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Monitoring Dairy Production, Marketing and Milk Quality in and Around Burie Town: Case of Dairy Cooperatives

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Abstract:
This study was conducted in Burie town administration in Western Gojjam Zone of Amhara Regional State to monitor milk production, marketing and quality. This study was initiated with the objective of generating baseline data in the area of milk production, marketing, and quality. The study was conducted in four purposively selected peasant associations (PAs) namely; Baguna, Wundige, Wangeda and Tengeha due to their dairy production potential. And four urban kebeles of the Burie town were also employed for this study. From each kebele three farmers having milking cows were purposively selected and their farms monitored and simultaneously interviewed. Accordingly, a total of 24 households were selected. The sizes of dairy farms identified were small scale dairy farms. To study butter marketing system Burie public was selected as the main market. Butter marketing systems were studied through selected retailers for 90 days for both wet and dry seasons 45 days for each season. There was a significant difference in the titrable acidity of milk among different farms, consumers and the cooperative. Mean pH of milk obtained from various sources varied between 6.5 and 6.7 and were within the normal range.Specific gravity of Samples from Burie kebele one (1.031) and Burie kebele three (1.0309) studied farms showed the highest specific gravity. While the specific gravity obtained from farms, consumers and cooperative were relatively lowered. There was a significant difference ($p<0.05$) among farms, cooperative and consumers on the chemical qualities of milk. The percent of protein among different farms, consumers and cooperative were not significantly ($p<0.05$) varied. The mean value of total solids between farms, consumers and cooperative were varied significantly ($p<0.05$). There were significant differences among dairy products sold in the cooperative. During the wet season 70.8% of respondents were sold their butter on average ≤80 ETB per kg and the rest 29.2% were sold with 81-100 ETB per kg. As well on dry season 70.8%respondents were sold with 101-115 ETB per kg and 29.2% respondents sold with116-130 ETB per kg.20.8%of respondents sold their milk for neighbors and 58.4%of respondents sold for hotel and restaurants. The rest 20.8%were sold for cooperative. Only 8.3% farms had private grazing land and more than 90% of the farms had used communal grazing. On average 1.46liters of whole milk, 0.77liters of yogurt and 0.96kgs of cheese were used for household consumption.41.7% of respondents had crossbreed cows.37.5% respondents can be used AI services. Average calving intervals for local and cross breed cows were 23.5 and 19 months respectively. Numbers of service per conception for local and cross breed cows were 1.71and2.33respectively. Average lactation length for local cows and crossbreed cows were 8 and 9 months respectively. And average ages at first service for local and cross breed heifers were 36 months and 20.4 months respectively. There was a significant difference on collected and processed whole milks from the period of November to January. The government should promote the dairy sector through inviting different NGOs who are engaged in dairy development interventions to reduce constraints related to forage seed, milk processing equipment, AI service and filling the skill gap of DAs and promoting the dairy producer to establish mechanized dairy cooperative.

Keywords: *monitoring, physical, chemical, milk, dairy, selected, marketing, quality*

1. Introduction

The agricultural sector in Ethiopia, engaging 85% of the population, contributes 52% to the gross domestic product (GDP) and 90% to the foreign exchange earnings (CSA 2008). Ethiopia possesses about 50.9 million heads of cattle (CSA, 2010). Despite its huge number, the livestock sub-sector in Ethiopia is less productive in general, and compared to its potential, the direct contribution to the national economy is limited. The poor genetic potential for productive traits, in combination with the sub-standard feeding, health care and management are exposed to the main contributors to the low productivity (Zegeye, 2003).

The dairy sector in Ethiopia holds large potential in contribute to the commercialization of the agriculture sector due to the country's large livestock population, the favorable climate for improved, high-yielding animal breeds, and the relatively disease-free environment with potential for animal feeding (Ahmed *et al*., 2004). The sector contributes to half of the livestock output and about 30 % of employment where 50% of households in the highland own cattle of which 56% are dairy cattle (Tesfaye *et al*., 2008).

Despite the potential for market oriented livestock development, smallholder dairy development performance and its contribution to poverty reduction and economic development has remained very low. Constraints to the development of livestock sector in general and dairy in particular includes shortage and fluctuation in quality and quantity of feed, poor and eroding genetic resource base, poor management practices, diseases, poor market infrastructure, poor service delivery and policy and institutional arrangements. To ameliorate the constraints and realize the potential of the sector, decades of efforts have been made to improve provision of input and support services such as animal health, credit, research and extension services, processing and marketing of milk and milk products. Most of the inputs and service provision activities have been mainly carried out by the public sector through development projects (Azage *et al.*, 2006).

Bridging this wide gap calls for the design of appropriate and sustainable dairy development strategies based on socio-economic, institutional and agro-ecological circumstances that build on the demand of consumers and the needs and opportunities of producers (Azage *et al*.2001).The mainstay of the population in the Amhara region is rain-fed subsistence agriculture and about 73 percent of smallholders practice mixed crop-livestock farming,19 percent practice crop cultivation, while the remaining 8 percent undertake livestock rearing (ZDA, 2005).Like other parts of the region, milk production is an integral part of the farming system in West Gojjam Zone. Local milk production is mainly from indigenous Zebu cattle which are kept by about half a million smallholder farming households, most of whom are poor (CSA, 2005). Even if the area has potential for production of milk and milk products, little is known about the existing dairy production system, constraints, and opportunities and also the emergence and role of dairy cooperatives associated with innovating dairying in the area. In order to design relevant development strategies that suit to the area, it is essential that researchers and dairy development agents understand the existing situations. Identification of prevailing problems and understanding of the existing dairy production system in the area is vital to devise appropriate development interventions. Furthermore, monitoring dairy production, marketability and quality for smallholder dairy producers may help for the development of the dairy sector in the area. The objective of this study is, therefore, to monitor the dairy production, marketing and qualities of milk produced by dairy cooperative, dairy farmers in and around Burie town.

2. Literature Review

2.1. Economic Importance of Livestock in Ethiopia

Livestock have diverse functions in the livelihood of farmers in the mixed crop–livestock systems in the highlands and pastoralists and agro-pastoralists in the lowlands of Ethiopia. Livestock provide food in the form of meat and milk, and non-food items such as draught power, manure and transport services as inputs into food crop production and fuel for cooking. They are a source of income, which can be used by rural populations to purchase basic household needs and agricultural inputs. In the rural areas of many developing countries, financial services such as credit, banking and insurance are virtually non-existent. In these areas, livestock play an important role as a means of saving and capital investment, and they often provide a substantially higher return than alternative investments. A combination of small and large livestock that can be sold to meet petty-cash requirements to cover seasonal consumption deficits or to finance large expenditure represents a valuable asset for the farmer (Sansoucy *et al*. 1995). The contributions of livestock can equally be well expressed at household level by its role in enhancing income, food security and social status (Winrock 1992; Ehui *et al*. 1998).

Cattle are kept for multiple purposes and the emphasis on use varies with the production system. In both crop–livestock and agro-pastoral systems, animal traction ranked first, followed by milk and reproduction. Manure production is also considered as a secondary important by-product by most crop–livestock and agro-pastoralist farmers. In contrast, in pastoralist systems, reproduction/breeding requirements received higher ranks and for female animals breeding outranked the importance of milk production (Workneh and Rowlands 2004). Women are usually responsible for feeding animals, cleaning barns, milking, processing milk and marketing of livestock products. Young children, especially girls between the ages of 7 and 15, are mostly responsible for managing calves, chicken and small ruminants and older boys are responsible for treating sick animals, constructing shelter, cutting grass and herding of cattle and small ruminants. The role of women in managing animals that are confined during most of the year is substantial and they are critically involved in removing and managing manure, which is made into cakes and used by the household or sold as fuel (Azage 2004). In the highlands of Ethiopia, smallholder's rear cattle, primarily for the supply of oxen power for crop production. Milk production, cash source, manure and fuel are considered as secondary. Cattle and equine play a vital role in smallholder farms for crop cultivation and transportation (Alemu 1998). Livestock products, especially dairy, can make a unique contribution to human nutrition to the poor in developing countries by providing micronutrients in bio-available form such as vitamin A, carbohydrates, protein and calcium (Ahmed *et al*. 2003). The value of output from livestock in Ethiopia will be estimated at around ETB 12 billion in 2000 and accounted for about 45% of the value of all agricultural output excluding the contribution of animal draught power. It will be also noted that, at constant prices (1995 USD), the value of output from livestock grew nearly by 22% between 1980 and 2000, and this increase (1.1% per annum) compares well with the growth of the value of agricultural output (FAO 2003).

2.2. Livestock Production Systems in Ethiopia

Different authors have classified livestock production system of sub-Saharan Africa in general and Ethiopia in particular using different context. Ibrahim (1998) divided livestock production system in sub-Saharan Africa into two major types, namely traditional and modern production systems. They can be distinguished mainly through the three production factors: land, labor and capital. On the other hand, Teferra and Abaye (1993) classified animal agriculture in Ethiopia broadly into three categories; namely the crop related livestock production system, subsistence oriented pastoral livestock production system and the private and commercial oriented parastatal production system. Moreover, Zinash *et al.* (2001) identified three types of livestock production systems in the country; extensive pastoralism in arid and semi-arid rangelands, integration of animals with cropping in rain-fed and irrigated areas and systems associated with perennial tree crops. In general, the existing livestock production system in the country can be broadly grouped into mixed crop-livestock and pastoral production system that are found in the highland and lowland areas, respectively.

2.2.1. Dairy Production Systems in Ethiopia

There are four major milk production systems in Ethiopia. These are pastoral and agro pastoral, smallholder crop–livestock mixed system, urban and peri-urban, and intensive dairy farming (Azage and Alemu 1998). Pastoralist and smallholder farmers produce 98% of the country's total milk production (CSA 2008). Total milk production in 2005will be estimated at 1.5 million tonnes which is equivalent to USD 398.9 million (FAOSTAT, 2007). The majority of milking cows are indigenous breeds which have low production performance. The average cow lactation milk yield is 524 liters over a lactation period of 239 days. About 238 liters are used for human consumption, while the remaining286 liters are suckled by the calf. The average age at first calving is 53 months and average calving interval is 25 months. Cows produce three to four calves before leaving the herd at 11–13 years of age. Cows are kept to provide milk primarily for household consumption and reproduce for production of draught oxen and replacement heifers. Surplus milk is sold, usually by women, who use the regular cash income to buy household necessities or to save for festival occasions Zewdu (2004).

Dairy production is a critical issue in Ethiopia—a livestock-based society where livestock and its products are important sources of food and income. However, dairying has not been fully exploited and promoted. Due to the low disease pressure and conducive agro climatic conditions for cultivation of feed, the greatest potential for dairying is expected in the highlands of Ethiopia. High population densities and animal stocking rates, as well as easy access to markets, also make it attractive to invest in market-oriented dairy production in peri-urban areas of these regions (Tangka *et al*. 2002). Another way of classifying the dairy production systems is on the basis of the main product supplied to the market, viz, fluid milk system and butter system. Dairy production in urban, peri-urban and some pastoral areas (e.g. Miesso) are fluid milk systems, whereas rural dairy production in the Ethiopian highlands is mostly a butter system. The peri-urban dairy system, like that of urban, has a comparative advantage in fluid milk supply due to its proximity to market in comparison to the rural dairy system, which mainly supplies butter to the market. The number and heterogeneity of actors engaged in smallholder dairy development is also different across PLWs.

