water?						
Yes	36	39.1	61	41.2	97	40.4
No	56	60.9	87	58.8	143	59.6
Total	***92***	***100***	***148***	***100***	***240***	***100***
Is the water problem:						
Very high	-	-	4	6.6	4	4.1
High	7	19.4	17	27.9	24	24.8
Not as much	29	80.6	40	65.5	69	71.1
Total	***36***	***100***	***61***	***100***	***97***	***100***

Water is a very important feed for the dairy cow to maintain the body functions and for milk production. The daily requirement of water depends on: climatic conditions where water requirement rises with high temperature; water content of the feed as moist feed like fresh grass reduces the drinking water requirement while dry feed like hay increases the need for water; milk production increases water requirement of cows ; stock mobility where the longer the distance covered by the stock, the greater the water requirement and intake. It is estimated that a dairy cow needs 50-60 litres of water per day and pure exotic and cross-bred cows require large quantities of clean drinking water daily to achieve good performance (Tsehay, 1999).

The sources of drinking water, frequency of watering the dairy cattle and problems of drinking water are presented in table 5.12. Accordingly, an overwhelming majority of the dairy farming households (88.3%) use piped system as a source of drinking water for the animals followed by streams/rivers (8.8%) and water well (2.9%). Most of the dairy farmers (54.6%) water the animals twice in a day whereas 24.2% of them water animals once, 10.8% three times and 10.4% water animals whenever the animals need it. About 60% of the dairy farmers do not face problem of drinking water. Out of the dairy farmers who faced the water problem, 71.1% of them didn't consider the problem as significant. The dairy farmers who indicated problem of drinking water were further requested to identify the season within which shortage of water is a major constraint. All the households indicated that the dry season is the time when water shortage is more frequent. It is to be concluded that the use of rivers/streams as a source of drinking water for the dairy cattle should be avoided as in all cases the streams are highly polluted thereby creating health problems for cattle and hygienic problems for the products.

5.2.4 Veterinary and Extension Services

Studies made indicate that among livestock farmers, disease is a big problem which leads to high death rates of animals. Similarly, since livestock are vulnerable to diseases and poor nutrition, the loss of animals from disease or drought can bring greater devastation to a household. Hence, good health care, herd management and disease control programs impact on dairy cow productivity. If diseases are prevented the costs of treatments and the loses of productivity and livestock deaths which diseases cause could be reduced. An attempt should also be made to isolate sick cows from healthy ones to avoid the spread of infectious diseases. Preventive measures are virtually all cheaper than cures, and cures are not always successful (Kinsey, 1993; FAO, 1998; Gundel, 2000).

The source of veterinary and extension service of the dairy farming households is presented in table 5.13. The figures in the table show that 71.7% of the investigated households obtain veterinary services from the Ministry of Agriculture while 19.6% of the farmers use private clinics as a source of veterinary services. The proportion of dairy farmers who use local traditional practitioners comprises 14.6%. A large proportion of the dairy farmers (74.2%) have the experience of frequently vaccinating animals whenever it deemed necessary, at least once or twice a year is reported. Most of the dairy farmers (61.3%) have veterinarians who regularly visit their farms. A careful scrutiny of table 5.13 shows that the use of modern private clinics as a source of veterinary services for the dairy farms is higher (30.4%) in the inner city farmers compared to 12.8% in the periphery. On the other hand, the use of local traditional practitioners predominates among the peripheral farmers (19.6%) as compared to the inner city farmers (6.5%). Similarly, percentage of dairy farmers who are regularly visited by a veterinarian is higher in the center (80.4%) compared to 49.3% in the periphery.

Table 5.13: Number and Distribution (%) of the Dairy Farming Households by Source of Veterinary Services and Support of Extension Agents

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Source of veterinary services						
Modern private clinics	28	30.4	19	12.8	47	19.6
Local traditional-practitioner	6	6.5	29	19.6	35	14.6
Ministry of Agriculture	67	72.8	105	70.9	172	71.7
Do you frequently vaccinate your animals?						
Yes	71	77.2	107	72.3	178	74.2
No	8	8.7	21	14.2	29	12.1
Rarely	13	14.1	20	13.5	33	13.8
Total	***92***	***100***	***148***	***100***	***240***	***100***
Do you have a veterinarian who regularly visits your dairy farm?						
Yes	74	80.4	73	49.3	147	61.25
No	18	19.6	75	50.7	93	38.75
Total	***92***	***100***	***148***	***100***	***240***	***100***
Are you supported by extension agents in your activity?						
Yes	33	35.9	29	19.6	62	25.8
No	59	64.1	119	80.4	178	74.2
Total	***92***	***100***	***148***	***100***	***240***	***100***
How do you rate the importance of extension agents?						
Very important	21	22.83	16	10.8	37	15.4
Moderately important	12	13.04	13	8.8	25	10.4
Do not know	59	64.13	119	80.4	178	74.2
Total	***92***	***100***	***148***	***100***	***240***	***100***

It is well known that agricultural extensionists and veterinarians are trained to promote improved, relevant practices which will bring about more profitable agricultural enterprises. The dairy farmer learns more if he is visited by an extensionist on his own farm and is trained using direct application of the recommended innovations to the local conditions of the farm (Kinsey, 1993). To this end, an attempt was made to know whether the dairy farmers are supported by extension agents in their activity or not. Surprisingly enough,

about three-fourth (74.2%) of the dairy farmers have never been supported by extensionists. These farmers further indicated that they have no idea as to whether the extension agents are important or not. It also appears from table 5.13 that the proportion of dairy farmers supported by the extension agents is more in the inner city (35.9%) compared to 19.6% in the periphery.

5.2.5 Major Expenses of Milk Production and Factors Affecting the Productivity of Dairy Cattle and Profitability of Dairy Farms

As presented in table 5.14, the total milk production cost is composed of expenditures on feed, labour, veterinary fee, barn expense, breeding service and utilities. The most ranked (1-3) source of expenditure of milk production by the dairy farmers (97.5%) is animal feed followed by utilities (80.4%). On the other hand, expenditure on breeding services is indicated to be the least ranked source of expense of milk production by the dairy farmers (5.0%) followed by barn expense (22.1%). Studies indicate that the proportion of feed cost to total production cost of a dairy farm is higher than other cost components (Belachew et al, 1994). This basic principle has been clearly attested in the findings of this paper. Contrary to expectations, barn expense is found to contribute less to the total cost of milk production. This might be because of shared expenses of living accommodation and animal production whereby the dairy farmers might not have felt the cost incurred for barn expenses. A study by Belachew et al (1994) indicated that labour cost comprised the highest proportion to total production cost, this however, contradicts to the findings of this paper whereby labour cost takes the third highest position, after feed cost and utilities, as a major source of expense of milk production. This might be because the management of animals is mainly carried out by family labour and there is a tendency to underestimate or neglect the opportunity cost of family labour.

Table 5.14: Number and Distribution of Dairy Farming Households by Most Ranked (1-3) Source of Expenses of Milk Production and Major Factors Affecting the Productivity of Dairy Cattle and Profitability of Dairy Farms.

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Most ranked (1-3) source of expense of milk production:						
Feed	90	97.8	144	97.3	234	97.5
Labour	49	53.3	68	45.9	117	48.7
Veterinary fee	44	47.8	67	45.3	112	46.7
Utilities (water, electricity, transportation).....	68	73.9	125	84.5	193	80.4
Barn expense	20	21.7	33	22.3	53	22.1
Bull service and AI	5	5.4	7	4.7	12	5.0
Most ranked (1-3) factor affecting productivity of cows /farms:						
Choice of species and breeds	92	100	148	100	240	100
Veterinary services & animal health care	52	56.5	64	43.2	116	48.3
Organized marketing & market outlet	30	32.6	62	41.9	92	38.3
Feed resources & improved feed system	88	95.6	135	91.2	223	92.9
Utilities like housing, water, electricity, transport.....	9	9.8	23	15.5	32	13.3
Labour	5	5.4	12	8.1	17	7.1

The dairy farming households were requested to rank the major factors that affect the productivity of the dairy cow and profitability of the dairy farms which include aspects like the choice of species and breeds; veterinary services and animal health care; organized marketing and market outlet; feed resources and improved feed system; utilities like dairy housing, water, electricity and transportation; and labour availability. As summarized in table 5.14, the choice of species and breeds is the highest ranked (1-3) factor considered by 100% of the dairy farmers to impact on dairy cow productivity and dairy farm profitability. The second ranked variable identified by 92.9% of the dairy farmers in affecting productivity of the cows and hence the farms is feed resources and improved feed system. The least ranked factors, considered by 7.1% and 13.3% of the dairy farmers, in affecting productivity of the dairy cow and profitability of the farm are labour availability and utilities respectively.

Generally, although it is difficult to estimate the ratio of cost: benefit for milk production in the sample dairy enterprises there are indications suggesting that the system is profitable with

respect to factors like - shared expenses of living accommodation and dairy production; the management of animals mainly being carried out by the family; the use of food rejects and other products derived from domestic sources and markets and grazing on communal lands; limited use of technological inputs; the sell of milk unpasteurized and unbottled at a viable price with a tendency to adulterate milk to increase profit; absence of established standard of quality for milk and its fat content which allows the producer to use lower amounts of concentrate in the ration; absence of taxes on the dairy business; sale of dung and the reduction in energy cost of the households.

The profit from dairy production is determined by the cost of production and by the selling price. If the dairy farmers are to become profitable and remain in business it is recommended that they should-select breeding stocks carefully and follow forward looking breeding programs; feed dairy animals balanced rations according to their maintenance and production needs and use economical and high quality hay; provide adequate housing, water supply and lightening; use good management practices in growing out herd replacement stock; safeguard the herd from diseases and parasites, keep production records of individual animals; select the best method of marketing and the best outlet.

5.3 Dairy Production Processes

5.3.1 Feeding and Milking of the Dairy Herd, Breeding Methods Used and Reproductive Performance

As pointed out in the earlier section of this chapter, the objective in feeding the dairy cow is to allow maintain and grow to mature body weight, provide nutrients for the production of a calf, and promote optimum quantity and quality of milk. A high and economic milk production can only be achieved with a well fed animal. Dry and non pregnant cows need to be fed a maintenance ration. The dairy farmers should also manage the feed supply to avoid or lessen shortages inorder to minimize animal stress, maintain body condition and prevent animal deaths, promote successive calving and sustain milk secretion and the growth of the offspring (Ranjhan, 1999; Tsehay, 1999). Similarly, the dairy cows should be fed economically as individuals by being considerate of the length of time in milk, and quantity and butter fat content of each cow's milk. If all cows are fed alike, the higher producer

would receive too little feed and decline in dairy yield, while the lower producer would be overfed (Clarence, 1956).

In light of the basic tenets discussed above, attempt has been made to investigate how the dairy farmers feed the dairy herd. Accordingly, more than half of the responding dairy farmers (57.5%) feed their animals as individuals while the remaining 42.5% of the dairy farmers provide feed to their animals in groups (collectively). The practice of feeding animals individually is found to be higher (68.5%) in the inner city farmers as compared to 50.7% in the periphery. It is recommended that the dairy farmers should be enlightened about the importance of feeding animals as individuals.

