

**ACCESS AND UTILIZATION OF AGRICULTURAL KNOWLEDGE
AND INFORMATION BY WOMEN DAIRY FARMERS: THE CASE OF
ADA'A DISTRICT, OROMIA REGIONAL STATE, ETHIOPIA**

M. Sc. Thesis

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April 2010

Haramaya University

**ACCESS AND UTILIZATION OF AGRICULTURAL KNOWLEDGE
AND INFORMATION BY WOMEN DAIRY FARMERS: THE CASE OF
ADA'A DISTRICT, OROMIA REGIONAL STATE, ETHIOPIA**

**A Thesis Submitted to the College of Agriculture and Environmental
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EXTENSION**

**By
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DEDICATION

Dedicated to my Mother W/o Shemsu Seid and Ato Kuru Mama Who sacrificed much to bring me up to this level but not lucky to see the final fruits of my effort.

STATEMENT OF THE AUTHOR

First, I declare that this thesis is the result of my own work and that all sources or materials used for this thesis have been duly acknowledged. This thesis is submitted in partial fulfillment of the requirements for an advanced **M.Sc.** degree at Haramaya University and to be made available at the University's Library under the rules of the Library. I confidently declare that this thesis has not been submitted to any other institutions anywhere for the award of any academic degree, diploma, or certificate.

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BIOGRAPHICAL SKETCH

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LIST OF ABBREVIATIONS

ADLI	Agricultural Development Led Industrialization
AI	Artificial Insemination
AKIS	Agricultural Knowledge and Information System
ATVET	Agricultural Technical Vocational Education and Training
BoARD	Bureau of Agriculture & Rural Development
CBC	Cross Breed Cows
CI	Condition Index
CSA	Central Statistics Authority
DAs	Development Agents
FAO	Food and Agricultural Organization of the United Nations
FHHs	Female Headed Households
FTC	Farmers Training Center
FVM	Faculty of Veterinary Medicine
GDP	Gross Domestic Product
GO	Governmental Organization
HH	Household Heads
ICT	Information Communication Technologies
ILRI	International Livestock Research Institute
IPMS	Improving Productivity and Market Success
m.a.s.l	meters above sea level
MHHs	Male Headed Households
MFI	Micro Financial Institution
MLR	Multiple Linear Regression
MoA	Ministry of Agriculture
MODD	Market Oriented Dairy Development
MoARD	Ministry of Agriculture and Rural Development
NGO	Non Governmental Organization

LIST OF ABBREVIATIONS (CONTINUED)

NLDP	National Livestock Development Program
PADETS	Participatory Agricultural Demonstration Extension and Training System
PPS	Probability Proportional to Size
SD	Standard Deviation
SDDP	Smallholders Dairy Development Projects
SMS	Subject Matter Specialists
SNNPR	Southern Nations, Nationalities and People Region
SPM	Strategic Planning Management
SPSS	Statistical Package for Social Sciences
ToT	Training of Trainers
VIF	Variance Inflation Factor
WoARD	Woreda Office of Agriculture and Rural Development

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ACCESS AND UTILIZATION OF AGRICULTURAL KNOWLEDGE AND INFORMATION BY WOMEN DAIRY FARMERS: THE CASE OF ADA'A DISTRICT, OROMIA REGIONAL STATE ETHIOPIA

ABSTRACT

Nevertheless, the significant role of women in dairy production, processing and marketing, so far no systematic study has been undertaken with regard to their access and utilization of knowledge and information and the factors influencing the same. Specifically the research attempts to answer four important questions: i).What is the sources of knowledge and information, inputs and services for women dairy farmers? ii) How far women dairy farmers are able to access and utilize the available knowledge and information? iii) What are the constraints and opportunities for creating enhanced knowledge and information flows amongst women dairy farmers? And iv) What are the factors influencing the access to and utilization of knowledge and information? Four stage sampling procedures were used in which both non-random and random sampling procedures were followed to stratify dairy production systems into peri-urban and rural systems, selection of two kebeles from each sub system and 120 respondents. Both quantitative and qualitative data were collected from primary and secondary source. The quantitative data were analyzed using descriptive statistics like frequency, mean, percentage, standard deviation, chi-square, t-test and F-test while persons' correlation and multiple linear regression analysis, were used to test the magnitude of the relationship and influence between dependent and independent variables. The study has investigated that neighbors and friends, public institutions, NGOs, cooperative and private sector involved in the activities of knowledge and information dissemination, input supply and provision of services for smallholder dairy farmers. With regard to access and utilization of knowledge/information, variations were observe among the sub systems, where the majority or 92.31 and 61.5% of rural producers belonged to low level of overall access and utilization, respectively. In the study area, opportunities like rapid urbanization and population increase, availability of services, strong linkage, favorable national policy, technological options and farmer's willingness to pay exists for achieving productivity improvement and market-orientation in smallholder dairy systems. Furthermore, the research identified feed scarcity, poor breeding, veterinary and credit services and access to markets as supply-side constraints while high marketing costs, highly seasonal price fluctuations and safety and quality concerns are demand-side constraints. Extension participation, family education, Medias, innovation proneness and cosmpoliteness were also found to be significant in explaining dependent variables of access and utilization of dairy knowledge and information while livestock holding and distance from market had negative influence. In summary, in the context of Ada'a, provision of technical and advisory services on dairy production were not biased towards MHHs, rather the services are lacking for the livestock sub-sector in general and dairy in particular. Therefore, purposeful focus has to be given on knowledge and information sources by strengthening pluralistic advisory service delivery mechanism in a coordinated and networked way. In addition, by considering the significant explanatory variables, ensuring the transfer of knowledge and services towards smallholder dairy systems for improving access to and utilization of knowledge and information among women dairy farmers in the study area is important.