Location-specific factors determine disease incidence and outbreak (Gerber *et al* 2008); and socio-economic criteria are as important to the success of interventions as natural and technical requirements (Ouma *et al*. 2007). The probability of adoption of dairy technologies is influenced by many factors such as agro-climate, market access, cattle density and other household specific policy and development interventions that are location specific. Experience shows that investment factors. Case studies carried out in several Asian countries such as Bangladesh, Mongolia, the Philippines and Vietnam underline the importance of careful spatial and social targeting of smallholder dairy development interventions (FAO, 2007). The diversity demands customizing and dairy development interventions can be systematically targeted through, among others, observations from household survey and GIS (Ouma *et al*. 2007; Gerber *et al*. 2008).

2.2.2. Dairy Development Efforts in Ethiopia

Formal research and development (R and D) efforts for dairy development began in the late 1940s (Feleke, 2003) and continued, mainly through donor-financed dairy and livestock development projects. A close scrutiny of different project, policy and research documents revealed that they were mainly supply-driven initiatives, emphasizing the transfer of technology and public provision of inputs and services. The focus will be on breed, feed and animal health service improvement; promotion of milk processing and formal marketing (large- and small scale); infrastructure development; and capacity building for technology generation and transfer. However, the dairy subsector has not been able to take-off despite over six decades of RandD efforts.

The total milk production from about 10 million milking cows is estimated at about 3.2billion liters, an average of 1.54 liters per cow per day over a lactation period of about 6months (CSA 2008). Only 0.15% of rural livestock holders reported on-farm production of improved forages like alfalfa and Napier grass; the use of industrial by-products like oil cake, bran, and brewery residue will be negligible (0.8%); the population of exotic and crossbred dairy cows in rural areas of the country accounted for less than 1% of the total dairy cattle population; and the blood levels of the limited crossbred population were unknown, due to the lack of appropriate breed registration system (CSA, 2008). Other empirical evidences (Ahmed *et al*. 2004; Azage *et al*. 2006; CSA 2008; Staal *et al*. 2008) showed that the generic supply-side constraints (feed, breed, animal health etc.) have not yet been resolved; the coverage and quality of support services need significant improvement; private provision of services is underdeveloped, and pluralistic service provision is in 'disarray' due to limited or no coordination

2.3. Milk and Milk Products as 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 colostrums-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 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 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.

2.3.1. 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.

2.3.1.1. 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. 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.

2.3.1.2. Environmental Factors

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. i.e. the fat, lactose and protein contents of milk vary according to the stage of lactation. Such as Solids-non-fat content is usually highest during the first two to three weeks, after which it decreases slightly. And also, 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. As cows grow older the fat content of their milk decreases by about 0.02 percentage units per lactation. Underfeeding and diseases particularly mastitis reduce both the fat and the solid-non-fat content of milk. The first milk drawn from the udder is low in fat while the last milk or stripping is always quite high in fat. Thus, it is essential to mix thoroughly all the milk removed.

2.3.2. Milk Adulteration and Health of Consumers

The chemicals which are being used as adulterants in milk have the following effects on the health of consumers; Formalin causes vomiting, diarrhea and abdominal pain. Larger doses may cause decreased body temp, shallow respiration, weak irregular pulse and unconscious. It also affects the optic nerve and cause blindness. It is one of the potent carcinogens (Gwin *etal*., 2009). Hydrogen peroxide damages the stomach cells, which can lead to gastritis and inflammation of the intestine and bloody diarrhea (Murthy *et al*., 1981). Octylphenol and nonylphenol parts of detergents cause breast cancer. They also decrease the sperm production from testicles (Ali *et al*., 2005). Urea causes pain in lower abdomen, irregular heartbeat, muscle cramps, numbness and weakness in hands and feet, chills and shivering fever. Urea also causes increase in bleeding from uterus. Appearance of unnecessary hairs on face especially of women and children (Baumgartner *et al*., 2005). High amounts of starch may cause diarrhea due to the effects of undigested starch in colon. Its accumulation in the body may prove very fatal for the diabetic patients. High amounts of carbonates/bicarbonates in the body potentially disrupt hormones signals that regulate development and reproduction (Rideout *et al*., 2008). Boric Acid causes nausea, vomiting, diarrhea, kidney damage, acute failure of circulatory system and even death (See *et al*., 2010).

2.3.3. Physicochemical Characteristics of Milk

Milk is an important source of nutrients required for growth, maintenance and proper functioning of bodies of mammals including human beings. Milk consumed by humans is usually obtained from five different species of mammals as cattle, buffalo, sheep, goat and camels. Milk is also used for preparation of various products like ghee, yogurt, butter, cream, sour milk, etc. (Webb *et al*.,1974; Hassan, 2005). Milk and milk products having good nutritional value, acceptable physical appearance, enhanced biological potential and free from all toxic chemicals are the demand of people (Khan and Zeb,2007; Rahman *et al*., 2006). Fats, carbohydrates, proteins, water, minerals, enzymes, vitamins and organic acids are the major chemical components of milk the amount of these components is different in milk of different species of animals. To analyze the quality of milk, different types of milk samples like raw milk (unprocessed), powdered milk, different infant milk formulas and processed milk were collected from various countries like Poland, USA, UK,Pakistan and Nigeria were collected and studied for all the parameters of their chemical composition (Ikem *et al*., 2002;

Dobrzanski *et al*., 2005). Raw milk samples which were collected from Silesian region, Poland were studied for 38 micro and trace elements by Dobrzanski bacterial contamination of milk starts. The main sources for the bacterial contamination of milk are: interior of the udder as in case of mastitis, outer surface of the udder, milk handling and storage equipments, milking and housing environment, health status and hygienic conditions of the animal (Bramley and McKinnon, 1990). Temperature and time of storage also effect microbial quality of milk. Lactometer test is used to check if milk has been adulterated with added water or solids. The test is based on the fact that the density of whole milk ranges from 1.026 to 1.032 g/ml. Adding water to milk lowers its density, while addition of solids increases the density of milk. A lactometer is the equipment that is used to measure the density of milk, and any deviation from the normal range would indicate that the milk has been adulterated Lusato R. Kurwijila (2006).

2.3.4. Major Types of Dairy Products

Milk and milk products have been used by humans since prehistoric times. It is thought that Cheese making will be 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 will be 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 putrefy 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 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 neighborhood demand is low. Processing reduces the risk of will wastage. Some of the major dairy products are (Butter, ghee Curd Dried Milk, Ice Cream and Cheese) i.e. Milk for churning is accumulated over days and will turn sour then Butter is made by agitating the sour milk until butter grains form and then rotated slowly until the fat coalesce (join together) in to a continuous mass and is taken out from the churn. The butter is heated in an open pan to evaporate its moisture then non-fat milk solids settle to the bottom and the butter fat or ghee can be decanted off other constituents. Butter fat usually 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. Curd can be made from whole milk or skim-milk. The milk is boiled and allowed to cool then inoculated it until the desired fermentations is complete. Milk is concentrated by removing much of its water in the form of evaporation and then dried by heating is called dried milk. Ice cream is greatly increasing its popularity in many countries and it has a very high fat content (Mahory, 1988). Cheese is the fresh or matured solid or semisolid product obtained by coagulating milk, skimmed milk, cream, whey cream, or buttermilk or any combinations of these materials, through the action of rennet or other coagulating agents, and by partially draining the whey resulting from such coagulation (FAO/WHO, 1978).

2.4. Market

Markets, not production, increasingly drive agricultural development (Rajalahti *et al*., 2008), particularly livestock development (Delgado *et al*., 1999). Recent empirical evidence confirms Ethiopian dairy subsector development has primarily been conditioned by demand-side factors, more than the availability of technological options to overcome the supply-side constraints such as feeding, breeding and animal health (Staal *et al.,* 2008). In Ethiopia, the national per capita consumption of milk and milk products is about17 kg, which is one of the lowest in sub-Saharan Africa, due to economic and cultural reasons (Ahmed *et al.,* 2004). The average expenditure on milk and products by Ethiopian households' accounts for only 4% of the total household food budget (Staal *et al*., 2008). The habit of consuming milk and milk products is yet to be developed, even among middle income urban households with a better purchasing power. The small quantity of milk produced coupled with high transaction cost results in lower prices for smallholder Unorganized producers and high product price for poor urban consumers leading to low effective demand. The demand for milk and products appears to be rising, though, in the recent years (Working Paper 17. ILRI, 2010)

2.4.1. Milk Marketing Systems in Ethiopia

As is common in other African countries (e.g., Kenya and Uganda), dairy products in Ethiopia are channeled to consumers through both formal and informal dairy marketing systems (Mohammed *et.al*., 2004). Until 1991, the formal market of cold chain, pasteurized milk will be exclusively dominated by the DDE (Dairy Development Enterprises) which supplied 12 percent of the total fresh milk in the Addis Ababa area (Holloway *et al*., 2000). The DDE remains the only government enterprise involved in processing and marketing dairy products. The DDE collects milk for processing from different sources, including large commercial farms and collection centers that receive milk from smallholder producers. The enterprise operates 25 collection centers located around Addis Ababa, 13 of them near Selale, 5 near Holetta and 7 around Debre Brehane (Mohammed *et al*., 2004).

Unlike the early phases, the formal market appears to be expanding during the last decade with the private sector entering the dairy processing industry. Recently, private businesses have begun collecting, processing, packing and distributing milk and other dairy products. However, the proportion of total production being marketed through the formal markets remains small (Muriuki and Thorpe, 2001). Formal milk markets are particularly limited to peri-urban areas and to Addis Ababa. The sale price of pasteurized milk changed from time to time. Until the 1980's, the DDE charged a price of 0.7 Birr per litter. The price of milk increased from 1.00 Birr

in 1985/1986 to 1.70 Birr in 1990. However, the wide gap between production and sale of milk by DDE during the 1980-1990 reflects the failure of DDE to efficiently market its products. During the last decade, the period of transition to a market-oriented system, the marketing situation has improved and almost all the output will be marketed. However, since its inception, the enterprise has only utilized its full capacity during the four-year period from 1987 to 1990 (Staal, 1995). The reasons for low capacity utilization include management problems, financial difficulties, and unstable and low consumption levels of processed milk in the society due to fasting that prohibits the orthodox Christians (about 35-40 percent of the population) from consuming dairy products for almost 200 days every year (Yigezu, 2000). The traditional processing and trade of dairy products, especially traditional soured butter, dominate the Ethiopian dairy sector. Of the total milk produced, only 5 percent is marketed as liquid milk due to underdevelopment of infrastructures in rural areas. In recent years, promotional efforts have focused on dairy marketing. Milk marketing cooperatives have been established by the SDDP (Smallholders Dairy Development Program) with the support of Finnish International Development Association. These groups buy milk from both members and non-members, process it and sell products to traders and local consumers. The units also process milk into cream, skim milk, sour milk, butter and cottage cheese. The number of these milk cooperatives reached to 32 in total, 2 established by FAO/TCP (Technical Cooperation Programme) and World Food Programme (WFP) while 30 by SDDP (Redda, 2001).