Table 5.15: Number and Distribution of Dairy Farming Households by their Practice of Feeding the Dairy Herd

	Location				Total hhs	
	Centeral		Periphery			
	No	%	No	%	No	%
How do you feed animals?						
Individually	63	68.5	75	50.7	138	57.5
Collectively (in groups)	29	31.5	73	49.3	102	42.5
Total	***92***	***100***	***148***	***100***	***240***	***100***
How do you feed milk to calves?						
Bucket feeding	61	66.3	43	29.1	104	43.3
Suckling	31	33.7	105	70.9	136	56.7
Total	***92***	***100***	***148***	***100***	***240***	***100***
From birth until what age do you give milk to calves?						
4 Months	65	70.7	65	43.9	130	54.17
6 months	27	29.3	36	24.3	63	26.25
10 months	-	-	47	31.8	47	19.58
Total	***92***	***100***	***148***	***100***	***240***	***100***
When do you start giving hay/concentrate to your calf?						
After one month	10	10.9	8	5.4	18	7.5
After three months	73	79.3	121	81.8	194	80.8
After six months	9	9.8	19	12.8	28	11.7
Total	***92***	***100***	***148***	***100***	***240***	***100***

As far as feeding of calves is concerned, the calves are allowed to suck at short time intervals, two times in a day, immediately when to milk and after milking sessions. Suckling

as a mechanism of feeding milk to calves is practiced by 56.7% of the dairy farmers. The farmers do not know how much milk is fed or sucked by the calves. On the otherhand, 43.3% of the dairy farmers use bucket feeding to feed milk to calves. As shown in table 5.15 that suckling is more commonly practiced in the peripheral dairy farmers (70.9%) compared to 33.7% in the inner city. The proportion of dairy farmers who feed milk to calves up to three months from birth is 54.2% while 26.2% give milk up to six months and 19.6% of the dairy farmers feed milk to calves up to the age of ten. From the table it appears that the practice of providing milk to calves is of short duration in the inner city, infact terminating in six months, as opposed to the dairy farmers in the periphery who feed milk extending up to ten months. Evidence from table 5.15 also shows that an overwhelming majority of the dairy farmers (80.8%) start to give concentrate and/or hay to calves after three months. At this moment it should be noticed that the calves should be provided earlier with a calf starter to assist in developing their rumen for subsequent digestion of high fiber content feeds.

Milking is the process of persuading the cow to let down its milk and allow the dairy farmer to get it for his or her own consumption or for sale. The dairy farmer, therefore, manipulates the natural process. Studies indicate that a milker can get twenty percent more milk than another; one may dry the cow within a few months while another may keep her in milk the entire year. The milker should not excite or distrub the cows by loud voice or cruelty or abuse of any kind. The milk yield of cows is found to be affected by excitement of any kind like the presence of a stranger, an animal and change of milkers (Clarence, 1996).

Cows are milked twice a day in all the farms. The respondents further indicated that if cows are milked more than twice, the practice dries up the cows early. As shown in table 5.16, the great majority of the dairy farmers (90.8%) milk their cows in the cow house while 9.2% of the dairy farmers milk cows in a separate milking parlour. Milking cows in a separate milking parlour is practiced by relatively high proportion of dairy farmers in the peripheral zone (11.5%) compared to 5.4% in the inner city zone which may be indicative of the relatively abundant land in the peripheral zone. As it was captured from field observations,

cows have been given concentrates during milking to stimulate milk let down or the calf is allowed to suck for a short period as this stimulation has been shown to result in high milk production specially in the indigenous animals. It is also observed in very few cases, specially on local cows that are a bit aggressive, that the rear legs of the cow are loosely secured together. In all the investigated farms milking is done by hand after the udder had been rinsed with luke-warm water and then dried with cloth. The milk is collected usually with wide-open stainless steel pails or on plastic containers.

Table 5.16: Number and Distribution of Dairy Farming Households who Keep Records of Daily Milk Output from each Cow; who Frequently Change Milkers and where they Milk Cows.

	Location				Total hhs	
	Centeral		Periphery			
	No	%	No	%	No	%
Do you keep records?						
Yes	44	47.8	43	29.1	87	36.3
No	48	52.2	105	70.9	153	63.7
Total	***92***	***100***	***148***	***100***	***240***	***100***
Where do you milk cows?						
In the cow house	87	94.6	131	88.5	218	90.8
In separate milking parlor	5	5.4	17	11.5	22	9.2
Total	***92***	***100***	***148***	***100***	***240***	***100***
Do you frequently change milkers?						
Yes	13	14.1	17	11.5	30	12.5
No	79	85.9	131	88.5	210	87.5
Total	***92***	***100***	***148***	***100***	***240***	***100***

It has been attempted to understand whether the dairy farmers keep records of daily milk output from each cow and if they frequently change milkers as these are related with productivity of the dairy cows and the profitability of the dairy farms. Keeping daily records of milk produced by each animal is important to know which cows are profitable and to dispose off the inferior animals. It enables the proper feeding of the individual cows as cows in milk should be fed in proportion to their milk production; helps the dairy farmer detect sickness in a particular animal before it would be observed; gives the chance to judge the

work of different milkers as some milkers are able to secure much more milk from the same cows than others; it also adds interest to work as the milkers observe the variations from day to day and find many things of interest in tracing the cause (Clarence, 1956; Kinsey, 1993).

As can be seen from table 5.16, 63.7% of the dairy farmers do not have the practice of keeping records of daily milk output from each cow milked while the remaining 36.3% keep records. The percentage of dairy farmers who keep records of milk output of each cow milked is found to be more in the central location (47.8%) compared to 29.1% in the periphery. It has long been the accepted practice that record keeping should become a natural thing for a successful farmer who wants to know exactly the profitability of the enterprise and each animal. It is also evident from table 5.16 that the vast majority of the dairy farmers (87.5%) do not frequently change milkers. It is advisable for those who change milkers to avoid the practice as it negatively affects milk production.

As far as breeding of the dairy herd is concerned, studies indicate that genetic improvement is a crucial mechanism of achieving the objective of improving the productivity of the dairy cows and profitability of dairy enterprises. The breeding strategies for genetic improvement can be selection from within the indigenous stock, substitution of local breeds with temperate breeds of high production potential, and cross breeding or up grading which combines high milk yield and early maturity of temperate dairy breeds with hardiness, disease resistance and adaptability of local cattle. (Kinsey, 1993; Bogalech, 1998; Sendros & Tesfaye, 1998; Veroce, 1999).

The figures in table 5.17 show that the most frequent breeding method used by the dairy farmers (77.9%) is natural mating or using bull service. The dairy farmers who use AI comprise 46.3%. The use of bull in breeding is found to be higher in the peripheral farmers (89.9%) compared to 58.7% in the inner city while 68.5% of the dairy farmers in the inner city use AI as opposed to 32.4% in the periphery. As studies indicate AI is expected to increase the genetic merit of the herd through the use of semen from progeny tested bulls. It is also advantageous in reducing the cost of keeping bulls and in reducing the risks of

acquiring venereal diseases, the main disadvantage being the need for precise detection of oestrus and the demand for skilled personnel (Mutukumira et al, 1996). As far as the source of breeding services is concerned, 42.9% of the dairy farmers have access to breeding from individuals through payment or they do have a bull of their own and 40.4% use MOA as a source of breeding services while the remaining 16.7% use both MOA and individuals. The dairy farmers pay ranges from a minimum of 5 birr per cow to a maximum of 25 birr for breeding services. The problems in getting breeding services by the dairy farmers include long distance (58.7%), difficult to get people (43.3%) and high payment (28.3%)

Table 5.17: Number and Distribution (%) of Dairy Farming Households Using Different Methods and Sources of Breeding Services and Payment per cow

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Breeding method						
Bull	54	58.7	133	89.9	187	77.9
AI	63	68.5	48	32.4	111	46.3
Source of breeding service						
MOA	49	53.3	48	32.5	97	40.4
Individual*	26	28.2	77	52.0	103	42.9
Both	17	18.5	23	15.5	40	16.7
Total	***92***	***100***	***148***	***100***	***240***	***100***
Payment per cow (birr)						
5- 9	20	21.7	25	17.2	45	19.0
10-14	27	29.4	45	31.0	72	30.4
15-19	14	15.2	40	27.6	54	22.8
20-24	31	33.7	35	24.2	66	27.8
Total	***92***	***100***	***145****	***100***	***237***	***100***
Problems in getting breeding services						
Places are too far	50	54.3	91	61.5	141	58.7
Difficult to get people	61	66.3	43	29.1	104	43.3
Payment is too much	29	31.5	39	26.4	68	28.3

**** includes own bull***

***** 3 housholds reported no payment as cows get pregnant in the field***

An assessment of the reproductive performance of the dairy herd was also made in the study as reproductive inefficiency is an important constraint to improved dairying. Reproductive inefficiency is related to delayed puberty and extended postpartum anestrus periods resulting in advanced age at first calving and long calving intervals. It is also related to low calving rates which might be related to low bull fertility or inefficient AI (Abaye et al, 1989). Reproductive performance of a dairy herd can be measured by parameters like age at first calving, calving interval, mortality and abortion rates, lactation length and lactation yield. For example, claving interval, the period between two parturitions, under ideal conditions should be in the range of 12-14 months and it is said to be affected by lactation length which inturn affects total milk production of a cow. Extended lactation length results in a long calving interval (Belachew et al, 1994).

As shown in table 5.18 the average lactation length of local cows is 8 months (240 days) and is found to be shorter than cross breeds (9.9 months or 297 days). There is an extended calving interval observed in local cows (16 months) as compared to 11.5 months for the exotic cows. The local cows are also found to be inferior in milk yield producing on average 3.2 litres per lactation day to the crossbred (6.2 litres) and exotic cows (13.5 litres).

Table 5.18: Breeding Parameters and Milk Yield

	Calving interval (average month)		**Lactation length (average month)**		**Milk Yield per day per cow/lite.**	
Breed	*Central*	*Peripheral*	*Central*	*Peripheral*	*Central*	*Peripheral*
Local	16	16	7	9	3.5	3.2
Cross	13	14	8.8	11	7	6.2
Exotic	11	12	9	8	12.5	13.5

5.3.2 Dairy Products Produced by the Enterprises

The dairy product that is produced by all the dairy farms is fresh milk. Fresh milk is allocated for different uses which include sale, calves feeding, home consumption or is processed into other dairy products. The proportion of dairy farming households who process milk to butter

is 45.4% while the proportion of the dairy farmers who process milk to local cheese ('ayib') and yoghurt is 40.4% and 31.7% respectively. It appears from table 5.19 that more of the dairy farmers in the periphery tend to process milk in to other dairy products compared to those in the center. Inquired why the dairy farmers do not process milk in to other dairy products, 61.8% of them do not process milk because of low milk output to process; while 28.2% of the dairy farmers do not process milk as the price for fresh milk is more than the processed products and 10.0% do not process as the activity is found to be difficult and demands more labour. Low milk out put to process milk into other dairy products is reported by 66.7% of the farmers in the periphery as compared to 55.4% in the center while higher fresh milk price as a factor is considered more by the inner city farmers (33.9%) compared to 24.0% in the periphery.

Table 5.19 also shows the varied experience of processing milk in to butter and cheese across time. From the investigated dairy farming households 50.4% of them process milk into butter and cheese during the long fasting period whereas 41.3% and 32.5% of the farmers process milk to butter and cheese during the wet season and dry season respectively. At this point it is vital to note that processing milk into other dairy products is influenced by climate which influences feed availability thereby influencing amount of milk produced. Similarly, it should be noted that the impact of religious practices manifest themselves in the dairying activity. As indicated in the earlier section of this paper, the vast majority of the investigated dairy farmers in particular and the city population in general belong to the Ethiopian Orthodox Church. The religion demands people to refrain from taking foods of animal origin, dairy products included, during the fasting period. Hence, the apparent excess supply and low demand might have urged the producers to convert milk into other dairy products that have a longer shelf life. Evidence from table 5.19 also indicates that the dairy output of the investigated farmers has been increasing for the 47.5% of the farmers while the proportion of the dairy farmers whose dairy out put has been declining is 27.5% and for the 25.0% dairy production has been constant over the years.

Table 5.19: Number and Distribution (%) of Dairy Farming Households by Type of Dairy Products Produced in the Enterprise

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Dairy product produced						
Fresh milk	92	100.0	148	100.0	240	100.0
Butter	36	39.1	73	49.3	109	45.4
Local cheese (ayib)	33	35.9	64	43.2	97	40.4
Youghurt	31	33.7	45	30.4	76	31.7
Why do you not make butter?						
Low milk output to process	31	55.4	50	66.7	81	61.8
price for liquid milk is more.	19	33.9	18	24.0	37	28.2
Difficult to process	6	10.7	7	9.3	13	10.0
Total	***56***	***100***	***75***	***100***	***131***	***100***
Processing milk into butter and cheese*						
Wet season	34	37.0	65	43.9	99	41.3
Dry season	23	25.0	55	37.2	78	32.5
Long fasting period	48	52.2	73	49.3	121	50.4
Is your dairy output over the last years:						
Increasing	41	44.6	73	49.3	114	47.5
Decreasing	19	20.6	47	31.8	66	27.5
Constant	32	34.8	28	18.9	60	25.0
Total	***92***	***100***	***148***	***100***	***240***	***100***

**** Some producers who do not regularly process milk occasionally process***

5.4 Production Constraints and Problems Related to Urban Dairy Farming

5.4.1 Health Problems and Animal Mortality and Problems of Maintaing Quality Product

The incidence of disease and the need for improved hygienic management is a major constraint against improved dairy production (Abaye et al, 1989). Disease is a major cause of poor performance. The main effects of diseases comprise of mortality, reduced

production, lower quality of animal products and the risk of zoonotic diseases to human beings like bovine tuberculosis, brucellosis and Salmonella (Wondwosen, 1998; Gundel, 2000). Diseases are also related with animal infertility and reproductive wastage the principal ones being anestrum, abortion, and endometritis in females and epididymitis in males which can be caused by infectious disease and inadequate nutrition and endocrine imbalances (Abaye et al, 1989). Alemayehu (1999) also indicated that lamenes is an important disease among dairy animals in urban and peri-urban production systems and the significance of the disorder increases with the level of intensification.