1. INTRODUCTION

1.1. Background

Ethiopia is one of the largest countries in Africa with total area of 1.1 million km². The total population of the country is estimated at 79,221,000 (CSA, 2008.) Agriculture is the most important sector in Ethiopian economy and its development is important for general economic development of the country. The significance of agriculture to the Ethiopian economy arises from the fact that in which in the fiscal year of 2007/08 it contributed to about 45.9% of GDP, to more than 88% export and about 85% of employment (CSA, 2008). Importance of agriculture is also indicated by many other facts like its support for the transport system and domestic trade. Moreover, the livestock sub-sector plays a vital role as a source of food, income and foreign exchange to the Ethiopian economy, and contributes to about 12 and 33% of the total and agricultural GDP, respectively. It also accounts to 12-13 % of the total export earnings.

Livestock are the integrated components of the Ethiopian farming systems and perform multiple functions at different level of aggregation. At individual smallholder level, livestock are important sources of food (meat and milk), cash income, and services like transport and traction and manure for soil fertility management and fuel (Birehanu, *et al.*, 2007).

Although Ethiopia holds the largest livestock population in Africa, estimated at about 43.1 million heads of cattle, 23.6 million sheep, 16.8 million goats, 0.62 million camel (CSA, 2008), the total national milk production remains among the lowest in the world. The total annual national milk production in Ethiopia from about 10 million milking cows is estimated at about 3.2 billion liters, which is 1.54 liters/cow, on average (CSA, 2008)

FAO (2000), estimates, that women account for 70 to 80 % household food production in sub-Saharan Africa. Women also play a critical role in the production of food for the household, in post harvest activities, in livestock care and cash cropping.

However, although many agricultural constraints are gender neutral, women farmers are less able than men to raise their productivity (Saito and Spurling, 2000). Because of this lack of awareness and appreciations of efforts to support agricultural development and food security tend to ignore women's resource needs as well as the barriers and constraints they face in fulfilling their productivity both at farm and at home (FAO, 2000).

The national Agricultural Development Led Industrialization (ADLI) strategy is designed to attain food security, secure supply of raw materials for domestic industries, increase foreign-currency revenue and create employment opportunities for the population of the country through improved agricultural technologies and practices Ministry of Agriculture and Rural Development, (MoARD), (2004). In addition, ADLI policy constitutes various components needed for agricultural growth including technology, finance, rural infrastructure, internal and external markets and the enhanced role of the private sector.

In today's diverse production and marketing conditions knowledge and information transfer and sharing is indispensable for profitable and sustainable smallholder farming. Hence, in complex rural environments, where farmers are facing different challenges, it is more necessary to be able to constantly build and improve knowledge, gain access to new information and knowledge and use these to adapt improvements to suit local conditions. In this regard, the major instrument public agency used to disseminate agricultural knowledge to farmers is agricultural extension. Extension program can increase agricultural productivity and rural income by bridging the gap between technological knowledge and farmers' practices (Saito and Spurling, 2000). Therefore, increasing access to relevant knowledge base from multiple sources and use it for socio-economic progress is an innovative system approach in the context of market oriented agricultural development (Birehanu *et al.*, 2006).

Dairy production among the sub sectors of livestock production system is a critical issue. In Ethiopia, where livestock and its products are important sources of food and income and dairying has not been fully promoted and exploited in the country (Sintayehu *et al.*, 2008). Due to urbanization and fragmented land holdings, in urban and peri-urban settings, there is little room for the horizontal expansion of dairy production (Haji, 2003). Livestock

husbandry, especially, dairy farm, is a labor-intensive activity as man-to-land ratio increases due to population growth; it can offer a viable option to absorb the redundant labor and can minimize the rural underemployment and unemployment problem (Ebrahim, 2006). Accordingly, in-depth assessments of the roles and constraints faced by rural dairy producers' (particularly women) in different circumstances should be undertaken in order to guide development and application of appropriate technologies.