Setting up a new dairy cooperative would clearly reduce the travel time to group, and the actual number of households that would benefit depends on local population densities. It is also important to keep newly emerging milk groups small and geographically limited to ensure proximity and avoid large groups that would tend to increase average travel times (Holloway *et al*., 2002). Another study showed that the creation of new market outlets for fluid milk brought major improvement in the production, marketing and consumption behavior of small dairy households. The new marketing outlets may also promote involvement in more intensive dairying (Nicholson *et al*., 2000). Furthermore, cooperatives, by providing bulking and bargaining services, increase easy access to market and help producers avoid hazard of being encumbered with a perishable product (Jaffee, 1994). In short, participatory cooperatives are very helpful in overcoming access barriers to asset, services and markets within which smallholders wish to produce high value items (Jaffee, 1994).

2.4.2. Dairy Marketing Channels and Outlets

Marketing channels are routes through which products pass as they are moved from the farm to the consumer (Winrock, 1989). In any marketing system, various actors participate in marketing of commodities and process of transactions made. These include itinerate/mobile traders, semi-whole sellers, retailers, cooperatives and consumers. Itinerate/mobile traders purchase commodities from nearby market points and sell at business site or residences. Whereas, retailers are market intermediaries such as super markets, small and large –scale retailers who perform the function of retailing. Semi-whole sellers are important commodity market intermediaries who perform the function of both retailing and whole selling depending on the market conditions. Cooperatives are common form of collective group of producers. They are milk outlets that are potential catalysts in markets by providing bulking and bargaining services, increase outlet market access and help farmers avoid the hazards of being encumbered with a perishable product with no rural demand. In short, participatory cooperatives are very helpful in overcoming access barriers to assets, information, services, and indeed, to the markets within which smallholders wish to produce high value items (Holloway *et al*., 2000). Cooperative marketing is based on the premise that a group of producers can achieve better results by combining their efforts and resources than operating separately. The final/destination link in any commodity marketing chain is consumer. Terms related to marketing outlets, marketing channels, and marketing chains are important to describe milk marketing systems (Sintayehu *et al.,* 2008). Marketing outlet is the final market place to deliver the milk product, where it may pass through various channels. A network (combination) of market channels gives rise to the market chain. Marketing survey in Hawassa, Shashemane and Yergalem depicted that milk producers sold milk through different principal marketing channels (Woldemichael, 2008).

3. Materials and Methods

3.1. Description of the Study Area

The study was conducted in urban and peri-urban areas of Burie town administrative which is found in West Gojjam Zone in Amhara Regional State. It consists of twenty-two peasant associations and four town kebeles. The minimum and the maximum rainfall in the area are 1386 mm and 1757 mm, respectively which are distributed over the growing season (mid-May to mid-October). Agro-ecologically Burie is classified into moist and wet lowland (10%), wet Woina-Dega (82%) and wet Dega (8%). The altitude of the woreda ranges from 713 to 2604 metres above sea level (masl).This woreda is one of the 15 and 106 woredas of West Gojjam Administrative Zone and Amhara National Regional State, respectively. There is good opportunity to easily transport agricultural inputs and products to and from PAs and market places**.**

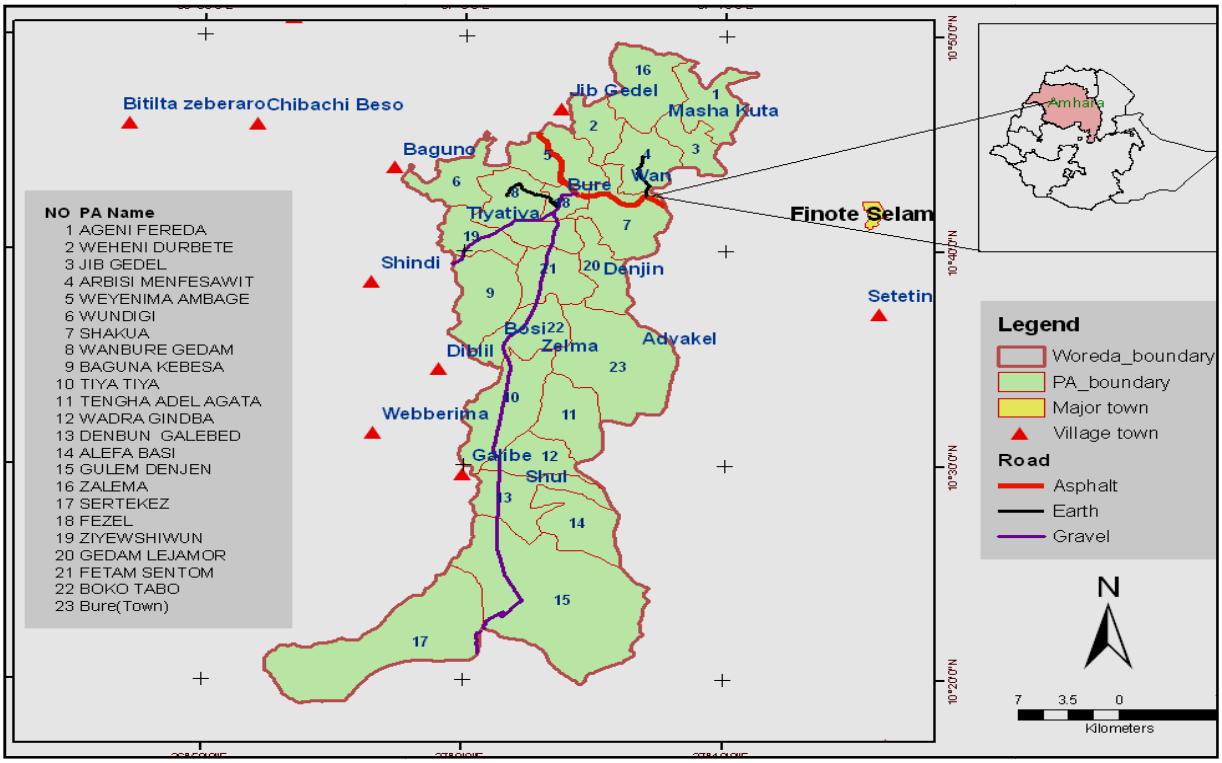

Figure 1: Geographical Location Map of Burie District

3.1.1. Selection of Peasant Associations and Participating Farmers

The study was conducted in four purposively selected peri-urban peasant associations (PAs) namely Wundige (highland), Baguna (midland), Wangedam (midland), Tengeha (midland) and four urban kebeles (mid-altitude) of Burie town administration due to their dairy production potential. From each peri-urban PAs and urban kebeles three heads of households were purposively selected and their farms monitored and simultaneously interviewed for their husbandry practices.

3.2. Monitoring of Selected Dairy Farms

Five attendants from trainees of Burie ATVET College were selected and trained in order to monitor selected farms on feeding, milking, watering, herding, milk processing, delivering dairy products to market and calf rearing. A standard measuring bucket was reserved to know amount of milk produced per house hold. Daily milk samples were collected using vials during morning and night time and brought to animal science laboratory of Burie ATVET College for physical quality analysis.

3.2.1. Rapid Market Appraisal

In order to characterize the marketing system of marketable milk and milk products, Rapid Market Appraisal Technique (RMA) was employed (Holtzeman, 1986; Mengay*et al*., 1988; Miles, 2000). Before conducting rapid market appraisal (RMA); Preliminary survey was employed to identify retailers and whole sellers that are routinely participated on dairy product marketing. Based on the preliminary survey ten butter retailers that stayed more than a year on Burie public market were selected and monitored with separate checklist tonew place, volume, and time of purchase and sale, type of buyers and mode of payment. As well the data obtained from these market agents were used to analyze butter channels, chains and marketing system.

3.2.2. Monitoring Milk Quality

Monitoring of milk qualities was conducted on each dairy farms, dairy cooperatives, hotel and restaurants from November 2012 to January 2013during this time different factors that affect qualities of milk such as personal hygiene, milking and storage equipments, traditional preservation mechanisms were monitored.

From each urban and peri-urban farms, Hotel and restaurants and dairy cooperative milk samples were taken and their physical qualities (Specific gravity, Titrable acidity, pH, Organoleptic test, Clot on boiling test, Alcohol test) and chemical qualities (Fat percentage, Protein percentage, Lactose percentage, added water, Ash percentage) were analyzed.

3.3. Sampling and Milk Quality Analysis

On every two weeks 250ml of sample milk was collected from each dairy farms, cooperative and consumers (hotel and restaurant). The samples were taken from morning and evening milk then physical quality of milk (specific gravity, pH, titrable acidity, alcohol test, clot on boiling test and organoleptic test) were analyzed and recorded at Burie ATVET college animal science laboratory. Then the last monitored sampled milk physical quality were analyzed as usual and simultaneously taken to further chemical quality analysis in to Ethiopian Meat and Milk Technology Institution dairy laboratory.

3.3.1. Organoleptic Test

This was carried out at each dairy farm. Milk can was opened immediately, smelling was done to establish the nature and intensity of smell, whether the milk has foreign odors (e.g. smoky, burnt, weedy, chemical/drug smell) or smells. Observation was done to examine appearance of the milk (colour of the milk, any marked separation of fat, colour and physical state of the fat, foreign particles or physical dirt). Cleanliness of the milk can and lids were checked according to Lusato R. Kurwijila (2006).

3.3.2. Clot-On-Boiling Test

Five ml of milk was placed in a test tube and sinked into a boiling water bath for five minutes. Then, the test tubes were carefully removed from the water bath and examined for the presence of floccules (O'Connor 1994).

3.3.3. Alcohol Test

Five ml of milk and 5 ml of 68 percent alcohol (ethanol) were placed in a test tube and the test tube was inverted several times with the thumb held tightly over the open end of the tube. Then the tubes were examined for formation of curd particles (O' Connor, 1994).

3.3.4. Titrable Acidity

The milk samples were titrated with N/10 NaOH solution using titration kit with phenolphthalein as an indicator and acidity percentage was calculated using the following formula (AOAC, 1990).

$$\text{Titrable acidity (\%)} = \frac{0.1\text{NaOH(ml)} * 0.009}{\text{weight of milk sample}} * 100$$

3.3.5. pH

The pH of milk was measured using a pH meter. The instruments were first calibrated using buffers of pH 7.0 and 4.0. Then the pH of samples was measured.

3.3.6. Lactometer test

The milk was left to cool at room temperature for at least 30 minutes and then the milk samples were gently poured into the measuring cylinder (200-250ml) and the lactometer were immersed slowly into the milk. Finally, the lactometer reading was read just above the surface of the milk (Lusato R. Kurwijila 2006).

3.3.7. Chemical Qualities of Milk

After routinely monitored the physical quality of the milk for three months, a total of 33milk samples were analyzed using Eco milk Ultrasonic (Milk-analyzer) at Ethiopian Meat and Milk Institution dairy laboratory. Milk samples were taken in a sterile 100ml vials and preserved with potassium dichromate (0.2g for 100ml of milk) and taken to the laboratory. Sampling procedure was accompanied by a statement that indicates individual identification and source of collection.