As shown in table 5.20 the great majority of the dairy farmers indicated that animal disease is a major cause of death of animals (70.4%) followed by complications of delivery (9.0%) consumption of poisonous materials, plastic and metal pieces (7.8%) collusion /butting (6.7%) and starvation (5.0%). Out of the investigated dairy farming households 71.2% indicated mastitis as a major cause of animal health problem followed by pneumonia (69.6%), tick (61.7%), anthrax (57.1%), foot and mouth disease (55%), liver fluke (52.9%) and lung worm (41.2%). As far as overcoming animal health problems is concerned, the vast majority of the dairy farmers (83.7%) use modern medicine only while 9.6% of the dairy farmers use local medicine only. The use of local medicine alone in disease treatment is nill in the center but 15.5% of the dairy farmers use this practice in the periphery.

Table 5.20: Number and Distribution (%) of Dairy Farming Households Reporting Incidence of Animal Disease and Ways of Overcoming it.

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Causes of death of animals*						
Animal disease	39	72.2	89	71.2	128	71.5
Starvation	2	3.7	7	5.6	9	5.0
At delivery	5	9.3	11	8.8	16	8.9
Consuming poisons Including plastic, metal...	4	7.4	10	8.0	14	7.8
Collision /butting	4	7.4	8	6.4	12	6.7
Total	***54***	***100***	***125***	***100***	***179***	***100***
Major causes of animal health problem.						
Mastitis	75	81.5	96	64.9	171	71.2
Anthrax	70	76.1	67	27.9	137	57.1
Pneumonia	66	71.7	101	68.2	167	69.6
Liver fluke	52	56.5	75	50.7	127	52.9
Tick	51	55.4	97	65.5	148	61.7
Foot and mouth disease	49	53.3	83	56.1	132	55.0
Lung worm	44	47.8	55	37.2	99	41.2
Overcoming animal health problems.						
Using local medicine only	-	-	23	15.5	23	9.6
Using modern medicine only	90	97.8	111	75.0	201	83.8
Both	2	2.2	14	9.5	16	6.7
Total	***92***	***100***	***148***	***100***	***240***	***100***

**** 54 dairy farms in the inner city reported death of 115 animals and 125 dairy farms from the periphery Reported death of 201 animals for the last ten years.***

The respondents were asked whether their animals have been causes of health problems to their family or neighbourhood. Surprisingly enough, no farm dare to say that the animals have caused health problems. However, studies attest that diseases like typhoid, dysentry, choleral, pneumonia, eye disorder and other zoonotic diseases are transmitted from animals to human kind. The researcher belives that the dairy farms have concealed what had happened or are unaware of the occurrence of diseases and suggests that the issue demands further investigation.

To have a disease and parasite free herd it is recommended that the dairy farmers should bring healthy animals in to the herd; isolate animals that are known to have contagious infections; have proper drainage and keep the place dry and free of stagnant water; have regular tests for diseases, vaccinate for diseases common in the area; disinfect housing quarters and equipment regularly, provide exercise for the breeding herd; and spray for external parasites and eliminate manure piles and other filth accumulations.

Maintaining a healthy herd is an important consideration in the production of quality milk. For the sake of health of the animals and people, quality milk from healthy animals should be produced. It is an old saying that nature never intended milk to see the light of the day. Milk is a highly nutritious fluid and therefore readily subject to attack by a great variety of micro-organisms (WHO, 1962). Milk is highly perishable and provides an admirable culture medium for bacteria and can serve as a vehicle for disease producing micro-organisms. Milk of good hygienic quality is necessary to produce milk products of good quality and adequate shelf life and to provide a safe, wholesome food for the consumer (Conor, 1995).

Quality of milk involves the falvour and odor of the milk, its bacterial content, and its physical and chemical properties. For example, the flavour of some plants and other materials a cow may feed up on will pass to her milk. Forage plants and weeds causing flavour defects in milk and cream are numerous (Payne, 1987).

There are different potential sources of contamination of milk which include the interior of the udder containing bacteria which enter the milk as it is secreted and infected udders usually yield milk with high bacteria; the health of the animal whereby a healthy cow with a healthy udder produces milk containing limited bacteria while milk from infected cows contains various patogens; utensils for milking and handling milk specially in cases where proper utensil sanitation is not there; dust particles originating from manure, soil and feed in the milking area; the health of milkers and persons handling milk.

From observations in the field it has been found that urine and manure are collected in a pit closer to the milking area; feed residues are not regularly removed from the shed and drainage is poor; the cowshed is in a precarious condition; the practice of regularly cleaning the site, animals and personal hygiene of the milkers are not in good conditions; regular test for diseases of animals is rare. Hence, it is recommended that the herd should be regularly tested for diseases; cows that have swollen or sore udders should be treated; the barn should be cleaned adequately and ventilated. Manure and feed residue should daily be removed from the barn and there should also be proper drainage system. There should also be proper cleaning and disinfection of the utensils used for milking and handling milk and personal hygiene of those who keep in touch with milk should be maintained. The milk should also be cooled as soon as possible after milking if it is not delivered fresh to the consumers.

5.4.2 Problems of Access to Inputs and Utilities

The dairying activity requires diverse array of production inputs the shortages of which result in poor performance of the dairy cows and hence the dairy farm. One of the biggest problems of dairy producers, specially for those in the inner city where there is little room for animal grazing, is feed supply. As studies indicate hay is scarce and organized fodder production is not common. Feed concentrates are not often available or they are of low quality and high price (Belachew et al, 1994; Asrat, 1996). Poor nutrition increases animal's susceptibility to health problem and physiological stress, resulting in lower production and longer calving intervals.

Lack of space to keep animals or lack of access to land and fear of eviction is another problem. Land prices continue to escalate faster than general price levels and the value of milk produced. Lack of developed credit market for dairy producers and the high cost of alternative sources impedes investments in improved animals, new technologies and equipment. There has always been little capital for smallholder dairying which hampered

investments in breeding stock, production, processing and on farm investments needed to support dairying. Increased costs of labour, both market rates and the opportunity cost of farm family member labour, will make it more difficult to secure attractive returns to family labour devoted to dairying. Lack of veterinary and extension services for the dairy farmers is another problem. There is also water shortage specially during the dry season and dairy farmers in the periphery use unsafe, usually polluted river water. Lack of refrigeration facilities to keep milk cool as soon as possible after milking are all constraints. Animal sheds of earthen floor, and of limited light sources, ventilation and poor drainage create problems.

Table 5.21: Number and Distribution of Dairy Farmers Identifying Major Problems in Managing the Dairy Farms.

Problem	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Feed problem	92	100.0	148	100.0	240	100.0
Disease problem & lack of Vet. Service	69	75.0	112	75.7	181	75.4
Lack of labour	73	79.3	94	63.5	167	69.6
Lack of Capital and Credit	41	44.6	80	54.1	121	50.4
Lack of Suitable plot of land	85	92.4	82	55.4	167	69.6
Lack of extension service	42	45.6	69	46.6	111	46.2
Lack of utilities (water, transport)	51	55.4	84	56.8	135	56.3
Lack of market of for products	25	27.2	47	31.8	72	30.0
Limited supply of improved breeds and low productivity of indigenous cattle	67	72.8	123	83.1	190	79.2

As indicated in table 5.21, animal feed problem is identified by all the dairy farming households (100%) as a major problem in managing the dairy farms. Limited supply of improved breeds and low productivity of indigenous cattle is identified by 79.2% of the dairy farmers to be the second major problem in managing the dairy farms followed by disease problem and lack of veterinary services (75.4%). Lack of suitable plot of land and labour

are indicated to be major problems for 69.6% of the dairy farmers. The proportion of dairy farmers who identified lack of utilities, capital and credit, extension services and market for dairy products comprise 56.3%, 50.4%, 46.2% and 30.0% respectively. Careful examination of table 5.21 reveals that lack of suitable plot of land and labour are major constraints in the inner city compared to the periphery. On the other hand, low productivity of indigenous cattle and lack of capital and credit are major problems in the periphery compared to the center.

5.4.3 Environmental Problems and Institutional Constraints

Although there are cases where urban livestock rearing, dairying included, positively contributes to the improvement of the urban environment, there are also circumstances where inappropriate management of wastes contribute to environmental pollution. Usually for security or convenience purposes straw and other animal feeds are stored close to or in the residence of the family and the smell of ammonia is highly unacceptable and may lead to eye disorders particularly in children (Ranjhan, 1999).

The management of animal wastes produced on farm represents a major health hazard and the problem increases with increasing herd size on the farm. Quantity of waste produced, inadequate removal, frequency of removal, storage, labour availability, value and use of dung are issues connected with management of waste. Studies indicate that waste water from dairy barns constituted great risk to the environment because of the higher Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD) and the presence of coli-form organisms. Waste water and leaching from piled up and drying manure contaminated ground water (Devendra, 2001).

Good waste management is important to maintain the quality of the milk product and the health of the animals and the operators, prevent adverse effects on land and water resources,

exploit wastes as resources. Sanitation is important to avoid expensive durgs that are required for treatments and to have a sustained production level of the cow within a lactation period (Kinsey, 1993).

The dairy farming households were requested to tell how they dispose off wastes emanating from their activity. Accordingly, collecting at one site (pit), drying it out and using for fuel, using it in the backyards and gardens to fertilize soil, disposing off through open sewers which spill into drainage systems and dumping directly into near by streams and rivers were the mechanisms used in disposing off wastes. It is to be noted that dairy farmers should be enlightened about the environmental impacts of their activity and sanitary experts should provide the necessary assistance to the farmers so that the negative environmental impacts of urban dairy farming will be minimized.

In addition to its impact on the physical environment, urban dairy farming also affects the human environment including neighbourhood relations, traffic accidents and physical damages to people. As indicated in table 5.22,about 95.0% of the dairy farmers have indicated that their animals have never been causes of traffic accidents while the remaining 5% of the dairy farmers indicated that their animals have caused traffic accidents. The proportion of dairy farmers who indicated animals as causes of traffic accidents are a bit higher in the inner city (7.6%) compared to 3.4% in the periphery. The figures in table 5.22 also show that 86.2% of the investigated dairy farming households have never experienced physical damages to people by their animals while 13.8% of the dairy farmers have indicated physical damages to people by their animals. It appears from table 5.22 that physical damages to people by the animals are slightly higher in the inner city (17.4%) compared to 11.5% in the periphery. Animal odors and noise pollution are incompatible with residential neighbours and neighbour conflict is often a series problem for urban dairy farmers. Of the dairy farmers 28.3% have reported complaint from neighbours. Relatively large proportion

of the dairy farmers in the inner city (35.9%) have reported conflicts with neighbourhood while the proportion is 23.6% in the periphery.