Therefore, it is important to identify strategies to refocus attention on the situation of rural women in agricultural development and food security and their right to resources and to strengthen policy and program intervention that accelerates the advancement of rural women. This study looked into dairy women farmers' knowledge and information sources, access and utilization as well as factors like personal, socio-economic, psychological and institutional that influence access to and utilization of knowledge and information on dairy production practices.

1.2. Statement of the Problem

In the study area (Ada'a Woreda), dairy farming is important and highly valued due to the reasons of: i) small land holding of farmers in mixed crop-livestock farming system ii) dairy promotion efforts made by different public, private and international organizations iii) proximity of the area to urban milk collection and market centers and iv) the presence of milk cooperative and other milk processing organizations. Additionally, the area is characterized by the presence of substantial number of Cross Bred Cows (CBC) mostly in urban and peri-urban areas.

In the study area, women play a critical role in dairy production. For example, out of 850 total milk cooperative members in the area, 400 were women (Eshetu, 2008).

With regard to division of labor in dairy production, adult females are more involved in dairy activity tasks such as collecting and processing of feeds, milking and marketing of milk in comparison to adult males, children and hired labor. For instance, in East Africa (Tangka *et. al.*

al., 2000) about 70.4% of dairy operators are women and 29.6% are men underling the traditionally important role of women in milk production in Kenya. Moreover, in the MHHs 66.7 % of the total of 365 sampled, 61.1% of the dairy operators are women and 38.9% are men. While in the FHHs (33.3% of the sample), 88.9% of the dairy operators are women and 11.1% are men.

Another study conducted by (Addis, *et al* 2001), in Ada'a, Lume and Gimbichu Districts of East Showa, Ethiopia, shows that most animal husbandry activities are the responsibility of women and children. Despite the significant role of women in livestock and dairy production, policy and institutional structures often restrict existing sources of support to women; particularly credit to acquire large ruminants (Bauman, 2000). But the role of women is very high as compared to male.

Considerable development efforts have also been made to generate and disseminate dairy technologies among farmers. In particular, tremendous efforts have been made to produce and disseminate crossbred dairy cows in Aada'a woreda through different dairy development projects and programs over the last three decades. According to Oromia Bureau of Agriculture and Rural Development (OBoARD), these include: Small Holders Dairy Development Projects (SDDP), National Livestock Development Program (NLDP) and household extension package programs are to be mentioned. However, access to and utilization of recommended technologies and practices amongst dairy farmers has not been as widespread as it was anticipated. For example, potentialities of the dairy sub-sector for the improved income generation was poor on the account of poor genetic merit of the local breeds of cattle, poor feed resources, poor traditional management and low adoption rate of the dairy technologies (Ahmed *et al.*,2003).

The other problem of women farmers related to knowledge and information gain was their limited access to formal knowledge and information, sources and trainings in modern dairying. For example, according to Deribe (2007), majority of women interviewed in Southern Nations, Nationalities and Peoples' Region (SNNPR), Dale woreda were having no

involvement in any formal institutions and organizations. They mainly rely on informal sources of knowledge and information of neighbors, associations and indigenous knowledge.

In general, the past poor performance of Ethiopian dairy development is attributed to socio-economic, infrastructure, and technical constraints and inadequate extension and research in livestock (compared to crops) and lack of directions and scope of policies related to dairy development (Azage *et al.*, 1997).

In this regard, women dairy farmers knowledge networks, level of knowledge and information access and utilization and the factors influencing them can differ from area to area in context of dairy production system.(Sintayehu *et al.*, 2008). Empirically, in the contexts of market oriented urban, peri-urban and rural dairy production systems, knowledge on sources of information, inputs and services, as well as the extent to which women dairy farmers access to and utilize improved dairy technologies is scant. In addition, personal, socio-economic, psychological and institutional factors that influence women dairy farmers to access and utilize knowledge and information in relation to dairy production were not fully understood.

Therefore, the availability of information on sources of knowledge and information, level of access to and utilization as well as factors influencing the same that would enhance the role of formal knowledge for improved productivity of women dairy farmers are important issues to be addressed. Based on these premises, this study is expected to fill the gap in these aspects in order to formulate policy recommendations for development intervention.

1.3. Objective of the study

General Objective of the Study is:

to identify women dairy farmers access to and utilization of knowledge and information, constraints and factors affecting the same.