3.4. Statistical Analysis

Following the completion of data collection Analysis of Variance (ANOVA) were carried out using General Linear Model (GLM) procedure of SAS (2008). Mean was separated using fisher's LSD and average of physical qualities of milk was done using excel. Data related with milk price and interviewed questionnaires were analyzed using descriptive statistics of SPSS, and the data collected with RMA were reported with flow charts and summarized discussions.

The specific ANOVA model used for the test was as follows:

$Yij = \mu + Ai + \varepsilon ij$

Where, Yij= Individual observation on the respective dependant Variables (Variables in the i^{th} location).

μ = The overall mean value.

Ai = Independent variables (location where i =3, producer, cooperative, consumer).

ε_{ij}=Random error

4. Result and Discussion

4.1. Milk Production in Urban and Peri-Urban Selected Farms

Based on the collected data two type of milk production systems were identified; namely mixed peri-urban production system (rural areas) and urban (land less) livestock production system.

Production System	**Cows**	
	Milking cows	dry cows
Peri-urban	26	20
Urban	23	13

Table 1: Dairy Production System in the Study Area

More than 83% of urban dairy farms were rearing crossbred dairy cows. In urban dairy farms23 lactating and 13 dry cows. While in peri-urban dairy farms 26 lactating and 20 dry cows were identified with a total of 49 lactating and 33 dry cows. These dairy breeds were Fogera and Holstein Friesian x Highland Zebu. In urban farms, most of the crossbred dairy cows were housed the whole day and they provided with oil seed cakes, wheat bran's, hay, and non-conventional feeds "atela, brint". On average 3.71and 8.82 liters of milk were gained at wet and dry season per animal from local and crossbred dairy cows, respectively.

	Wet Season				**Dry Season**			
	Once		Twice		Once		Twice	
Kebeles	N	percent	N	percent	N	percent	N	percent
Burie k.1	2	67	1	33	3	100	0	0
Burie k.2	1	33	2	67	1	33	2	67
Burie k.3	1	33	2	67	2	67	1	33
Burie k.4	1	33	2	67	1	33	2	67
Baguna	2	67	1	33	3	100	0	0
Wundigie	1	33	2	67	2	67	1	33
Wangedam	3	100	0	0	3	100	0	0
Tengeha	3	100	0	0	3	100	0	0

Table 2: Milking Frequency of Monitored Farms at Different Seasons

As shown in table 3 during the wet season more than 60% of studied urban farms were milked their cattle twice a day. The rest 40% were milked their cattle once a day. In dry season, some urban and peri-urban studied farms were milked their cattle once a day. Few peri-urban studied farms were milked their cows interruptedly. Because most of the feeds provided for lactating cows were crop residues and low quality hay. As a result, the cows were not delivered more milk what the calf suckled. Most of those producers who milked their cattle twice a day had both breeds (local and cross breeds). As well their feed and feeding system were a little bit varied mostly they provided high energy concentrate rations such as wheat bran and wheat screenings. During the wet season this peri-urban producer had got relatively more succulent forages. Most of these peri-urban producers leave the calves freely to suckle for longer time especially for male calves because they consider the calves stronger and grown up with in shorter time.

LF	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**
sex	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	M	M	M	M
age	10	8	12	10	12	10	6	12	45	12	10	8	11	50	12	10	8	55	10	12	35	8	12	5
TS	8h	4h	7h	3h	6h	8h	4h	7h	3h	6h	6h	4h	7h	3h	5h	8h	4h	7h	4h	6h	9h	4h	7h	7h

Table 3: Calf rearing

LF: location of farms TS: time spent to perform the task in hour. A: Burie kebele 1A, B: Burie kebele 1B, C: Burie kebele 1C, D: Burie kebele 2A, E: Burie kebele 2B, F: Burie kebele 2C, G: Burie kebele 3A, H: Burie kebele 3B, I: Burie kebele 3C, J: Burie kebele 4A, K: Burie kebele 4B, L: Burie kebele 4C, M: Wundigie1, N: Wundigie 2 ,O: Wundigie 3 ,P: Tengeha 1 ,Q: Tengeha 2 ,R: Tengeha 3 ,S: Baguna 1 ,T: Baguna 2 ,U: Baguna 3 ,V: Wangedam 1 ,W: Wangedam 2 ,X Wangedam 3.

LF	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**
sex	M	F	M	M	F	M	F	M	M	F	M	F	M	M	F	M	F	M	M	F	M	F	M	M
age	35	30	40	28	25	35	30	40	28	25	35	30	40	28	25	35	30	40	28	25	35	30	40	28
TS	30 m	40 m	25 m	15 m	30 m	30 m	40 m	25 m	15 m	30 m	30 m	10 m	25 m	15 m	30 m	20 m	40 m	25 m	15 m	30 m	20 m	40 m	25 m	15 m

Table 4: Milking the cow

LF: location of farms TS: time spent to perform the task in hour. A: Burie kebele 1A, B: Burie kebele 1B, C: Burie kebele 1C, D: Burie kebele 2A, E: Burie kebele 2B, F: Burie kebele 2C, G: Burie kebele 3A, H: Burie kebele 3B, I: Burie kebele 3C, J: Burie kebele 4A, K: Burie kebele 4B, L: Burie kebele 4C, M: Wundigie1, N: Wundigie 2 ,O: Wundigie 3 ,P: Tengeha 1 ,Q: Tengeha 2 ,R: Tengeha 3 ,S: Baguna 1 ,T: Baguna 2 ,U: Baguna 3 ,V: Wangedam 1 ,W: Wangedam 2 ,X Wangedam 3

LF	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**
sex	F	F	M	F	F	F	F	M	F	F	F	F	M	F	F	F	F	M	F	F	F	F	M	F
age	15	30	12	22	14	15	30	12	22	14	15	30	12	22	14	15	30	12	22	14	15	30	12	22
TS	1h	90 m	30 m	25 m	30 m	1h	90 m	30 m	25 m	30 m	1h	10 m	40 m	25 m	30 m	1h	50 m	30 m	25 m	2h	1h	30 m	30 m	25 m

Table 5: Barn cleaning

LF: location of farms TS: time spent to perform the task in hour. A: Burie kebele 1A, B: Burie kebele 1B, C: Burie kebele 1C, D: Burie kebele 2A, E: Burie kebele 2B, F: Burie kebele 2C, G: Burie kebele 3A, H: Burie kebele 3B, I: Burie kebele 3C, J: Burie kebele

4A, K: Burie kebele 4B, L: Burie kebele 4C, M: Wundigie1, N: Wundigie 2 ,O: Wundigie 3 ,P: Tengeha 1 ,Q: Tengeha 2 ,R: Tengeha 3 ,S: Baguna 1 ,T: Baguna 2 ,U: Baguna 3 ,V: Wangedam 1 ,W: Wangedam 2 ,X Wangedam 3.

LF	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
sex	M	M	F	M	M	M	M	F	M	M	M	M	F	M	M	M	M	F	M	M	M	M	F	M
age	17	35	30	28	12	17	35	30	28	12	17	35	30	28	13	18	35	20	30	35	35	28	33	40
TS	15 m	40 m	20 m	30 m	20 m	30 m	40 m	20 m	30 m	1h	15 m	40 m	20 m	30 m	20 m	2h	4h	1h	30 m	20 m	2h	40 m	20 m	30 m

Table 6: Providing feed for animals

LF: location of farms TS: time spent to perform the task in hour. A: Burie kebele 1A, B: Burie kebele 1B, C: Burie kebele 1C, D: Burie kebele 2A, E: Burie kebele 2B, F: Burie kebele 2C, G: Burie kebele 3A, H: Burie kebele 3B, I: Burie kebele 3C, J: Burie kebele 4A, K: Burie kebele 4B, L: Burie kebele 4C, M: Wundigie1, N: Wundigie 2 ,O: Wundigie 3 ,P: Tengeha 1 ,Q: Tengeha 2 ,R: Tengeha 3 ,S: Baguna 1 ,T: Baguna 2 ,U: Baguna 3 ,V: Wangedam 1 ,W: Wangedam 2 ,X Wangedam 3.

LF	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
sex	F	F	F	M	F	F	F	F	M	F	F	F	F	M	F	F	F	F	M	M	M	M	M	M
age	35	30	28	14	35	40	45	40	36	42	22	28	26	33	55	41	53	29	33	34	42	35	27	29
TS	30 m	20 m	15 m	20 m	10 m	30 m	20 m	15 m	20 m	10 m	30 m	20 m	15 m	20 m	10 m	30 m	20 m	15 m	20 m	10 m	30 m	20 m	15 m	20 m

Table 7: Providing water for animals

LF: location of farms TS: time spent to perform the task in hour. A: Burie kebele 1A, B: Burie kebele 1B, C: Burie kebele 1C, D: Burie kebele 2A, E: Burie kebele 2B, F: Burie kebele 2C, G: Burie kebele 3A, H: Burie kebele 3B, I: Burie kebele 3C, J: Burie kebele 4A, K: Burie kebele 4B, L: Burie kebele 4C, M: Wundigie1, N: Wundigie 2 ,O: Wundigie 3 ,P: Tengeha 1 ,Q: Tengeha 2 ,R: Tengeha 3 ,S: Baguna 1 ,T: Baguna 2 ,U: Baguna 3 ,V: Wangedam 1 ,W: Wangedam 2 ,X Wangedam 3.

LF	A	B	C	D	E	F	G	H	I	J	K	L
sex	M	F	M	M	M	M	F	M	M	M	M	F
age	10	30	12	10	12	10	30	12	10	8	9	11
TS	20 m	20 m	10 m	15 m	20 m	20 m	20 m	10 m	15 m	10 m	8 m	15 m

Table 8: delivering milk to customer

LF: location of farms TS: time spent to perform the task in hour. A: Burie kebele 1A, B: Burie kebele 1B, C: Burie kebele 1C, D: Burie kebele 2A, E: Burie kebele 2B, F: Burie kebele 2C, G: Burie kebele 3A, H: Burie kebele 3B, I: Burie kebele 3C, J: Burie kebele 4A, K: Burie kebele 4B, L: Burie kebele 4C.

LF	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
sex	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
age	35	30	30	22	28	35	38	30	22	40	35	30	26	22	28	35	40	30	22	55	35	35	30	25
TS	8h	5h	12h	8h	9h	9h	5h	10h	8h	8h	7h	5h	11h	8h	9h	6h	5h	12h	9h	10h	8h	8h	12h	10h

Table 9:Milk processing

LF: location of farms TS: time spent to perform the task in hour. A: Burie kebele 1A, B: Burie kebele 1B, C: Burie kebele 1C, D: Burie kebele 2A, E: Burie kebele 2B, F: Burie kebele 2C, G: Burie kebele 3A, H: Burie kebele 3B, I: Burie kebele 3C, J: Burie kebele 4A, K: Burie kebele 4B, L: Burie kebele 4C, M: Wundigie1, N: Wundigie 2 ,O: Wundigie 3 ,P: Tengeha 1 ,Q: Tengeha 2 ,R: Tengeha 3 ,S: Baguna 1 ,T: Baguna 2 ,U: Baguna 3 ,V: Wangedam 1 ,W: Wangedam 2 ,X Wangedam 3.