Table 5.22: Number and Distribution of Dairy Farming Households Experiencing Difficulties in Connection with their Activity in their Immediate Working Environment

	Location				Total hhs	
	Centeral		Periphery			
	No	%	No	%	No	%
Have your animals been causes of traffic accident?						
Yes	7	7.6	5	3.4	12	5.0
No	85	82.4	143	96.6	228	95.0
Total	***92***	***100***	***148***	***100***	***240***	***100***
Have your animals caused physical damage to people?						
Yes	16	17.4	17	11.5	33	13.8
No	76	82.6	131	88.5	207	86.2
Total	***92***	***100***	***148***	***100***	***240***	***100***
Do you find any difficulty (complaint) with neighbours						
Yes	33	35.9	35	23.6	68	28.3
No	59	64.1	113	76.4	172	71.7
Total	***92***	***100***	***148***	***100***	***240***	***100***

An attempt has been made to investigate the institutional constraints as perceived by the dairy farming households. Inquired whether they have any fear of eviction from the dairy activity area, 37.9% have the fear while 62.1% do not have the fear of eviction from dairying. Relatively larger proportions of the dairy farmers in the center (43.5%) have fear of eviction compared to 34.7% in the periphery. Form table 5.23 it is also evident that any part of the administration has never been creating problems to the 58.7% of the dairy farming households while 30.0% of the dairy farmers consider the 'kebele' administration as an obstacle to their dairy farming practices. The city administration is considered as an obstacle to dairy farming by 14.6% of the dairy farmers and 2.9% of the dairy farmers consider the wereda administration as an obstacle.

From the investigated dairy farming households, 60% of them do not know whether urban dairy farming is recognized by the government. About 23.3% of the dairy farmers believe that the activity is well recognized by the government while 16.7% of the dairy farmers do

not believe that urban dairy farming is recognized by the government. It appears from table 5.23 that more than half of the dairy farmers in the center (51.1%) believe that urban dairy farming is well recognized by the government as opposed to 6.1% in the periphery. Inquired about government's attitude towards urban dairy farming, 68.8% do not have any idea of government's attitudes towards urban dairy farming. About 16.2% of the dairy farmers believe that the government's attitude towards urban diary farming is positive while 15.0% believe that it is negative. From the analysis it can be concluded that the government's attitude to urban dairy farming is one of neglect if not harassment. Government institutions should create an enabling environment for the dairy farmers instead of creating problems.

Table 5.23: Number and Distribution (%) of Dairy Farming Households on their Perception of Institutional Constraints

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Do you have any fear of eviction from your dairying area?						
Yes	40	43.5	51	34.5	91	37.9
No	52	56.5	97	65.5	149	62.1
Total	***92***	***100***	***148***	***100***	***240***	***100***
Which one is considered as an obstacle to your dairy farming practice?						
Kebele administration	23	25	49	33.1	72	30.0
Wereda administration	-	-	7	4.7	7	2.9
City administration	12	13.0	23	15.5	35	14.6
No problem from any	61	66.3	80	54.0	141	58.7
Do you believe that urban dairy farming is well recognized by govt.?						
Yes	47	51.1	9	6.1	56	23.3
No	9	9.8	31	20.9	40	16.7
Do not know	36	39.1	108	73.0	144	60.0
Total	***92***	***100***	***148***	***100***	***240***	***100***
What do you think of government's attitudes towards urban dairy farming?						
Is positive	20	21.7	19	12.8	39	16.2
Is negative	23	25.0	13	8.8	36	15.0
Do not know	49	53.3	116	78.4	165	68.8
Total	***92***	***100***	***148***	***100***	***240***	***100***

The study also attempted to investigate whether there exists a conducive atmosphere whereby the government institutions lend hands to the endeavours of the dairy farming households. Strikingly enough, 92.5% of the dairy farming households do not receive assistance from the government and only 7.5% receive assistance. From the dairy farming households who receive some kind of assistance from the government, 44.4% rate the assistance given as medium, 38.9% as low and 16.7% consider the assistance given as high. As indicated in table 5.24 it seems that relatively higher proportion of dairy farmers from the center (14.1%) receive assistance from the government as compared to 3.4% in the periphery. From the discussion in the earlier sections of this paper, it is indicated that the uses of urban dairy farming are multi-faceted and multi-fold. Hence, the right support should be provided to the dairy farmers.

Table 5.24: Number and Distribution (%) of Respondents who Receive Assistance from the Government.

	Location				Total hhs	
	Centeral		Periphery			
	No	%	No	%	No	%
Do you receive assistance from the government?						
Yes	13	14.1	5	3.4	18	7.5
No	79	85.9	143	96.6	222	92.5
Total	***92***	***100***	***148***	***100***	***240***	***100***
How do you rate the assistance given?						
High	2	15.4	1	20.0	3	16.7
Medium	7	53.8	1	20.0	8	44.4
Low	4	30.8	3	60.0	7	38.9
Total	***13***	***100***	***5***	***100.0***	***18***	***100***

Generally, the overall discussion in this chapter indicate that the need to feed family is a major motivating factor to start dairying. Producers mainly purchased initial dairy cows by their private money and acquired information and skills mainly from relatives. The dairy farms have both local and exotic breeds and raise calves or purchase from a dealer to replace

discarded cows. The dairy farmers operate in constricted area mainly using family labour. Animals are in most cases stall-fed and hay, industrial, agricultural and domestic by-products are used to feed animals. Grazing is commonly practiced in the periphery. The major source of drinking water for the animals is piped water. The dairy farmers have access to veterinary services from MoA and private clinics and they use AI and bull services as methods of breeding. The local cows have longer calving interval and low milk yield. The dairy producers face different problems and constraints of which animal health problems, lack of suitable plot of land, shortage of feed, lack of capital and credit, increased cost of labour, lack of veterinary and extension services, neighborhood conflict, fear of eviction and neglect of the government are the most pertinent ones.

CHAPTER SIX

DAIRY MARKETING ASPECTS, DISTRIBUTION METHODS AND PRODUCT UTILIZATION

6.1 Dairy Products Sales Outlets and Distribution Methods

6.1.1 Milk for Sale and its Determinants and Income from Dairying

Marketing is the performance of all business activities involved in the flow of goods and services from the point of initial agricultural production until it reaches the hands of ultimate consumers. Marketing improvement can bring an increase in the economic value of output by raising consumer satisfaction from a given quality of produce by providing it with the form, time and location and utility most pleasing to consumers. Improved production can be achieved through improved marketing as it stimulates production. It also raises dairy farmer incomes and living standards and urban food security. A market can be visualized as a process in which ownership of goods is transferred from sellers to buyers who may be final consumers or intermediaries (Debrah and Berhanu, 1991).

The milk marketing system is determined by the nature of the product-liquid, perishable; produced by many smallholders and the relative locations of the producers and consumers, and the distinct income-segmented markets, the relative economic power of buyers and sellers (Malcolm, 1999).

The dairy farmers were questioned whether there exists a demand for milk in the area in which they operate the activity. All, 100%, of the dairy farmers have replied that there is no

problem of demand for milk in the area. As can be expected, when few people are involved in dairying and the demand for milk in a particular area is not satisfied, it is unlikely that the farmer will experience any marketing problems unless the buying power of the populace is too low. The respondents have also indicated that most of the milk produced is meant for sale. It is found that 76.9% of the milk produced by the dairy farmers in the peripheral zone and 67.3% of the milk produced by the inner zone farmers is allocated for daily sale. With the exception of milk that is processed as a minor activity, most of the product is retailed in a raw form directly to the consumers. Characteristics of the household which include aspects like household size, number and ages of children and income can influence the likelihood that the household sells milk (Bogalech, 1998).

A household's marketable supply of milk (Mm) is a function of total production (Tp), home processing (Hp), home consumption (Hc) and calf feeding (Cf). Hence, (Mm = Tp - (Hp + Hc + Cf). Assuming Tp remaining constant if the sum of Hp, Hc and Cf increases, the amount of fresh milk supplied to the market decreases and if Tp increases, keeping Hp, Hc and Cf constant, Mm will also increase (Debrah and Berhanu, 1991; Belachew et al, 1994). An increase in total milk production inturn depends on the breed type kept in the herd, the number of cows under milking and the quality and quantity of feed fed to the cows. Hence, it is safe to conclude that those dairy farmers who keep exotic and crossbred cows in the herd tend to supply more milk to the market compared to those who keep local cows; those who keep many cows specially lactating ones in the herd can supply more milk on a sustainable basis and those who feed concentrates to their cows obtain higher production and supply more milk to market. Similarly if the proportion of milk meant for home consumption and calf intake is low, the amount of milk supplied to the market from households will increase.

Table 6.1: Number and Distribution (%) of Dairy Farming Households by Most Ranked (1-2) Factors Affecting Household's Marketable Supply of Milk.

Most ranked (1-2) factor affecting household's marketable supply of milk	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Breed type	80	95.2	140	97.2	220	96.5
Number of lactating cows	78	92.9	125	86.8	203	89.0
Proportion meant for home consumption	8	9.5	12	8.3	20	8.8
Calf intake	2	2.4	11	7.6	13	5.7

The Dairy farmers were requested to rank the factors that determine the amount of milk they supply to the market. The breed type kept in the herd is ranked (1-2) by 96.5% of the dairy farmers to be the most important factor that determines the household's total marketable milk supply followed by the number of lactating cows ranked (1-2) by 89.0% of the households. Only 8.8% and 5.7% of the dairy farmers rank (1-2) the proportion of milk meant for home consumption and calf intake as important determinants affecting the household's marketable supply of milk.

The sale of milk is the most frequent and regular source of cash income for the investigated dairy farming households. At this point it is vital to note that eight dairy farms from the center and four from the periphery entirely use dairy products for household consumption and hence dairy products are not for sale. The average monthly income derived from milk sale indicated by the dairy farmers in the central zone is 594.8 birr/month where the maximum and minimum reported incomes are 1100 and 150 birr per month respectively. The monthly average cash income earned by peripheral dairy farmers from milk-sale is 449.6 birr per month where the maximum and minimum reported incomes being 750 birr and 120 birr per month respectively. Other dairy products are processed and sold only when excess is there that is not sold specially during the fasting period. For some of the dairy farmers, the sale of butter and cheese, dung sale and bull services are found to contribute less than 100

birr per month. However, it should be noted that income derived from these sources is highly erratic and infact the great majority of the households do not indicate these as monthly income sources. Livestock sale as a source of monthly cash income for the households is negligible.

6.1.2 Milk Market Outlets and Reasons for the Selection

As it was pointed out in the earlier sections of this paper, in Addis Ababa, milk is distributed through the informal and formal marketing systems. In the informal market, fresh milk is directly delivered to consumers in the immediate neighbourhood or is sold to itinerant traders or individuals. The formal market is dominated by the DDE and Mama. Studies indicate that urban consumers usually buy products from livestock reared on low cost local resources and sold through unofficial channels rather than the formal markets (Bayer, 1995; Staal and Shapiro 1996; Wondwosen, 1998). The increasing demand for milk and dairy products in areas where low income groups dominate the market, is expected to favour the informal market, particularly where milk is produced primarily by small and medium scale producers. The success of the informal market is based on consumer reluctance to pay the extra costs of pasteurization and packaging (Leeuw, 1999).

As it is evident from the survey result presented in table 6.2, the overwhelming majority (94.3%) of the dairy farmers sold milk directly to consumers or individual households, 49.6% of them sold milk to itinerant traders or retailers and 14.0% supplied to commercial establishments and institutions (hotels, bars, creameries, governmental institutions). It appears from table 6.2 that large proportion of dairy farmers in the center (32.1%) use commercial establishments and institutions as their milk sales outlets as compared to 3.5% in the periphery. This may be attributed to small production per dairy farm and distance of institutions from the production site of the peripheral farmers. It should also be noted that the DDE factory or its collection sites have never been used by producers in both locations as an outlet.

The study result further indicates that there are large numbers of buyers of individual households than itinerant traders and commercial establishments and institutions. However, more of the milk is sold to traders and commercial establishments and institutions even if they are fewer in number.

With regard to selection of market outlets for liquid milk, important considerations include distance (proximity), price, reliability and lack of alternatives. According to Debrah and Anteneh (1991), producers knowledge of alternative sales outlets and of prices they offer will enhance their bargaining position and improve their chances of getting the highest prices for their products. Producers will also have the flexibility to shift between outlets to obtain the best prices when there are different sales outlet options. The dairy farmers gave consideration mainly to proximity and better pay (56.6%), followed by proximity of buyer (28.5%), no other means or lack of alternatives (20.6%), reliability (18.0%), and better pay (7.0%). 4.8% of the dairy farmers do not have regular buyer (client) and hence no criteria was used in outlet selection. Careful examination of table 6.2 reveals that reliability as a factor for the selection of outlets is more important to the inner city dairy farmers (26.2%) compared to their peripheral counterparts (13.2%). Proximity and better pay is considered more by the peripheral dairy farmers (66.0%) compared to those in the inner city (40.5%). Relatively higher proportion of dairy farmers in the center (10.7%) do not have regular buyers compared to 1.4% in the periphery.

Table 6.2 :Number and Distribution of Dairy Farmers Selling Milk to Different Outlets and Factors Considered in the Selection.

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Outlet						
Individual household	82	97.6	133	92.4	215	94.3
Itinerant trader	41	48.8	72	50.0	113	49.6
Commercial establishment	-	-	-	-	-	-
& institutions	27	32.1	5	3.5	32	14.0
Criteria used to choose buyers.						
Proximity of buyer	25	29.8	41	28.5	65	28.5
Better pay	7	8.3	9	6.3	16	7.0
Reliability	22	26.2	19	13.2	41	18.0
No other means	18	21.4	29	20.2	47	20.6
Proximity & better pay	34	40.5	95	66.0	129	56.6
No regular buyer & no criteria	9	10.7	2	1.4	11	4.8

6.1.3 Producer Prices and Pricing Method, Payment Interval, Variation in the Price of Milk and Methods of Advertizing

The price of dairy products influences both the producers and the consumers. It can influence the level of milk output, consumption on the farm and conversion of milk into other dairy products. In Addis Ababa, even if apparently excess supply of milk is observed in the long fasting period and in the wet season, price fluctuation is not significant. This signals the unmet demand even in periods of apparently excess supply. Similarly, if a large number of middle men are involved between producers and consumers, prices tend to rise thereby ultimately resulting in reduced milk consumption specially by the low income segment of the population. Studies indicate that the margin between the final sales price and the price paid to the farmer is relatively wide and the existence of such price differentials might invite potential investors to participate in milk distribution channels as organized processors (Belachew et al, 1994).

The average milk price that producers receive is 2.58 birr per liter in the inner city. The milk price received by producers varies from as low as two birr to as high as three birr. On the other hand, the peripheral dairy farmers received an average price of 2.24 birr per litre with a maximum of three and minimum of 1.50. Some of the investigated dairy farming households reported charging higher prices to individual households as compared to the itinerant traders and commercial establishments. However, the majority charge the same price for both buyers. Hence, producer milk prices vary by outlet and by location as the milk price in the inner zone of the city is higher than the periphery. The relative spatial variation in the producers fresh milk price might be attributed to limited number of dairy cattle, high population concentration and businesses in the inner city which are likely to create strong demand and higher prices than in the periphery.

As can be seen from table 6.3, the vast majority of the dairy farmers (93.0%) sell milk on contractual basis while 57.9% of them sell milk on cash. Similarly, large proportion of the dairy farmers (73.7%) collect payments at the end or beginning of every month based on agreements between customers (monthly) from milk sale while 54.4% collect revenue on a daily basis, 8.8% bi-monthly, and 7.0% weekly. It appears from the table that most of the producers in the center (70.2%) collect the revenue on a daily basis as compared to 45.1% in the periphery. It is also evident from table 6.3 that 49.5% of the producers determine the price of milk in agreement with the buyers (common deal) while sellers determine the price of milk in 48.7% of the cases. The buyers are found to determine price of milk in only 1.8% of the cases. Hence, it is safe to conclude that the milk market is a sellers' market and this also is a manifestation of the shortage of milk supply and the excess demand for milk in the study area so that the buyers have to be guaranteed with uninterrupted supply. For the great majority of the dairy farmers (72.8%), prices have never varied seasonally while for 15.8% of the dairy farmers slightly higher prices are reported during the dry (winter) season. The writer believes that the relative feed shortage during the dry season particularly for those who depend on grazing in the periphery explains the situation.

An attempt was also made to investigate how dairy farmers advertize their activity and produce. Accordingly, it was found out that using sign board or writing on walls (fences); word of mouth or telling the neighbours and any one who comes to buy milk and supplying quality milk to the local populace to develop good reputation were methods used by the dairy farmers to advertize their activity and produce.

As regards the sale of dairy products processed from milk, for those who process milk to butter and local cheese or 'ayib', the sale took place both in the market and in the business premise (residential unit). Unlike that of fresh milk, the term of sale for these products is in all cases cash. This may be because the processed dairy products do have longer shelf life and hence producers may defer selling them. Butter is reported to be sold between 25-30 birr per kilo and 'ayib' is sold between 5-7 birr per kilo.

Table 6.3:Number and Distribution (%) of Producers by Milk Pricing Methods

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Terms of sale						
Cash	49	58.3	83	57.6	132	57.9
Credit (contract)	77	91.7	135	93.7	212	93.0
Payment Interval						
Daily	59	70.2	65	45.1	124	54.4
Weekly	7	8.3	9	6.3	16	7.0
Mid-month	9	10.7	11	7.6	20	8.8
Monthly	61	72.6	107	74.3	168	73.7
Who determines price of milk?						
Seller	42	50.0	69	47.9	111	48.7
Buyer	1	1.2	3	2.1	4	1.8
Common deal (interest)	41	48.8	72	50.0	113	49.5
During which season are prices higher?						
Summer	14	16.6	5	3.5	19	8.3
Winter	13	15.5	23	16.0	36	15.8
Spring	1	1.2	6	4.1	7	3.1

No price variation	56	66.7	110	76.4	166	72.8

6.1.4 Milk Containers Used and Milk Handling Before Selling

The dairy producers used different materials for packing milk. As it is summarized in table 6.4, the vast majority of the dairy farmers (78.5%) use plastic containers in handling market milk. The proportion of dairy farmers who use aluminum cans, bottles and tin cans as containers of market milk constitute 21.1%, 11.4% and 1.3% respectively. The type of material used in handling milk and the methods of keeping milk cool bear significant relationships with the quality (hygiene) of the milk and needs further investigation.

The investigated dairy farming households were demanded to identify the mechanisms that they use to keep milk fresh before it is being sold and the results are presented in table 6.4. As it is presented in the table, all the investigated dairy farming households have replied that fresh milk is delivered to consumers soon after milking. This, is an important practice that should be encouraged and sustained. Under circumstances where there is some kind of delay, may be because of distance in distributing the product or in cases where the milk is not readily taken by the consumers, the producers have developed alternative means of keeping market milk cool. Hence, more than half of the dairy farmers (55.3%) keep the milk cool by keeping containers in a cool room while the proportion of dairy farmers who keep market milk cool in refrigerators are 13.6% and the proportion for those who immerse containers in water to keep milk cool is 13.6%. An important point that needs to be mentioned here is that there is remarkable spatial variation in the methods used by the producers in keeping market milk cool. The proportion of dairy farmers who keep milk cool in refrigerators is found to be higher (27.4%) in the inner city compared to 5.6% in the periphery. On the other hand, keeping market milk cool by immersing milk containers in water and by keeping containers in a cool place are most commonly practiced by the peripheral dairy farmers compared to those in the inner city.

Table 6.4: Number and Distribution (%) of Dairy Farming Households Using Different Materials to Handle Market Milk and Milk Handling before Selling?

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Containers used in handling milk						
Aluminum cans	17	20.2	31	21.5	48	21.1
Plastic container	70	83.3	109	75.7	179	78.5
Bottles	6	7.1	20	13.9	26	11.4
Tin cans	-	-	3	2.1	3	1.3
How do you keep milk cool before selling?						
Containers immersed in water	8	9.5	23	16.0	31	13.6
Containers kept in a cool room	39	46.4	87	60.4	126	55.3
Containers kept in fridge	23	27.4	8	5.6	31	13.6
Milk is delivered fresh soon after milking	84	100	144	100.0	228	100.0

6.1.5 Distribution Methods and Type of Transport Used

With regard to milk distribution methods, the investigated dairy farming households sold milk directly to consumers or consumers collected milk from the dairy farms or both methods were used. 89.9% of the producers sold milk at the point of production or at farm gates while 78.9% delivered milk to customer's house or place of business. Most producers sold their milk at the farm gates as there is higher demand for milk which may not necessitate home delivery. It appears from table 6.5 that relatively large proportion of dairy farmers in the inner city (95.2%) directly sold milk at their farm gates compared to 86.8% in the periphery. On the other hand, 85.4% of the dairy farmers in the periphery delivered milk to customer houses or place of business as opposed to 67.9% in the inner city. At this point it should be noted that dairy farmers sell products at their farm gates predominantly for individual buyers and to few itinerant traders while deliveries of milk to customer's house or place of business is mainly done for traders and commercial establishments and to few households.

Table 6.5 also shows the type of transport used to deliver milk. It has been found out that milk is transported to sales locations on foot, public transport (bus and taxi) and own vehicle. The vast majority of the producers (84.2%) transported milk on foot while 20.2% used vehicles in transporting milk. Careful examination of table 6.5 reveals that more of the dairy farmers in the periphery (88.2%) transport milk on foot compared to 77.4% in the center. On the other hand, the use of vehicles in transporting milk by the dairy farmers is more in the center (25.0%) compared to 17.4% in the periphery. It should also be noted that foot as a type of transport is mostly used to deliver milk for the individual households and nearby traders whereas vehicles are mainly used to transport milk for commercial establishments and institutions.

Table 6.5: Number and Distribution of Producers Using Different Milk Distribution Methods and Means of Transport.

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Type of delivery						
Sales made at point of production (at farm gate)....	80	95.2	125	86.8	205	89.9
Deliveries to customers house or place of business....	57	67.9	123	85.4	180	78.9
Type of transport used						
On foot	65	77.4	127	88.2	192	84.2
Vehicle*	21	25.0	25	17.4	46	20.2

**** Vehicles include public transport, and own vehicle***

6.2 Dairy Consumption and Product Utilization

6.2.1 Household Dairy Products Utilization and Dterminants of Dairy Consumption

Milk is a traditional, widely used product in many parts of the world. In poor countries, wealthy consumers regard milk as a basic food product while poor people regard milk as a

supplement to the traditional diet. For the urban poor in developing countries, milk and milk products are usually too expensive for them to buy in significant amounts (Malcolm, 1999).

Traditional food habits, religious beliefs or food prejudices may affect the consumption of milk. The geographical, economic or physiological differences between various categories of people influence the intake of dairy products. The well-to-do may take much more milk than those less well off; producers than the non producers; more milk may go to adults, for example, in tea or coffee than to children (Kon, 1972). Hence, milk production and consumption levels, the range of products consumed, and consumer habits and attitudes in relation to milk products, vary considerably with country and even within a country. Measured milk consumption, for example, is about 20 litres per person per year in Africa, but is as high as 400 litres per person per year in Western Europe and America (Malcolm, 1999). The per capita consumption of milk in Ethiopia is as low as 17 kg (Staal and Shapiro, 1996).

There are enormous disparities of incomes between a small segment of very affluent people, a large but still a relatively small middle class segment and a huge mass of people representing a minor share of total disposable income. Milk and milk products are not common items that the whole population can afford to buy, and milk consumption will grow in line with growth and distribution of income. However, it is likely that the dairy producers consume more milk than the non producing households in the city.

In addition to income, dairy consumption can also be influenced by demographic factors like number of people and age structure of the population. For example, high amount of milk is required at early ages and the requirement declines as age progresses and females require more milk while they are nursing (UNICEF, 1987 in Ameha, 1989). Dairy consumption also shows a temporal variation. At present, the majority of people who live in Addis Ababa belong to the Orthodox religion, as the 1994 census result reveals, which rules that the

followers have to observe several fasting days in a year. Fasting requires abstinence from food of animal origin. The fasting days are many, about one-third of the year.

Household dairy products utilization is an important component of the study and therefore there is a need to consider household allocation of milk for different purposes. Accordingly, the percentage share of milk allocated for different uses by the dairy farming households is summarized in table 6.6. As indicated in the table, the highest proportion of milk produced in the dairy enterprises (72.05%) is allocated for sale. The proportion of milk allocated for home consumption, calf feeding and home processing constitute 11.83%, 11.28% and 4.84% respectively. Careful examination of table 6.6 reveals that more milk is allocated for home consumption (14.75%) by dairy farmers in the center compared to the periphery (8.92%). It is also evident that the proportion of milk allocated for sale is higher in the peripheral dairy farmers (76.76%) compared to 67.33% in the center. This is contrary to the expectation that good market access and better prices motivate dairy farmers in the center to allocate most of the milk for sale than the periphery. Large household size, few dairy cows per farm, purpose of the farm-production for home consumption rather than sale, perhaps diverse income alternatives of household heads and low female headship of farms in the inner city might have contributed to the allocation of most of the milk for home consumption instead of earning cash income.