4.1.1. RoutinePractices of the Dairy Farms

Calf rearing was one of the routine tasks undertaken on monitored farms. They were given special attention for their feed, house and herding, especially for those young calves. As shown on the above table most of calf rearing activities was performed by females.

In Rural kebeles, milking the cow was done by women and practiced without cleaning and washing the udder and the teats while in urban dairy farms cleaning the udder and teats was practice before milking. Detergent was used to clean milking equipment (plastic bucket) and most of rural farms were using gourds as milking equipment and cleaning was done by simple cleaning with water. After cleaning the equipments they allowed the calf to the dam and let the calf to suckle. Most monitored farms were using once suckle and milking technique where the calf is allowed a maximum of two to three minutes before being separated from the dam for milking

Both urban and peri-urban producers used clay pot as milk storage equipment and this equipment was cleaned with water and smoked with cheba (*Acacia nilotica*), kega (*Rosa abissinica*) and woira (*Olea Africana*) to prolong the shelf life of milk and to avoid the bad odor of the equipment.

And other activities like barn cleaning, feeding and watering activities in peri-urban farms were accomplished by boys. Their main feed sources were crop residues and communal grazing land. And the watering points were rivers and ponds. In the urban farms this

activity was accomplished by women since most of those crossbreed cows were confined within the house. In urban dairy –milk supply to the customer was performed by young boys and girls of the family members. Another routine task accomplished by women were collecting and processing the milk; it was tedious task for some urban women's and leisure time activity for rural women's. This activity was taken longer time than other tasks so they were performed patiently to gain the desired final products.

4.2. Socio-Economic Characteristics of House Holds

4.2.1. Household Characteristics

Almost the entire monitored farm house holds (98.5%) were orthodox Christians, while the rest 1.5% were Protestants and Muslims. The marital statuses of the sample respondents were never married (12.5%), married (79.2%) and divorced (8.3%). The average age of the respondents were 39.5 years with a minimum and maximum of 27 and 55 years with the average family size of 5.7. The average house hold size observed in this study was smaller than reported by Adebabay (2009) who found an overall mean size of 6.22 in Burie district. The result of this study is comparable to Tesfay (2007) with the overall mean size of Metema district. In Burie district that might be due to reduction of the actual size of the respondent's family size.

Family Size	Frequency
3-4	4
5-6	15
7 and above	5

Table 10: Family Size of the study area

Head of households on monitored farms were engaged in different activities of which farmer 37.5%, civil servant25%, penisionist 25% and business man 12.5% the total population in the monitored kebeles were 135 out of which 72(54%) were working age (15-64).

4.2.2. Gender Role

Milk production activities were done by both gender groups. Cattle milking, feeding, watering, barn cleaning selling of dairy products were performed by adult males and females. Milk processing, barn cleaning, calf rearing and selling of dairy products were performed mostly by females. Only 16.7%of the producers were female headed house holds

No of visit by DA/NGO	Frequency	Percent
Once	2	8.3
Twice	13	54.2
Three times	9	37.5

Table 11: Frequency of Visit by Development Agents per Year

As it is indicated in the above table out of 24 respondents 2 (8.3%) got information about improved dairy production, post-harvest handling and marketing system at list once a year from development agents while13(54.2%) were visited twice a year and 9(37.5%)were visited three times a year.As indicated on the above table there was an NGO providing a kind of extension service on dairy production and promotes the youth to engage in dairy production i.e. AGP (Agriculture Growth Program)

4.3. Cattle Husbandry Practices

4.3.1. Cattle Housing

Cattle are tethered either on the communal grazing land "Amaga" or in fences near the homestead. This confining activity has dual function primarily for their dung for organic fertilizer and secondly to keep their cattle from theft mainly during summer season. Almost more than 98%of the monitored respondents had cattle house but the confining activity is vary depending on the physiological condition, sex and age of animal. Mostly calves, lactating cow and fattened ox were confined in animal shed constructed near to residence area and majority of the monitored respondents were mutuality cooperate with the traditional alcohol distillers. The monitored farms and distillers were exchanged with animal by product with distillery by products.

4.3.2. Feeds and Feeding

Communal grazing land was the dominant Feed sources used by theurban dairy producers especially for those farms who have only local breeds. And they supplement with on conventional feeds "Attela, Brint", conserved hay, agro-industrial by products like wheat bran and oil seed cakes. But rural small-scale mixed farms were providing, hay and crop residues. Few monitored farms provide elephant grass for their lactating cows and calves; with cut and carry system. The communal grazing land in the Burie district plains accounts for about 766ha and most of the plain were covered by a weed known as Asyacanthalongifolia (amykila), since it has thorns on its tips and leaves it prevents the cattle from grazing. In addition to weeds, some kebeles were incorporating communal grazing lands for their private crop cultivation purpose. In dry season scarcity of feeds were the main problems especially for those farmers who do not conserve crop residues on the surplus season. In the wet season feed scarcity is relatively reduced due to availability of

green feeds at the time of thinning and road side grasses. More than 50% of the respondents provide non-conventional diets for their cattle.

Figure 1: Hay Conservation method on One of the Monitored Farms

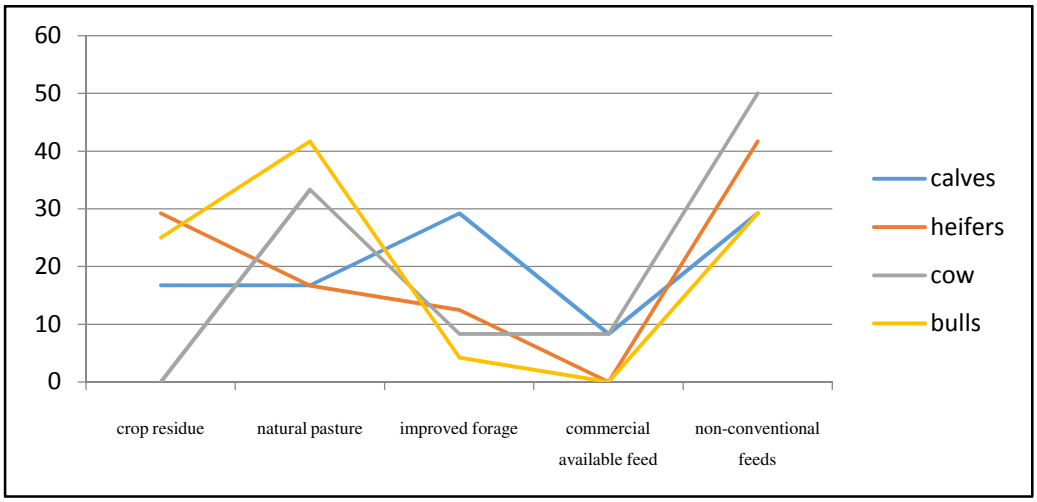

Figure 2: Feed Supplementation Based on Age and Sex

4.3.3. Water Resources for Animals

In the study area, dairy farms were using different water resources for their animal 37.5%, 25% and 20.8% of the respondents were using river, pipe and pond, respectively. During the dry season 16.7% of farms were get water from well. Frequencies of watering for lactating cows per day during wet season vary. 75% of farms were watering their animal once a day and the rest 25% were twice a day. And during dry season more than 66% of respondents were watering twice a day. Distances covered for watering dairy animals were varied. More than 95% of producers were traveled 10 and less minutes to water their animals while the rest 4.2% of producers covered between 10-20 minutes to reach the watering points.

4.3.4. Calf Rearing

Calf rearing were one of the routinely activity practiced on the studied farms, especially for those farms found on Burie town. 83.3% of the farms had crossbreed cows. 50% of the respondents, care calves by females and the rest 50% were reared by male and female. In the district, there were two types of calf feeding systems practiced i.e. once suckling and alternate suckling. In the studied farms weaning of the calf was practiced by avoiding the calf from suckling the dam by smearing the teat with cow dung (80%) and separating the calf from the dam (20%).

4.4. Cattle Reproductive Performances

4.4.1. Age at First Service

The average ages at first service (AFS) of local and crossbred heifers were 36 months and 20.04 months, respectively. The result obtained in this study (36 month) is less than the one reported by Adebabay (2009) who found 42.48 month but within the range of what Geday (2001) reported for Fogera heifers (44± 8months) at Andassa livestock research center. But the age of crossbreed heifers found to be less than (35.7±0.4) the average age for crossbred and local bulls which were 33 and 55.1 months, respectively

4.4.2. Number of Service per Conception

Number of service per conception was 1.71 and 2.33 for local and crossbred cows respectively.NSC (1.71) for local cows was greater than 1.59 which was reported by Adebabay (2009). As well for crossbred cows Adebabay was found 4.91 but on this study 2.33.

4.4.3. Age at First Calving

Average ages at first calving (AFC) were48.79 and 24.5 months for local and crossbred cows, respectively. The result of this study for local breed cows were less than the AFC reported by Adebabay (2009) for fogera cows (53.52 months) but AFC for crossbred cows were almost similar to what Albero (1983) reported for Holstein Friesian x Highland Zebu (29.1 months).

4.4.4. Lactation Length and Average Milk Yield of Local and Crossbreed Cows

Average lactation lengths of the local and crossbred cows were 8 and 9 months, respectively. This result was greater than the average lactation length of local cows (7.29 months) at Meiso district (Kedija, 2008).

The overall Milk yields per cow per day of local and crossbred cows for wet and dry season were3.71 and 8.82 liters respectively. This result for local cow is higher than the average milk yield per cow per day (1.82liters) of local cows in Burie district (Adebabay 2009). The average milk yield per day for three lactation stages were 8.45, 10.36 and 7.64 liters for crossbred cows and 3.55, 3.88 and 3.75 liters for local cows. This variation in lactation length might be the overall management practices of the producer. On the other hand, over all mean milk yield per cow were relatively reduced and this might be due to during early lactation complete milking was not practiced as traditionally some respondents indicated that some milk should be made available for calf.

Breed	Lactation Stage	Minimum	Maximum	mean±Std.Error	N	Std.
Local	early lactation	1	4	3.50±0.204	16	0.816
	Mid lactation	1	5	3.88±0.315	16	1.258
	Late lactation	3	5	3.75±0.250	16	1.000
Crossbred	early lactation	6	12	8.45±0.679	11	2.252
	Mid lactation	9	12	10.36±0.472	11	1.567
	Late lactation	3	12	7.64±1.302	11	4.319

Table 12: Reported Daily Milk Yield of Cows in Monitored Farms

4.4.5. Calving Interval

Average calving intervals of local (CI) and cross breed cows were 23.5 and 19 months, respectively. The reported CI in this study is nearly similar to Adebabay (2009). On the same district this variation might be from husbandry practices.

4.5. Breeding Practices on Monitored Farms

According to the result of this study two types of breeding practices were identified i.e. artificial and natural. Only 41.7% of respondents have 62.5% and 75% blood level cows and 37.5% respondents can be used AI services the rest respondents said places too far, it is often difficult to get the inseminator and we did not hear about cross breeding. The parameters used for local bull selection were coat color and drought power75%, body conformation of the animal 16.7% and milk production potential 8.3% and 100 % of respondents said highland zebu type of local breeds were used.