It was also found out that the share of milk allocated for home consumption in the inner city dairy farming households ranges from a maximum of 90% to a minimum of 4% while in the periphery the proportion ranges from a maximum of 30% to 3%. Similarly, milk meant for calf feeding in the inner city ranges from 50% to 5% whereas the proportion ranges from 25% to 3% in the periphery. The proportion of milk allocated for sale ranges from a maximum of 90% to nill in both locations. The proportion of milk allocated for home processing by dairy farmers ranges from as high as 50% (inner city) and 25% (periphery) to nill in both locations.

Table 6.6: Daily Percent Share of Milk Allocated for Different Purposes by the Dairy Farmers.

Location	Proportion of Milk Allocated for the Uses				
	Home consumption	*Calf feeding*	*Sale*	*Home processing*	*Total*
Central	14.75	12.32	67.33	5.60	100
Peripheral	8.92	10.24	76.76	4.08	100
Average total	11.83	11.28	72.05	4.84	100

An attempt was also made to look into the dairy products that are frequently consumed by the dairy farming households. The dairy farming households consume milk either in fresh or fermented form. Processed dairy products are also consumed. As shown in table 6.7, milk is the dairy product consumed by all the investigated dairy farming households although the proportion consumed may vary from one household to another. Yoghurt ('Irgo') is consumed by 42.1% of the dairy farming households while 9.6% of the households consume butter and local cheese ('ayib'). Whey is reported to be least consumed by the households (7.5%), infact none of the dairy farmers in the center indicated consumption of whey. In most cases whey is fed to calves and pet animals.

Table 6.7: Number and Distribution (%) of Dairy Farming Households by the Type of Dairy Product Consumed Frequently

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
Dairy Product Consumed						
Milk	92	100	148	100	240	100
Yoghurt	41	44.6	60	40.5	101	42.1
Butter	8	8.7	15	10.1	23	9.6
Local cheese ('ayib')	7	7.6	16	10.8	23	9.6
Whey	-	-	18	12.2	18	7.5

6.2.2 Utilization of Unsold Dairy Products and the Use of Manure

The survey revealed that there are circumstances where milk meant for sale may turn sour either because it is not immediately sold as a result of non availability of buyers or because of preservation problems and can be rejected. However, the variability in the range of milk production of the dairy farms, production perse and causes of over production and the non availability of immediate buyers do not constitute a problem for the enterprises. The system has found alternative ways to utilize the extra milk by consuming it at home, processing into other dairy products that have longer shelf life or feeding to animals, although the producers do not hold this as their main objective.

As regards to the utilization of unsold milk, 59.2% of the dairy farming households processed it into butter and local cheese or "ayib" whereas 27.6% of the households used it for family consumption and 9.2% fed unsold milk to animals (calves and pet animals). At this point it is important to note that there are dairy farmers who do not intend to sell milk and some dairy farmers have indicated that their milk intended for sale has never turned sour as it is sold immediately.

The fact that there are no wastes in dairying is a truism. The dairy farming by-products like manure are important resources. The importance of manure in reducing the need for chemical fertilizers, increasing compost production, increasing the nutrient content of the soil and improving its structure and water holding capacity which inturn helping to boost crop yields is considerable (Kinsey, 1993; FAO, 1998). Manure is also useful to obtain pollution-free biogas for fuel and lightening (Kinsey, 1993).

As presented in table 6.8, the overwhelming majority of the investigated dairy farming households (95.8%) dry up manure (dung) and use it as a source of household energy (fuel), 41.3% sell the dried manure, 14.2% of the farmers use it as fertilizer while 8.7% use it for

plastering walls and floors. The impression one gets from the analysis is that manure is highly utilized by the peripheral farmers compared to those in the inner city. Relatively higher proportions of the dairy farmers in the periphery (16.9%) use manure as fertilizer compared to 9.8% in the center. This is indicative of the relatively large land area available in the periphery. It is generally accepted that the manure from animals should return to the soil the nutrients extracted. It should be applied to gardens in the backyards, in market gardening areas in the wetlands in the city or to mixed farmers plots in the outskirts of the city. It is also evident from table 6.8 that 14.2% of the dairy farmers in the periphery use manure to plaster walls and floors while the practice is negligible in the inner city. This, some how, signals the housing and living conditions of the dairy farmers.

Table 6.8: Number and Distribution (%) of Dairy Farming Households Utilizing Unsold Dairy Product and Manure for Different Purposes.

	Location				Total hhs	
	Centeral		Periphery			
	No of hh	% of hh	No of hh	% of hh	No of hh	% of hh
How is unsold milk utilized?						
Consumed by the family	28	33.3	35	24.3	63	27.6
Processed into butter & 'ayib'	51	60.7	84	58.3	135	59.2
Fed to animals	8	9.5	13	9.1	21	9.2
How do you utilize manure (dung)?						
Use it for fuel	85	92.4	145	98.0	230	95.8
Use it as fertilizer	9	9.8	25	16.9	34	14.2
Sell it	28	30.4	71	48.0	99	41.3
Plastering walls, floor	-	-	21	14.2	21	8.7

Generally, the results of the study covered in this chapter reveal that there is considerable demand for dairy products in the study area. The marketable supply of milk is dependent on factors like the breed type kept in the herd, the number of cows under milking, the quality and quantity of feed fed to the cows, the proportion of milk allocated for home consumption, home processing and calf feeding. Most of the dairy farms obtain a large proportion of their monthly income from the sales of milk. The major milk sales outlets for the dairy farmers

are individual households and retailers. The farmers considered proximity, price and reliability in selecting sales outlets for their products. There is spatio-temporal variation in milk price and revenue from milk sale is collected monthly in most cases. Milk price is determined mainly by producers which indicates the high demand for and shortage of milk supply in the area. Plastic materials are commonly used to handle market milk and milk is usually kept cool, if not sold fresh, by keeping containers in a cool place. The dairy farmers sell milk at their farm gate and deliver milk to customer's premises mainly on foot and also by vehicle.

Household dairy consumption depends on factors like the household's income, family size and composition and social aspects like religion. Most of the milk is allocated for sale. The dairy product most frequently consumed by the households is fresh milk while other dairy products are infrequently consumed. If milk is not sold because it had turned sour, it is processed to other longer keeping form, consumed at home, or is fed to animals. Most of the dairy farmers use manure as a source of household energy.

CHAPTER SEVEN

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

7.1 Summary of Findings and Conclusion

High levels of urbanization, population growth and expansion of urban areas represent a new dimension for development and food security policies in many developing countries. Rapid urbanization in the developing countries has been related with increased demand for food, shortages of housing, inaccessibility of clean drinking water, environmental pollution, and degradation of the surrounding bio-regions. Urban growth increases food demand but its horizontal expansion reduces the availability of productive land, increases the price of available land, intensifies motor traffic, increases distance of consumers from their work site and the cost of food transport.

The capacity of Third World governments to manage urban growth and provide food, shelter and basic services and create sustainable cities are becoming great challenges. Rural areas are not in a position to produce enough food to feed both rural and urban people and food import is constrained by lack of foreign exchange and soaring food prices. Imported food stuffs also degrade the local food production base and introduce foreign food tastes. Urban poverty and food insecurity has been growing. Hence, to meet the food needs of urban dwellers, urban agriculture is becoming a familiar and almost permanent feature in the developing world. Infact, with out urban and peri-urban agriculture, the challenge to feed cities would be enormous.

Urban agriculture is neither a new nor a declining activity. The system exists with heterogeneous resource utilization situations ranging from resource scarce to abundance and under a range of policy environments ranging from prohibitive to supportive conditions. It is also practiced by a wide socio-

economic spectrum of urban farmers ranging from subsistence production to fully commercialized agriculture.

The benefits of urban agriculture are diverse and multifaceted. Urban agriculture is labour intensive and has significant employment generating potential for urban areas whose unemployment rates are growing. It creates both full and part-time employment for household members and the community at large. It improves the overall level of family income. It also plays a vital role in reducing the negative environmental impacts and contributes towards the improvement of the urban environment. Urban agriculture also complements rural agriculture interms of self provisioning and marketing flows and a dichotomy between rural and urban, and to assign food production solely to rural areas is not much helpful as urban residents are not passive recipients of food. It contributes much to regulate the problem of undependable supply of food in cities and is also important to bring food prices down.

Urban agriculture has a tremendous potential to improve the livelihoods of the producers and makes important contribution to food security. Urban food security depends on many factors like the availability of food through production in rural and urban areas, imports, marketing and distribution, infrastructure, purchasing power; quality of food depending on preservation, quality production and sanitary conditions on market. The urban consumers, more vulnerable to food insecurity, mainly include the unemployed, the newly urbanized people, single mothers with dependent children. In African cities, food is turning into a basic luxury and to have a single meal daily is becoming common place and per capita food consumption is generally higher in rural than urban areas.

Population concentration in urban and peri-urban areas often coincides with intensive agricultural production. Urban agriculture is based on the intensified urban and peri-urban livestock production systems in areas with good infrastructure close to cities. Similarly, in areas where population pressure on land resources are greatest, there is a tendency for production to be more market oriented in nature. Milk production in urban areas is advantageous because of greater demand for milk, better access to markets, the unit cost of support services such as input supply and animal health services. Animal rearing in the urban areas, both on-plot and off-plot, is important in many regards

which include home consumption, as a source of highly valued food, supplementary income and hence employment, reducing transport and energy cost, improving the supply of perishable but nutritious food at affordable price and waste recycling.

Milk is one of the most complete and oldest known animal food containing almost all the nutrients needed for humans and is crucial for healthy physical and mental development. Dairying is said to originate in Mesopotamia-7000-6000 B.C. Dairy production is a biologically efficient system which provides a regular, sustained and stable income throughout the year. It is said to be a safe business manifested by quickness and certainty of returns as well as a product that is almost always marketable. It permits efficient use of labour and economic use of buildings and equipment, reduces risk of having one or two sources of income, helps in capital accumulation, improves family diet and reduces food and energy costs. Small-scale urban livestock keeping gives value to municipal and private land that is not momentarily used for other purposes.

Addis Ababa is a potential dairy production area. It has a favourable climatic condition. The demand for milk is high and can be expected to grow because of fast growth rate of of the population, high income elasticity of demand for milk and the development of social values favourable for the development of tastes for milk. Infact, the demand for food, milk included, depends on many factors which include total size and age structure of the urban population, household size, per-capita income, asset position of consumers, product promotion, knowledge about nutrition and health, educational level of consumers, religion, consumer preference, price of the product and substitutes and complements.

Addis Ababa is supplied with milk both from domestic sources, formal and informal markets, and imports. The bulk of fresh milk in Addis Ababa is channeled through the traditional marketing subsystem produced mainly from the backyards of the household. In the city the demand for milk exceeds the supply; milk requirement of the population is very high and the unmet demand is so enormous.

As the dairy producer characteristics indicate, the great majority of the urban dairy farmers (70.4%) are over 50 years of age and males predominate in the activity (85.8%). Nearly 76.2% of the producers are married. Amhara and Oromo ethnic groups are major participants in the activity comprising 88% of all the urban dairy farmers. Out of the total dairy farmers 93.3% of them belong to the Orthodox religion. About 70% of the dairy farming households have larger than five family members and 43.7% of the farming household heads are either illiterates or can only read and write. The dairy farmers belong to diverse occupation groups, infact, dairy farming is the major source of livelihood for the greatest proportion of the households in the periphery (69.7%) compared to 30.3% in the center. The overwhelming majority (78.8%) of the producers are well established migrants, 93% of whom resided in Addis Ababa for more than twenty years; who originally migrated mainly from the Shewan region. Hence, it is safe to conclude that well established migrants, males, people in higher age groups with low level of education predominate in urban dairy farming.

Evidence from the results of this study also reveal that the major factors that motivated the dairy farmers to start the activity include the need to feed family, rural background and business close to home. The most important factors considered in the choices of location for dairying include business at residence, proximity to source of animal feed and availability of utilities. About three-fourth of the dairy enterprises are 25 years old. The largest proportion of the dairy farmers (82.1%) have used their own money and 80.8% of them initially purchased dairy cows to start the dairying activity. As for knowledge and skills for conducting the activity, 80.8% of the farmers acquired it from relatives while others acquired from previous similar employment and college training.

The dairy herd in both locations is composed of local, crossbred and pure exotic animals. The average number of animals kept per household is higher in the periphery (7.95) compared to the center (6.3). The proportion of exotic breeds and crosses per farm is higher in the inner city compared to the periphery. Local cows exhibited shorter average lactation length,extended calving interval and low milk yield compared to exotic/cross-breeds. In selecting breed types, producers considered the average production of milk and fat, original cost, availability of feed supply and beef value of discarded cows. The farmers who raise calves to replace discarded cows are ha high as 95.8%.

Urban dairy farming is practiced in relatively smaller land area whereby 75.8% of the producers possess less than 400m^2 including living accommodation. Peripheral producers possess relatively larger land area compared to those in the center. Most of the dairy farmers have the intention to expand their activities (80.8%) and 69.1% of them want to relocate the dairying enterprises in the outskirts of the city where there is plenty of land. Most of the work in the dairy enterprises is done by family labour. Producers also pay cash to labour for employees with low level of education, illiterates (56.3%) or who can only read and write (21.5%).

Most of the dairy producers are dependent on stall-feeding but grazing is commonly practiced in the periphery using communal grazing land. Hay is the most commonly used feed type followed by concentrate oil cake, wheat bran, "atela", cotton seed and straws. Producers usually complain about higher feed prices and feed availability is also seasonal. Animal feed is brought to farm using hired transport or is delivered by suppliers using donkeys, human porters and vehicles. Animals are fed as individuals and in groups.

The overwhelming majority of dairy farmers (88.3%) use piped water for animals. Other sources include streams and water wells. Shortage of drinking water is also apparent specially during the dry season. As for the source of veterinary services, most of the farmers (71.7%) use MoA. Others use the services of private clinics and local traditional practitioners. It is striking to see that 74.2% of the dairy farmers have never been supported by extension agents.

Cows are milked by hand twice in a day mainly in the cow house and calves are let to suck cows or are bucket fed. Most of the farmers (63.7%) do not have the practice of keeping records of daily milk output from each cow. Some dairy farmers process milk to butter and cheese, particularly during the long fasting period and the wet season. Natural mating is the most frequently used breeding method by the farmers (77.9%) and artificial insemination is also used; the source of breeding services being MoA and individuals.

Inavailability of feed of adequate quantity and quality is recognized to be a major limiting factor for increased milk production. Incidence of diseases and inefficient animal health care are also major constraints against improved dairy production and are major causes of death of animals; the most common diseases being mastitis, pneumonia, tick related, anthrax, foot and mouth disease. 83.7% of the farmers use modern medicine to overcome health problems. Other constraints to improved dairying include dairy production with local breeds of low productivity, lack of adequate space, lack of developed credit market, shortage of capital, increased cost of labour, lack of veterinary and extension services, reproductive inefficiency, shortage of water, lack of refrigeration facilities and precarious dairy housing. In addition, institutional constraints like governmental neglect, absence of support, fear of eviction, absence of clear livestock development policy and strategy are also prominent. Environmental problems as a result of inefficient waste management, neighbourhood conflict, traffic accident and physical damage to people are associated with dairy farming.

Dairy products are of great demand in the study area. The amount of milk supplied to the market is dependent on total production, home consumption, home processing and calf feeding. Total production inturn depends on the breed type, the number of lactating cows, the quality and quantity of feed fed to the cows and increased level of inputs including health care. Hence, the dairy farmers who keep exotic and crossbred cows in their herd, those who own many cows, most of which lactating, who provide adequate quantity and quality feed and follow appropriate management tend to supply more milk to the market. Similarly, if the proportion of milk consumed at home and calf intake is low, the amount of marketable milk increases.

The sale of fresh milk is the most frequent and regular source of income for the dairy farming households. Dairy farmers in the inner city earn more average monthly income (594.8 birr) than those in the periphery (449.6 birr). Income from other dairy products is highly erratic. The dairy farmers mainly sell milk directly to individual households. Other sales outlets include itinerant traders or retailers and commercial establishments and institutions. Important considerations in the selection of market outlets include proximity of buyer, higher price, reliability and lack of alternatives. Dairy producers in the center receive relatively higher average prices per a litre of fresh milk (2.58 birr/litre) compared to 2.24 birr/litre in the periphery. Producers obtain higher prices

from individual hoseholds than traders and institutions. Most of the milk is sold on contractual basis and payments are collected maily at the beginning or end of a month based on agreements with customers. The price of fresh milk is mainly determined by the sellers alone or in agreement with buyers, hence, it can be said that the milk market is a sellers market.

If milk is not sold fresh to the customers, the producers have developed alternative means of keeping milk cool by keeping containers in a cool room, fridge or immersing in water. Milk is sold at farm gate (point of production) or delivered to customers house or place of business. Milk is mainly transported to sales locations on foot (84.2%) and using vehicles.

The most frequently consumed dairy product by the farming households is fresh milk followed by Yoghurt while whey is least consumed. Household dairy consumption depends on factors like household income, family size and composition and social aspects like religion. If milk is not sold immediately, the producers utilize the extra milk by consuming it at home, processing into other dairy products with longer shelf life or feeding to animals. As for the utilization of manure, it is mainly used as a source of household energy. It is also sold or used as fertilizer and in very few farmers it is used for plastering walls and floors in the periphery.

7.2 Recommendations

The contribution of urban agriculture for the producers in particular and the urban community and environment in general is so enormous that there is a need to understand about those involved in the activity, the conditions of the farms, the role they play and the constraints they face. Hence, such a study can provide valuable input to mitigate the problems faced by those involved in it and to facilitate sustainable urban development. Accordingly, governmental, non governmental and community based organizations could use the findings of the study to take measures to achieve their aims of bringing about sustainable urban development. Therefore, the following points are suggested based on the findings of the research:

1. The study reveals that active participants in urban dairy farming are old people with low level of education and large family size. Hence, it is a major source of livelihood for these vulnerable groups. The activity benefits both the farming and non farming community in connection with food security and nutrition, employment, income and environmental improvement. Contrary to this, it is found that most of the producers have fear of eviction, and do not know whether urban dairy farming is recognized by the government and still many of them do not have any idea of government's attitude towards urban dairy farming. Hence, it is not difficult to see governmental neglect and at times harassment. Therefore, it is recommended that governmental institutions should create appropriate, encouraging and working environment for the dairy farmers. The right support should be provided to the dairy producers through more appropriate production technology available through research and extension, improved resource management, investment in human resource development. Similarly, urban agriculture should be legally recognized and be integrated into urban planning processes under the municipal policy to prevent negative impacts from unregulated urban agriculture. Linking urban agriculture to sustainable city development programmes is a major issue for integration of agriculture to education, nutritional and environmental issues. Regular information on urban agriculture should be provided to the municipality about urban farmers including what they produce, their motives and the methods being used, and about environmental impacts in order for them to make right policy decisions.

2. Shortfall of dairy products is found to be apparent during the dry season and when cows gestate or are dry. The shortage of dairy products is associated with shortage of feed. Hence, there is a need for the producers to purchase feed in times of plenty and hoard for latter use when feed shortage is severe. There is also a need to increase the number of animals per farming household and diversify the breeding time so that sustained output will be maintained even if some of the cows are under gestation period or are dry. The ratio of dry to milking cows should not fall below the recommended level so that there will be minimum non-lactation time to sustain products for home consumption and sale.

3. In order to increase the milk supply to the city, the number of farms and the level of intensification in dairy production should grow at a faster rate by making use of improved genotypes and appropriate management. There should also be a mechanism of stimulating private sector involvement in the dairy sector by providing adequate legislative and regulatory frameworks and all the necessary support so that producers have alternative outlets. There can also be a possibility of protection for locally manufactured dairy products in the form of reduction in the quantity of imports and increase of custom duty. Hence, controlled prices can motivate dairy producers to produce more and supply to the market.

4. The low productivity of the dairy herd, because of low genetic potential, specially in the periphery resulted in depressed milk production. Breed improvement is a crucial mechanism of achieving the objective of improving the productivity of the dairy cows and profitability of dairy enterprises. There must be careful selection of breeding stock. The producer should be provided with sufficient and accessible AI and bull services at reasonable prices in order to upgrade the genetic make-up of the herd for more productivity. There can also be substitution of low yielding local breeds with temperate breeds of high production potential being considerate of the availability of feed and other inputs and management aspects for high level of intensification. The dairy farmer should disregard replacement buying to replace discarded cows, instead they should raise calves to replace cows.

5. The dairy cows should be provided with adequate housing with appropriate drainage, ventilation and light source. Improving the accessibility and quality of water for the animals is crucial. The use of polluted river/stream water should be avoided if producers are to maintain a healthy herd and hygienic product. Movement for the cows should be encouraged all of which influence dariy productivity.

6. It has been indicated in the foregoing discussions that inavailability of feed of adequate quality and quantity and higher feed costs greatly limit milk production potential of animals and is the most serious constraint to improved dairying. Thus, the farmers should purchase feed directly from producers instead of itinerant traders. The seasonal feed shortages should

be mitigated by hoarding animal feed that could be bought in times of plenty. Similarly, promoting efficient handling of feed, diversifying the sources and types of feed, feeding animals economically as individuals in relation to physiological status of animals which include pregnancy, lactation and weaning to pregnancy, and quantity and butter fat content of each cow's milk is crucial. The dairy farmer should avoid feeding animals collectively. There should also be a need to train dairy farmers in fodder production specially the introduction of multi-purpose and fodder trees and backyard vegetable production where there is relatively ample land area. Vegetable and fruit rejects originating from gardens and main markets can be given to producers or sold at low prices which makes them a very profitable source of feed for the dairy enterprises. Household separation of garbage for livestock should be encouraged.

7. Lack of sufficient land for dairying, including grazing, is also found to be a major constraint. The restriction in physical space is said to be related with animal welfare and comfort. Hence, the dairy farmers need to be rehabilitated in areas where there is adequate land for grazing and forage production to minimize dependence on concentrates. Establishment of new dairy enterprises should be in the outskirts of the city and grazing in the inner city should be limited and animals should not be allowed to roam freely as it creates nuisance conditions, cause traffic accident, and physical damage to people and therefore closed barn management is more appropriate.

8. Cattle disease is a big problem among dairy producers which leads to animal mortality and reduced productivity of the cows, lower quality product and risk of zoonotic diseases. Hence, good health care and disease control programs should be implemented. Sick cows should be isolated from healthy ones to avoid the spread of infectious diseases. There should be development of animal health management skills of dairy farmers, an increase in the availability of animal health services, veterinary drug supply at affordable prices and accessible locations. The producers should develop the habit of frequently vaccinating animals. Developing proper waste water drainages, regular tests for diseases, disinfecting materials, close inspection while animals are foraging are all important practices.

9. In producing hygienic product and safeguarding the public from zoonotic diseases, there is a need of managing the health of animals, good health and hygiene of milkers. Introduce the use of good quality milking utensils and antibacterial cleansing reagents, protecting equipment from flies, insects, dirt, dust, use of machine milking, efficient storage and transportation of milk to sales points, and hygienic processing.

10. The milking process bears a significant relationship with the productivity of dairy cows. Hence, the dairy farmers should avoid frequently changing milkers as it negatively affects milk production. The milkers should not excite or worry the cows by loud voice or cruelty of any kind. Strangers and animals like dogs should not be there while milking. There is also a need to milk cows in a hygienic separate milking parlour. Inaddition, record keeping of the produce from each cow milked in a day should become a normal activity for a successful farmer who exactly wants to know the profitability of each animal in particular and the enterprise in general. It helps the farmer to identify more productive cows and dispose off the inferior ones, for proper feeding of the individual cows, detect sickness in a particular animal and judge the work of different milkers. Bucket feeding of calves should be encouraged as restricted sucking is said to improve the hygiene of feeding and decreases calf mortality. The calves should also be provided with a calf starter earlier to assist in developing their rumen for subsequent digestion of high fibre content feeds.