4.6. Consumption and Utilization of Dairy Products

Whole milk, sour milk, buttermilk, butter, cheese, whey, ghee and "Metata" were the famous dairy products found in the study area. On average 1.46lit of whole milk, 0.77.lit of yogurt and 0.96kg of cheese were used for house hold consumption. in the study area, only cow milk was used as dairy product and no other species milk was used.

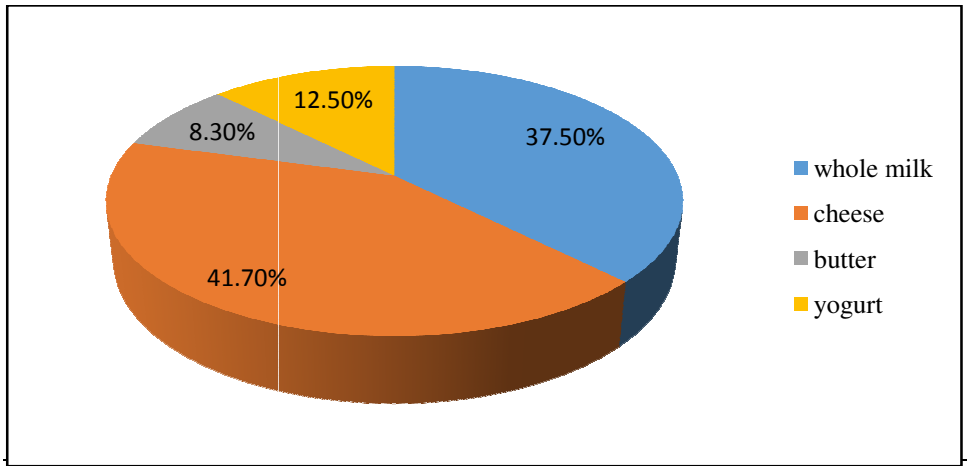

Figure 3: Amount of Dairy Products Utilised Per House Hold

4.7. Marketing of Dairy Products at Burie Town

Dairy products like milk and butter had a big role in addition to consumption to create an asset for the house hold. There were different market actors participated in the marketing system of dairy products starting from the producer (rural and urban) to the consumer and the price of this dairy products were varies depending on the fasting seasons and during high milk production season. The dominant types of dairy product in the district were fresh milk, butter, yogurt and cheese. Different market actors were taking their own part in the way of delivering the product from producer to consumer however cooperatives, itinerate traders and consumers were the focal market partners. According to Woldemichael (2008) dairy product marketing were characterized through different channels.

Customers	Market out let	Mode of payment	Average Price of milk per liter	Average Volume Of milk delivered per day	N	percent
Neighbors	DDD	Cash	5 ETB	1.5 liters	3	20.8
Hotel and Restaurant	H	Contract	7 ETB	3 liters	6	58.4
Cooperative	DDD	Contract	5 ETB	2.5 liters	3	20.8

Table 13: Milk Marketing System in Monitored Farms at Wet Season
H=Homestead DDD=Door to Door Delivery

Customers	Market out let	Mode of payment	Average Price of milk per liter	Average Volume of milk delivered per day day per day	N	percent
Neighbors	DDD	Cash	6ETB	1liters	3	20.8
Hotel and Restaurant	H	Contract	9ETB	2liters	6	58.4
Cooperative	DDD	Contract	5ETB	2liters	3	20.8

Table 14: Milk Marketing System in Monitored Farms at Dry Season
H=Homestead DDD=Door to Door Delivery

4.7.1. Milk Marketing System in Study Area

The type of milk marketing practiced in the study area was informal type of marketing. It was a type of monthly contractual agreement. That means the producer and his customer agreed on the amount to be delivered in a day and its price per liter.At the end of the month the producers received the money from customers based on the amount of milk they provided. And the producer which were practiced this type of marketing were those producers who owned crossbreed cows.

The other type of marketing was door to door selling to potential consumer. This type of marketing was irregular and not reliable. It is common at wet and non-fasting season. Even if (peri-urban producers) milk production were below the market demand in accessible to transportation, lack of adequate milk collection centers and milk processing facilities were the most determinant factorswhich affect the provision of fresh milk in to the consumer.

Another main constraint for fresh milk marketing was fasting days; during this days (Wednesday and Friday) the milk was left and the producers were forced to bulked in to traditional clay pot for further processing specially for those producers who sold their products to hotels and door to door outlets were made the marketing system more irregular but those producers who are member of the cooperative were not face this market rip-off.

4.7.1.1. Milk Marketing Channels

Cooperative, hotels, restaurants and consumers were the major marketing agents participated in milk marketing. The number of intermediaries in a given marketing channels had a big role on both producers and consumers milk prices. As we know when the channels get longer the price increased for the final consumer; simultaneously the producer will not gain fair return for the product they delivered. In the contrary when the market chain was short the price of milk will relatively fair for consumer and also the producer will gain optimum return.

- → Producer→ consumer (P-C) channel: These marketing channels were accounted 10.8% of the total milk marketed per day. This channel is common for both rural and urban areas.
- → Producer → Retailer → Consumer: These channels were accounted 38.4% of the total market i.e. hotels and restaurants.
- → Producer → Cooperative → Retailer →Consumer: these channels accounted 10.8% of the total market
- → Producer → Cooperative →Consumer: these channels were accounted 40% the total milk market

4.7.2. Butter Marketing System in Burie Town

Butter marketing in Burie town was varying. Some butter Retailers collect fresh butter from rural and peri-urban dairy producers and sold at Burie public market. This type of butter was sold commonly for cosmetic purpose. Its amount was relatively small and costly. Most butter retailers, who participated in Burie public market were collect butter from neighbor districts such as Sekela, Telili and Agamssa. They were tried to bulk the butter from Monday to Friday through brokers. Then bulked butter was brought to Burie public

market every Saturday. Most of butter Retailers mentioned on table 11 had customer's (hotels, restaurants and consumers) whose purchase their butter; therefore, there was no market constraint.

Name of butter Retailers	sex	Education level	Place of purchase	average purchased butter at wet season	average sold butter at wet season	their customers	Mode of payment
RT1	F	Illiterate	Telili	20kg	19kg	CC	Cash
RT2	F	Illiterate	Sekela	36 kg	34 kg	HR	Cash
RT3	F	Illiterate	Kuch	18 kg	17 kg	CC	Cash
RT4	M	8 Grade	Burie	25 kg	25 kg	CC	Cash
RT5	M	Illiterate	Adega	15 kg	13.5 kg	CC	Cash
RT6	M	4 Grade	Fereda	25 kg	22.5 kg	CC	Cash
RT7	F	Illiterate	Kalo	19 kg	18.5 kg	CC	Cash
RT8	F	Illiterate	Burie	32 kg	31.5 kg	HR	contract
RT9	F	3 Grade	Arbisi	20 kg	19.3 kg	CC	Cash
RT10	F	10 Grade	Wundigi	30 kg	28 kg	HR	Cash

Table 15: Monitored Butter Retailers at Wet Season
CC=Consumer and for Cosmetics HR=Hotel and Restaurant

Name of butter traders	sex	Education level	Place of purchase	average purchased butter at dry season	average sold butter at dry season	their customers	Mode of payment
RT1	F	Illiterate	Telili	12kg	12	CC	Cash
RT2	F	Illiterate	Sekela	21 kg	20	CC	Cash
RT3	F	Illiterate	Kuch	10 kg	10	CC	Cash
RT4	M	8 Grade	Burie	13 kg	12.5	CC	Cash
RT5	M	Illiterate	Adega	11kg	10	CC	Cash
RT6	M	4 Grade	Fereda	15 kg	15	CC	Cash
RT7	F	Illiterate	Kalo	10 kg	10	CC	Cash
RT8	F	Illiterate	Burie	23 kg	23	CC	Cash
RT9	F	3 Grade	Arbisi	16 kg	16	CC	Cash
RT10	F	10 Grade	Wundigi	20 kg	20	CC	Cash

Table 16: MonitoredButter Retailers at Dry Season
CC=Consumer and for Cosmetics

4.7.2.1. Butter Marketing Channels

- Producer → consumer: this type of channel practiced through relatives' neighborhoods directly selling the butter to consumers commonly this type of market was practiced when the females needs cash without the permission of house hold head commonly little in amount like cosmetics butter
- Producer →retailer →consumer: This type of channels practiced on Burie public markets (Saturday and Tuesday) on this market the retailers collect butter and bulked and finally sell on the same day or in the next market day.

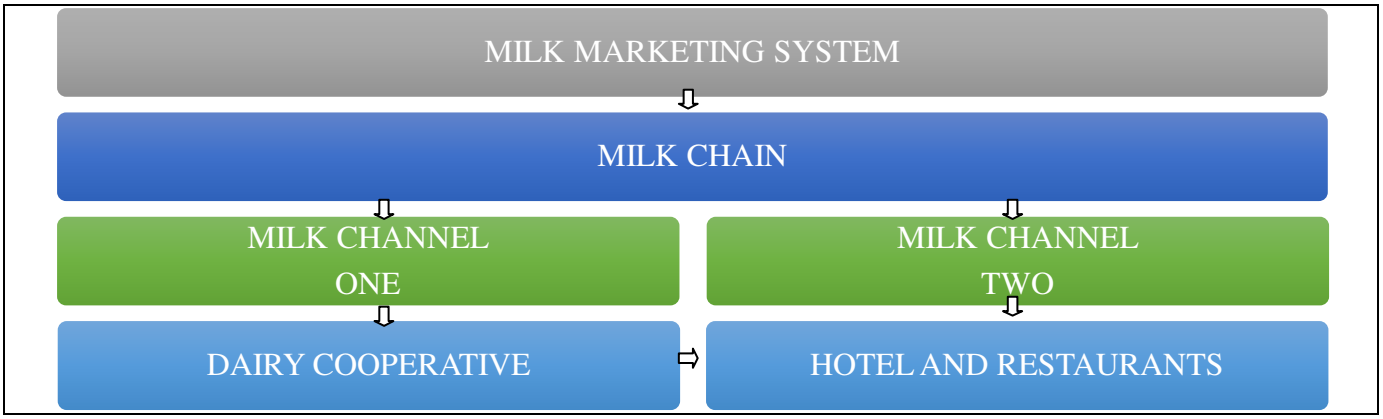

Figure 4: Marketing System Practiced in BurieTown

4.8. Price, Demand and Supply of Dairy Products

The average price of butter during the wet season was 101-115 ETB per kg (70.8%) and 116-130 ETB per kg (29.2%)on dry season. During the wet season availability and quality of feed was relatively high and simultaneously milk production boosted; this were resulted surplus provision of butter in to the market and different factors were contributed for this price variation like season, fasting

days, holidays and consumption habit. As the respondent said more users divert their animal product utilization from meat to dairy products were the result of these findings were similar to Adebabay (2009).

In the studied area fasting days were the most determinant factor for dairy product price fluctuation and this price fluctuation were enforced the dairy cooperative to change its highly perishable product in to other dairy derivatives like butter and cheese which are relatively less perishable. And in the contrary during holidays the demand of dairy product were more than expected at this time the cooperative enforced to sell more skim milk and yogurt than butter.

Product	N	Percent	Selling Price	
			Wet season	dry season
Butter	17	70.8	≤80ETB/kg	101-115 ETB/kg
Butter	7	29.2	81-100 ETB/kg	116-130 ETB/kg

Table 17: Price of Butter at Different Season

4.9. Constraints to Milk Production, Processing and Marketing in Study Area

There are different factors that hinder milk production in the study area. Only 8.3% of studied farms had private grazing land and more than 90% of them had used communal grazing land. As a result, this communal grazing land was highly degraded, over utilized. It was leading the animals to parasite infestation. It was partially changed in to bare ground.

More than 90% of studied producers need crossbred heifers but they couldn't get these crossbred heifers. Therefore, they were forced to use AI service to improve local herd performance. And also, AI service had disadvantages such as detecting heat period and distance to insemination service. Lack of infrastructure (transportation service and electric power in peri-urban area) to delivered their dairy product to consumers. And they were forced daily collected milks for house hold consumption and bulked the rest for further processing in to butter and cheese. As a result, these peri-urban producers would not benefit from milk production unless involved in butter production and marketing.

Another problem was mastitis problem, as analysis of physical qualities of milk through organoleptic test indicated abnormal odour. Samples from some producers had yellowish color and rancid test.

Urban producers labor shortage were the main constraints for herding cattle, milking cows, calf rearing and feed preparation, therefore most producers forced to kept young calves with cows and heifers. In addition to this input problems like shortage of improved forage seed supply, expansion of crop land or reduction of communal grazing land and lack of adequate extension services were identified as constraints to dairy production in the study area.

Figure 5: Cream Separations at Burie Damot Dairy Cooperative

4.10. Burie Damot Milk Cooperative

BurieDamot milk cooperative union has been established in 2007. It has five man powers (1 guard, 1 auditor and 3processers). The cooperative collects whole milk from its member's dairy producer of the town. During the monitoring period the members of the cooperative were 26and the cooperative had equipments like deep refrigerator, churner, cream separator, different level of milk storage cans and plastic buckets.

Figure 6: Collection of Whole Milk from Customers

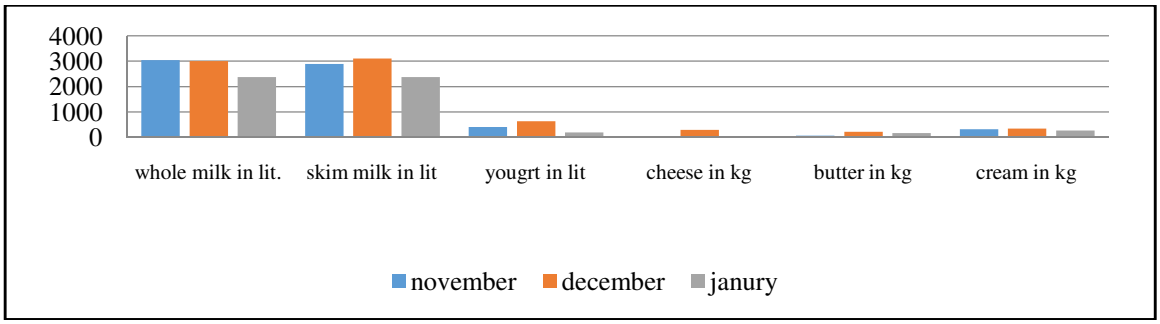

Figure 7: Three Months' Data from Burie Damot Dairy Cooperatives

The collection and processing room was corrugated iron sheet based and it was narrow room. The main problem of the cooperative was interruption of electric power for the storage of the dairy product with deep fridge.

4.11. Physical Qualities of Milk in the Monitored Dairy Farms, Cooperative and Consumers

	Sources of samples	Physi.quali	N	mean	St.dv	SE	minimum	maximum
1	Baguna	Sg.	3	1.0307	0.0015	0.0009	1.0291	1.0321
2	Burie kebele one	Sg.	3	1.0310	0.0012	0.0007	1.0298	1.0322
3	Burie kebele two	Sg.	3	1.0294	0.0006	0.0004	1.0289	1.0301
4	Burie kebele three	Sg.	3	1.0309	0.0013	0.0008	1.0296	1.0322
5	Burie kebele four	Sg.	3	1.0296	0.0010	0.0006	1.0290	1.0307
6	Cooperative Indepen	Sg.	3	1.0305	0.0017	0.0010	1.0288	1.0321
7	Cooperative Bulk	Sg.	3	1.0282	0.0011	0.0006	1.0271	1.0292
8	Hotel and Restaurant	Sg.	3	1.0299	0.0020	0.0011	1.0284	1.0321
9	Wangedam	Sg.	3	1.0298	0.0020	0.0012	1.0282	1.0321
10	Tengeha	Sg.	3	1.0305	0.0004	0.0002	1.0301	1.0309
11	Wundigie	Sg.	3	1.0306	0.0005	0.0003	1.0300	1.0309

Table 18: Specific gravity of milk from Monitored Dairy Farms, Cooperative and Consumers
Cooperative Bulk sample, Cooperative Independent sample, Burie k=Burie kebele, Hotel and Restaurant Sg=specific gravity phy.qualities =physical qualities

	Sources of samples	Physi.quali	N	mean	St.dv	SE	minimum	maximum
1	Baguna	pH	3	6.6123	0.0818	0.0472	6.5377	6.6998
2	Burie kebele one	pH	3	6.4724	0.0926	0.0535	6.4189	6.5794
3	Burie kebele two	pH	3	6.5025	0.3394	0.1960	6.1281	6.7900
4	Burie kebele three	pH	3	6.7098	0.1830	0.1057	6.5894	6.9204
5	Burie kebele four	pH	3	6.5794	0.1057	0.0610	6.4691	6.6797
6	Cooperative Indepen	pH	3	6.5359	0.0588	0.0339	6.4691	6.5794
7	Cooperative Bulk	pH	3	6.5226	0.0899	0.0519	6.4189	6.5794
8	Hotel and Restaurant	pH	3	6.6463	0.1667	0.0963	6.4691	6.8001
9	Wangedam	pH	3	6.5493	0.2213	0.1278	6.3186	6.7599
10	Tengeha	pH	3	6.5226	0.0668	0.0386	6.4791	6.5995
11	Wundigie	pH	3	6.6362	0.1448	0.0836	6.4691	6.7198

Table 19: pH of milk from Monitored Dairy Farms, Cooperative and Consumers
Cooperative Bulk sample, Cooperative Independent sample, Burie k=Burie kebele, Hotel and Restaurant Sg=specific gravity phy.qualities =physical qualities

	Sources of samples	Physi.quali	N	mean	St.dv	SE	minimum	maximum
1	Baguna	Titrable acidity	3	0.1491	0.0127	0.0073	0.1377	0.1628
2	Burie kebele one	Titrable acidity	3	0.1499	0.0140	0.0081	0.1377	0.1652
3	Burie kebele two	Titrable acidity	3	0.1469	0.0092	0.0053	0.1377	0.1561
4	Burie kebele three	Titrable acidity	3	0.1591	0.0140	0.0081	0.1469	0.1744
5	Burie kebele four	Titrable acidity	3	0.1530	0.0191	0.0110	0.1377	0.1744
6	Cooperative Indepen	Titrable acidity	3	0.1622	0.0140	0.0081	0.1469	0.1744
7	Cooperative Bulk	Titrable acidity	3	0.1591	0.0191	0.0110	0.1377	0.1744
8	Hotel and Restaurant	Titrable acidity	3	0.1561	0.0092	0.0053	0.1469	0.1652
9	Wangedam	Titrable acidity	3	0.1610	0.0164	0.0095	0.1469	0.1790
10	Tengeha	Titrable acidity	3	0.1515	0.0165	0.0096	0.1331	0.1652
11	Wundigie	Titrable acidity	3	0.1714	0.0140	0.0081	0.1561	0.1836

Table 20: Titrable Acidity of milk from Monitored Dairy Farms, Cooperative and Consumers
Cooperative Bulk sample, Cooperative Independent sample,
Burie k=Burie kebele, Hotel and Restaurant Sg=specific gravity phy.qualities =physical qualities

OLTTT	frequency	percentage	OLTTOA	frequency	percentage
Normal	23	69.6	Good and normal color	24	72.7
Fair	5	15.2	Barny odder and yellowish	6	18.2
SR	5	15.2	Smoky and normal	3	9.1
Alcohol test			COBT		
Normal	30	90.9	Normal	29	87.9
CF	3	9.1	SFP	3	9.1
HP		1	3		

Table 21: Physical Quality Measurement of Milk through Organoleptic, Alcohol and Clot on Boiling Tests
SFP: slightly form precipitation COBT: clot on boiling test(OLTTT): Organoleptic test through testing SR: slightly rancid OLTTOA: Organoleptic test through odder and appearance CF=curd formed HP=highly precipitate

There was a significant difference in the titrable acidity of milk among different farms, consumers and the cooperative. However titrable acidity between Burie kebele one, Burie kebele two and Baguna were similar.
Mean pH of milk obtained fromvarious sources varied between 6.5 and 6.7 and were within the normal range (Table 13) the results of titrable acidity and pH were not correlating to each other. The reason could be attributed to addition of water.
Tengeha, Burie kebele one and Wundigie milk showed the heist specific gravity while the specific gravity obtained from other farms, consumers and cooperative were relatively lowered. These results suggest the water adulterations in milk from these places.
Through organoleptic test physical qualities of milk(test, odor and appearance) were monitored and more than 69%of monitored farms milk had normal test and more than 70% of samples from monitored farms had good odor and normal appearance but around 3% of samples had barny odor.
And through alcohol test around 90.9% of monitored samples were normal and only 9.1% of samples were form curd. Simultaneously physical qualities of milk obtained from these farms, consumers and cooperative were analyzed. Aswell on clot on boiling test more than 87.5% of sampled milk was normal, 9.1% were slightly precipitated and the rest 3% were highly precipitated.
As we seen on organoleptic, alcohol and clot on boiling techniques Physical qualities of milk from different monitored farms were variable. These might be attributed to individual's personal hygiene, cleanness of milking equipments, storage duration and adulterations.