11. It is well known that agricultural extensionists and veterinarians have been trained to promote improved, relevant practices which bring about profitable agricultural enterprises. The dairy farmers learn more if they are visited by extensionists on their own farm and trained using direct applications of innovations to the local conditions of the farms. However, it was found out that the great majority of the dairy farmers have never been supported by extensionists and the major source of skills and knowledge for conducting the dairying activity is acquired from relatives/friends. Hence, the dairy farmers need to be supported by extension workers, provided with technical assistance, training on herd selection, herd management, storage of dairy products, dairy processing and marketing.

12. The provision of credit to farmers is essential to start and expand production capacity or improve the productivity of their enterprises thereby increasing the level of dairy supply. Hence, credit and incentive programmes for urban dairy farmers should be developed. The dairy farmers should also develop mechanisms of reducing cost like avoidance of keeping both unproductive cattle and bulls, should not purchase expensive feed and keep only healthy cows.

13. Milk is mainly sold in unorganized way in the informal market. A considerable proportion of the milk is sold to catering institutions. Hence, there is a need for the formation of self help dairy farmer groups by way of establishing voluntary dairy associations which organize milk collection, processing and distribution, for information exchange and credit availability. Integration of milk producers with the market will lead to higher local production through remunerative producer prices and ensures reliability while supplying hygienic milk at affordable prices to consumers. Improvements in the marketing chain can help reduce fluctuations in price by stabilizing production and by reducing the number of intermediaries along the chain.

14. Consumption promotion will increase access to information about the merits of consuming dairy products. Appreciation of the importance of milk as a valuable source of good quality protein, mineral and vitamins during pregnancy, lactation, infancy and the years of growth is crucial. Educating the public in nutrition through a variety of child care services, nutrition and home economics programmes, popular magazines, the press, radio and television is crucial to underline in the popular mind the place of milk in human nutrition. Consumption of dairy products is relatively lower not only because of limited availability and high cost but also because of habits. Inaddition, job creation and improvement in income leads to an increase in people's purchasing power and the increased consumption motivates the farmers to produce more.

15. In cases of excess production and excess supply of milk specially during the rainy season and the longer fasting period, it is advisable to convert fresh milk into other dairy products that

have longer shelf life. There is also a need to improve the technology and efficiency of butter and cheese making and other labour saving processing.

16. The management of animal wastes produced on farm represents a major health hazard. The activity should not contaminate the neighbouring environmental units. Good waste management is important to maintain the quality of the milk product, health of both animals and operators, prevent land, water and air pollution. Good waste management also helps to avoid neighbourhood conflict. There should be a mechanism of delivering manure and wastes to gardens in the backyards, the nearby market gardens in the wetlands and farms in the outskirts of the city. Building of fermentation tanks for manure to reduce odors and obtain methane gas before residues are sent to the fields is crucial. Thus, bio-gas production can be an alternative to appropriate utilization of wastes emanating from the activity.

17. Finally, research on the productivity of urban dairy farming needs to be expanded. This opens the ways for improvements in tackling animal diseases, identifying disease resistant animals; and improving genetic potential of dairy cows. It is also vital that feed varieties be improved and assess feed requirement of animals. There is also a need to undertake research on traditional drugs and practices to integrate it with modern means.

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Appendix 1

DAIRY FARMS IN ADDIS ABABA CITY ADIMINISTRATIVE COUNCIL (1986 Eth.c. census)

Zone	*Woreda*	*1-5 Cows*	*6-10 Cows*	*> 10 Cows*	*Total*
1	3	24	2	1	27
	4*	55	1	1	57
	5	14	1	1	16
	6*	60	3	3	66
	Total	***153***	***7***	***6***	***166***
2	20	158	13	2	173
	21	100	10	-	110
	22	24	-	-	24
	23*	357	6	13	376
	24*	741	13	12	766
	Total	***1380***	***42***	***27***	***1449***
3	17*	417	8	9	434
	18	55	11	4	70
	19	256	19	14	289
	28*	348	12	10	370
	Total	***1076***	***50***	***37***	***1163***
4	1	34	1	1	36
	9	96	5	3	104
	11	127	7	4	138
	12*	153	8	5	166
	13	111	7	4	122
	15	135	8	4	147
	16*	261	14	9	284
	Total	***917***	***50***	***30***	***997***
	2	12	2		14
	7	60	5	3	68
5	8*	205	4	6	215
	10*	235	14	6	255
	14	28	5	4	37
	25	193	10	5	208
	Total	***733***	***40***	***24***	***797***
6	26*	298	4	6	308
	27*	268	7	12	287
	Total	***566***	***11***	***18***	***595***
	G/Total	***4825***	***200***	***142***	***5167***

Source:- Region 14 Agriculture Bureau

**** Sample Weredas***

Appendix 2

LIVESTOCK POPULATION IN ADDIS ABABA CITY ADMINISTRATIVE COUNCIL

Zone	Woreda	Cows		Heifers		F.Calves		M.Calves		Bullocks		Bull		Ox		Total	
		Exotic	Indi.	Exotic	Indi.	Exotic	Indi	Exotic	Indi.	Exotic	Indi.	Exotic	Indi.	Exotic	Indi.	Exotic	Indi.
1	3	74		12		20		18	2							124	
	4	117		47		41		35		7	4	4				251	
	5	39		14		21		13								87	4
	6	149	8	48		55	3	32		11		2			22	297	
Sum		***379***	***8***	***121***		***137***	***3***	***98***	***2***	***18***	***4***	***6***			***22***	***759***	***39***
2	20	307	55	169		114	13	58	3	20	7	7	10			675	88
	21	224		103		70	12	33		12						442	12
	22	150	6	38	3	40	6	25		9		3				265	15
	23	1618	79	491	26	540	64	153	24	37	29	45	3		11	2884	236
	24	2222	944	831	256	651	365	312	320	73	262	40	23		576	4129	2746
Sum		***4521***	***1084***	***1632***	***285***	***1415***	***460***	***581***	***342***	***151***	***298***	***95***	***36***	***-***	***587***	***8395***	***3097***
3	17	1155	1722	430	780	400	633	136	537	86	527	20	132		527	2227	4858
	18	393	10	74		127	6	57	4	12	6	2			24	665	50
	19	760	571	316	246	185	251	174	202	20	216	26	33		375	1481	1894
	28	792	2919	230	1284	266	1151	114	840	149	1014	215	152	59	2184	1825	9544
Sum		***3100***	***5222***	***1050***	***2310***	***978***	***2041***	***481***	***1583***	***267***	***1763***	***263***	***317***	***59***	***3110***	***6198***	***16346***
4	1	85	13	17	3	7	1	8	3							117	20
	9	224	34	65	12	60	12	16	5			4				369	63
	11	252	38	69	12	68	13	39	10			8				436	73
	12	419	62	140	25	68	13	59	17			10	1			696	118
	13	368	55	92	17	82	16	29	8			8				579	96
	15	356	53	166	29	109	21	36	10			9				676	113
	16	624	91	212	38	148	29	42	12			4				1030	170
Sum		***2328***	***346***	***761***	***136***	***542***	***105***	***229***	***65***			***43***	***1***			***3903***	***653***

..... appendix 2.../ continued

Zone	Woreda	Cows		Heifers		F.Calves		M.Calves		Bullocks		Bull		Ox		Total	
		Exotic	Indi.	Exotic	Indi.	Exotic	Indi	Exotic	Indi.	Exotic	Indi.	Exotic	Indi.	Exotic	Indi.	Exotic	Indi.
5	2	31	7	10	4	10		2	4	2						55	15
	7	135	30	31	7	36	8	33	3	8		4				247	48
	8	439	8	47		187		87		29		3		3		795	8
	10	518	79	122	32	161	28	118	30	30	13	7	2			956	184
	14	138		37		35	3	17		3						230	3
	25	372	124	97	18	136	66	80	56	39	20	20				744	284
Sum		***1633***	***248***	***344***	***61***	***565***	***105***	***337***	***93***	***111***	***33***	***34***	***2***	***3***		***3027***	***542***
6	26	596	1781	194	851	148	860	179	776	120	763	58	251	193	3218	1488	8500
	27	1488	488	618	197	619	241	411	178	242	264	69	64	32	710	3479	2142
Sum		***2084***	***2269***	***812***	***1048***	***767***	***1101***	***590***	***954***	***362***	***1027***	***127***	***315***	***225***	***3928***	***4967***	***10642***
T/Sum		***14045***	***9177***	***4720***	***3840***	***4404***	***3815***	***2316***	***3044***	***909***	***3125***	***568***	***671***	***287***	***7547***	***27249***	***31319***
																58	***568***

Source: Region 14 Agricultural Bureau

APPENDIX 3

Number of the Investigated Dairy Farming Households who Give Rank to the Problems that they Face in Managing the Dairy Farms; Identified and Ranked the Sources of Expenses of Milk Production; Indicated and Ranked the Factors that Affect Productivity of Dairy Farms; and Factors that Determine Supply of Marketable Milk

	Major problems in managing the Dairy farms	**Number of Respondents Ranking the Variable Considered**																
		1		***2***		***3***		***4***		***5***		***6***		***7***		***8***		***9***
		Centr.	*Peri.*	*Cent.*	*Peri.*	*Centr.*	*Peri.*	*Centr.*	*Peri.*	*Centr.*	*Peri.*	*Contr.*	*Peri.*	*Centr.*	*Peri.*	*Centr.*	*Peri.*	*Centr.*
1	Feed problem	62	71	16	38	14	24		11		4							
2	Disease problem & lack of vet. Services	2	11	14	21	15	20	15	27	13	20	3	8	4	2	2	1	1
3	Lack of labour	5	5	16	11	19	13	10	15	5	13	5	7	4	9	5	9	4
4	Lack of capital and credit	3	8	5	27	1	15	8	11	7	9	4	10	1		8		4
5	Lack of suitable plot of land	14	7	15	7	14	21	14	15	11	13	5	11	9	8	3		
6	Lack of extension services		1	6	3	3	13	5	16	5	6	8	14	4	8	6	1	7
7	Lack of utilities (water, transport)	1	2	7	5	9	19	9	16	3	20	6	7	8	1	3	2	5
8	Lack of market for products		2	4	4	5	5	3	5	5	7	2	3	2	11	5	10	2
9	Limited supply of improved breeds & low produuctivity of indigenous cattle	5	41	9	32	12	18	4	5	4	9	13	4	6	6	4	4	10
	Major Expenses of Milk Production (milk production costs)																	
1	Feed	86	135	4	9			2			4							
2	Labour			27	43	22	25	10	31	7	25	26	24					
3	Veterinary fee		4	7	8	37	55	35	49	10	23	3	9					
4	Utilities (water, electricity; transportation)			46	76	22	49	7	10	11	8	6	5					
5	Barn expense	6	9	5	5	9	19	12	15	27	53	33	47					
6	Bull service and AI			3	7	2		26	43	37	35	24	63					

..... appendix 3.../ continued

		Number of Respondents Ranking the Variable Considered																
		1		*2*		*3*		*4*		*5*		*6*		*7*		*8*		*9*
		Centr.	*Peri.*	*Cent.*	*Peri.*	*Centr.*	*Peri.*	*Centr.*	*Peri.*	*Centr.*	*Peri.*	*Contr.*	*Peri.*	*Centr.*	*Peri.*	*Centr.*	*Peri.*	*Centr.*
	Major Factors that Affect Productivity of Dairy Cattle and Profitability of dairy Farms																	
1	Choice of species and breeds	79	121	10	23	3	4											
2	Veterinary services and animal health care				7	52	57	26	55	7	29	7						
3	Organized marketing and market outlet	2	3	7	20	21	39	41	44	10	3	11	39					
4	Feed resources and improved feed system	10	21	73	94	5	20	5	9		2		1					
5	Utilities like housing, water, electricity, transport		2	1	2	8	19	12	18	45	63	26	44					
6	Labour	1	1	1	2	3	9	8	22	30	51	49	63					
	Factors Determining Marketable Supply of Milk																	
1	Breed type	45	109	35	31	3	5											
2	Proportion meant for home consumption	4		4	12	25	24	52	107									
3	Milk consumed by calves (calf intake)			2	11	50	103	32	30									
4	Number of lactating cows	35	35	43	90	6	12		7									

Source:- Field Survey

Declaration

I, the undersigned, declare that the thesis is my original work, has not been presented for a degree in any other University and that all sources of materials used for the thesis have been duly acknowledged.

Signature _____
Teferee Makonnen Kassa