Figure 8: Measuring Milk pH at Burie Agriculture College Laboratory

		Mean					
Source of variation	fat	protein	lactose	TS	SNF	Ash	AW
Burie kebele one	4.3^{ab}	3.47^{a}	4.10^{ab}	13.77^{a}	8.64^{a}	0.55^{ab}	1.55^{ab}
Burie kebele two	4.08^{ab}	3.33^{a}	3.92^{bc}	12.17^{ab}	8.47^{a}	0.52^{abc}	1.79^{a}
Burie kebele three	3.10^{b}	2.87^{a}	3.84^{bc}	12.78^{a}	8.83^{a}	0.53^{abc}	1.65^{ab}
Burie kebele four	3.74^{ab}	3.13^{a}	3.97^{bc}	12.58^{ab}	8.72^{a}	0.55^{ab}	1.47^{b}
Cooperative bulk??	3.9^{ab}	3.10^{a}	3.76^{c}	12.23^{ab}	8.27^{a}	0.59^{a}	1.72^{ab}
Cooperative independent	4.33^{ab}	3.34^{a}	4.01^{bc}	12.31^{ab}	8.23^{a}	0.56^{ab}	1.47^{b}
Hotel and restaurant	4.14^{ab}	3.17^{a}	3.86^{bc}	12.72^{a}	8.12^{a}	0.51^{abc}	1.70^{ab}
Baguna	3.86^{ab}	2.98^{a}	4.29^{a}	12.67^{ab}	8.58^{a}	0.54^{ab}	1.45^{b}
Wundigie	4.18^{ab}	3.31^{a}	3.89^{bc}	12.58^{ab}	8.31^{a}	0.45^{c}	1.67^{ab}
Tengeha	4.71^{a}	2.93^{a}	4.03^{ab}	12.97^{a}	8.22^{a}	0.48^{bc}	1.48^{b}
Wangedam	3.25^{b}	3.29^{a}	3.88^{bc}	11.65^{b}	8.17^{a}	0.56^{ab}	1.57^{ab}
Error	0.55	0.13	0.02	0.37	0.37	0.002	0.027
CV	18.73	11.19	3.90	4.86	7.23	9.28	10.20
R^2	0.35	0.28	0.54	0.38	0.18	0.47	0.43

Table 22: Chemical Qualities of Milk from Studied Farms, Cooperative and Consumers

abc = within column, means with different superscripts are significantly different (P<0.05) TS=total solid SNF=solid not fat AW=added water

4.12. Chemical Qualities of Milk in the Monitored Dairy Farms, Cooperative and Consumers

As reported on the above fat percentages among different producers were varied and the mean value (4.71%) of Tengeha (P<0.05) is much greater than, mean value of cooperative bulk sample (4.33%), cooperative individual samples (3.9%), hotel and restaurants (4.14%), Burie kebele three (3.1%) and Wangedam (3.24%).These variations in fat percentages might be in Tengeha area providing crop residue and natural pasture continuously without supplementation of any concentrate. The percent of protein among different farms, consumers and cooperative were not significantly varied. Most of producers supplement for their cattle energy based diets with roughages.

And the mean value of lactose from Baguna (4.29%) was significantly different (P<0.05) from Burie Keble one (4.10%), Tengeha (4.03%),cooperative independent samples (4.01%), Burie Keble four (3.97%),Burie Keble two (3.92%),Wundige (3.98%), cooperative bulk sample (3.76%), Burie kebele three (3. 84%).In this area the severity of subclinical mastitis might be suspected. In Baguna area and some member of cooperative might be adulterate the milk.

The mean value of total solids of milk samples from Buriekebele (13.07%), Hoteland Restaurants (12.72%),Cooperative independent samples (12.31%), Cooperative bulk samples (12.23%)and Wangedam (P<0.05) were varied significantly. This variation might be due to both husbandry and milk handling (personal hygiene, cleanness of storage equipments) problems. And no significant variations were observed on the SNF portion of the analyzed milk sample among the farms and retailers and the ash content among the farms and retailers were significantly different.

Another variation among farms and retailers were the average values of added water. The amount of added water among different sources were varied such as; Burie kebele (1.79%), cooperative bulk sample (1.72%) and Cooperative independent samples (1.46%) this variation might be due to purposively adulterating the milk, feeding regimes (mostly at urban farms common non-conventional feeds were provided), watering frequency, milking frequency and milking utensils might be the possible causes.

5. Summary, Conclusions and Recommendations

5.1. Summary

This study was conducted with the objective of monitoring milk production, marketing, and qualities in Burie district of Amhararegion. The study was carried out on purposively selected peri-urban Peasant Associations (PAs) namely Wundige (highland), Baguna (midland), Wangedam (midland), Tengeha (midland) and four urban kebeles (mid-altitude) of Burie town administration; due to their dairy production potential. From each peri-urban PAs and urban kebeles three heads of households were purposively selected and their farms monitored and also simultaneously interviewed for their husbandry practices. To the monitoring activity size of dairy farms were identified and all the farms were small scale dairy farms. Preliminary survey was employed to identify retailers and whole sellers that are routinely participated on dairy product marketing. Based on the preliminary survey ten butter retailers that stayed more than a year in Burie public market were selected and monitored with separate checklist. The checklist was contained an information about volume, time of purchase and sale, type of buyers and mode of payment. As well the data obtained from these market agents were used to analyze channels, chains and marketing system

Average family size of the monitored respondents was 6.22 and the average croplands were

2.5ha.and on average 0.38ha of land was used for improved forage cultivation. Alternate suckling and once suckle techniques were the two dominant type of milking techniques. 16.7%of respondents use off-farm activities. On both seasons (wet and dry seasons) animals were left to graze entirely on communal grazing land and crop residues like sorghum and maize Stover were the common type of roughages used in the study area.

Crossbred (Holstein Friesian x Highland Zebu) and Fogera breeds were the two common types of breeds found in the study area. The overall mean ages at first service for local and crossbred cows were 36and 20.04 months, respectively. The overall mean number of service per conception was 1.71and 2.3 for local and crossbred cows, respectively.

Overall average milk yields for crossbred and local breed cows were 3.71and 8.82 liters per day per cow at wet season with lactation length of 8 and 9 months, respectively. The overall mean ages at first calving for these breeds were28.79 and 24.5 months, respectively. During monitoring period of milk marketing 70.8% of urban farms sold their fresh milk with a price of 5ETB per liter, 25% of the farms sold with 6-10ETB per liter and the rest 4.2% of farms were sold with 11-15ETBper liter. Butter marketing in Burie town was monitored through selected butter retailers. They purchase butter from neighbor districts through brokers and sold for consumers and hotels at Burie public market. The price of butter was varied among different seasons and farms as well.

Two types of milk outlets were practiced in urban monitored farms. Through dairy cooperative and farm gets (hotel, restaurant, and neighbors). Amount of collected and processed milk in the monitored cooperative during the period of November, December and January were whole milk 3039.5, 3004.12 and 2371 liters, butter 67.5,343and 262.5kgs. cheese 43.5,286 kgs, yogurt 407.5,630 and 183 liters and cream 314.25,343 and 262.85 liters respectively.

The physical qualities of milk among different farms were monitored. There was significant variation intitrable acidity and specific gravity. And Organolepticstest, physical quality of milks from different sources were analyzed through its odor, appearance and then clot on boiling and alcohol test were used to analyze physical quality.

Chemical composition of milk among farms, cooperative and consumers were significantly different. Fat compositions among different farms were significantly different. Mean value of Tengeha (4.71%) were varied from the rest sampled sources. Lactose

percentages from Baguna kebele is significantly differed from the rest monitored farms cooperative and consumers. Protein composition among farms, cooperative and consumers are not significant.

5.2. Conclusion and Recommendation

In this study milk production, marketing and quality were analyzed based on information from monitored farms, cooperative and consumers. Milk production system, marketing and qualities of dairy products were found to be not in a sustainable manner as a result of many constraints related to feed and feeding system, breed and breeding practices, milk handling and processing, hygienic and marketing constraints dominate the district. During the monitoring period both physical and chemical qualities of milk were determined. Different techniques such as organoleptic, alcohol, clot on boiling test and titrable acidity were undertaken to analyze physical qualities of milk.

Chemical qualities of milk from different farms, cooperative and consumers were monitored. Fat composition of Tengeha kebele were significantly differed ($P<0.05$) from the rest of the monitored farms and consumers. Protein Composition among different monitored farms were not significantly different and the lactose content of Bagunakebele was significantly ($P<0.05$) different from Wundige, Wangedam, Burie kebele one, two, three and cooperative bulk samples.

The marketing system of milk and milk products in the monitored farms and the retailers were mainly dominated by traditional marketing system. Even if some monitored farms were member of the dairy cooperative, they were no satisfied with activity of the cooperative. And the extension services in relation to AI and improved forage were not delivered in the way of what producers needed.

By alleviating these constraints, the government should promote the dairy sector through inviting different NGOs who are engaged in dairy development interventions to reduce constraints related to for age seed, milk processing equipment, AI service and filling the skill gap of DAs and promoting the dairy producer to establish mechanized dairy cooperative.

6. Dedication

I dedicate this thesis manuscript to my elder sister Birhanie Mossie, who has been steadfast to treat me more than a mother and for her good guidance in my successful life and to the rest of my family for their dedicated partnership for the success of my life.

7. ACRONYMS

AFS	Age at First Service
AFC	Age at First Calving
AGP	Agriculture Growth Program
AI	Artificial Insemination
AOAC	Association of Official Analytical Chemists
BSI	British Standards Institution
CI	Calving Interval
CSA	Central Statics Agency
DDE	Dairy Development Enterprises
ETB	Ethiopian Birr
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GIS	Geographic Information System
HH	House Holds
ILRI	International Livestock Research Institution
NGO	Non-Governmental Organization
NC	Number of Service per conception
PA	Peasant Association
PLW	Pilot Wereda
PPS	Probability Proportionate to Size
R and D	Research and Development
SDDP	Smallholders Dairy Development Program
SNF	Solids Not Fat
SPSS	Statistical Package for Social Science
TS	Total Solid
USD	United States Dollar
ZDA	Zone Department of Agriculture

Monitoring Dairy Production, Marketing and Milk Quality in and Around Burie Town: Case of Dairy Cooperative

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Appendix

SS	DF	SS	MS	CV	F	Pr > F
Model	10	6.69	0.69	18.73	1.21	0.3358
Error	22	12.13	0.55			
Corrected total	32	18.81				

Table 1: ANOVA Milk Fat Percentage of Monitored Dairy Farms

SS	DF	SS	MS	CV	F	Pr > F
Model	10	1.09	0.109	11.19	0.87	0.5763
Error	22	2.78	0.126			
Corrected total	32	3.87				

Table 2: ANOVA Milk Protein Percentage of Monitored Dairy Farms

SS	DF	SS	MS	CV	F	Pr > F
Model	10	0.63	0.06	33.90	2.62	0.0285
Error	22	0.53	0.024			
Corrected total	32	1.15				

Table 3: ANOVA Milk lactose Percentage of Monitored Dairy Farms

SS	DF	SS	MS	CV	F	Pr > F
Model	10	4.99	0.499	4.86	1.35	0.2675
Error	22	8.15	0.370			
Corrected total	32	13.14				

Table 4: ANOVA Milk Total Solid Percentage of Monitored Dairy Farms

SS	DF	SS	MS	CV	F	Pr > F
Model	10	1.79	0.179	7.23	0.48	0.8830
Error	22	8.16	0.371			
Corrected total	32	9.95				

Table 5: ANOVA Milk Solid Not Fat (SNF) Percentage of Monitored Dairy Farms

SS	DF	SS	MS	CV	F	Pr > F
Model	10	0.047	0.004	9.28	1.95	0.0924
Error	22	0.053	0.002			
Corrected total	32	0.101				

Table 6: ANOVA Milk ASH Percentage of Monitored Dairy Farms

SS	DF	SS	MS	CV	F	Pr > F
Model	10	0.439	0.044	10.20	1.66	0.1534
Error	22	0.580	0.026			
Corrected total	32	1.019				

Table 7: ANOVA Milk Added Water Percentage of Monitored Dairy Farms