The specific objectives of the study are:

- to identify women dairy farmers' knowledge and information sources,
- to assess the level of access to and utilization of knowledge and information by women dairy farmers,
- to identify factors influencing women dairy farmers' access to and utilization of knowledge and information, and
- to identify constraints and opportunities in creating enhanced access to knowledge and information, technology and services for innovation.

1.4. Research Questions

1. What are the sources of knowledge and information, inputs and services for women dairy farmers?
2. How far women dairy farmers are able to access and utilize the available knowledge and information?
3. What are the factors influencing the access to and utilization of knowledge and information by women dairy farmers?
4. What are the constraints and opportunities for creating enhanced knowledge and information flows amongst women dairy farmers?

1.5. Significance of the Study

The aim of this study is to investigate women dairy farmers' access to and utilization of agricultural knowledge and information on dairy farming and the factors influencing it. It is also designed to identify sources of knowledge, constraints and opportunities for creating effective linkage and information flows. Thus, research on knowledge sources and constraints and opportunities as well as factors that influence access to and utilization of knowledge and information will provide direction and information which may be of significant for further research and development partners on knowledge and information for innovation. Also the

result of this study would indicate policy makers and other rural development organizations concerned with smallholders' dairy farming, to design appropriate strategies and to back up future planning and enhance the pace of adoption of dairy technologies. Moreover, gender balanced dairy development projects, trainings and extension services that consider roles and responsibilities of household members can be designed.

1.6. Scope and Limitation of the Study

This study is conceived to focus on issues related to knowledge and information accessed and utilized by women dairy farmers in Ada'a District Eastern Showa Zone Ethiopia. The research results mainly depends on data collected from six urban and rural kebeles randomly selected samples of 120 households. Due to limited geographical coverage and being based on a sample, the generalizations would have limitations. However, the results of the study could be used in other areas having comparable or similar situations.

1.7. Organization of the Thesis

This thesis is organized into five chapters. Chapter one introduces the background and problem under the study area and the research objectives. Chapter two deals with a review of the literature that includes smallholder dairy production and its gender dimensions, conceptual explanation of agricultural knowledge and information, role of agricultural extension service and empirical studies on factors affecting access to and utilization of agricultural knowledge and information. In chapter three, research methodology including description of the study area, sampling procedure, sources of data and methods of data collection, methods of data analysis and definition of variables and hypothesis are presented. In chapter four, the research findings are presented and discussed. Finally, chapter five presents the summary, conclusions and policy implication.

2. REVIEW OF LITERATURE

2.1. Smallholders Dairy Production in Ethiopia

In Ethiopia, smallholder farmers represent about 85% of the population and are responsible for 98% of the milk production (Tsehay, 2001). In this regard, Livestock production provides a continuous flow of income and reduces the vulnerability of agricultural production. Particularly, the milk cow contributes the most to the well being of farming households due to the role it plays such as supply of milk and beef for the household consumption, utilization of labor with low opportunity cost, security against crop failure, liquidity against financial crises, as collateral for informal credit and as protection against inflation (Holman *et al.*, 2003) as cited by (Ebrahim, 2006).

Dairy development can lead to income generating activities in the rural areas by increasing farm incomes and employment opportunities. However, the available high potential land is intensively farmed and fodder supply is insufficient leading to often serious environmental consequences as inappropriate husbandry measures are applied in non-suitable areas (Haji, 2003). Besides milk production levels, milk collection, processing and marketing are not developed

Dairy production is also the most important income generator particularly for urban and peri-urban smallholder farmers. A study conducted in the central highlands of Ethiopia, showed that out of the total gross margin 70% comes from livestock and 30% from crop production (Hailemariam, as cited in Ebrahim, 2006). According to Omiti *et al.*, (2004), though Ethiopia's rural economy is dominated by smallholder mixed crop-livestock farms, the objectives of various policies of the successive regimes over the past five decades have been similar; to improve commercial dairy production in selected areas of the country, especially around Addis Ababa, through introduction of exotic and cross-bred cattle and related feed and management technologies, and development of a milk processing industry to supply the Addis Ababa market.

According to (Gebrewold *et al.*, 2000) cited in (Ahmed *et al.*, 2003), after major policy reforms since the beginning of the 90s, the market liberalization created opportunities for commercial private enterprises in the Ethiopian dairy sector. Accordingly, three types of dairy farming and four marketing channels are distinguished. First, the smallholder dairy households keep the majority of the cattle in Ethiopia accounting for 97% of all milk produced and 75% of commercial milk production. They own mainly indigenous cows of low-productivity native zebu breed, producing between 400 to 680 kg milk/cow per lactation period. Secondly, state farms that have been privatized or are in the process of privatization, use high graded animals.

The third group is peri-urban or urban households, mainly keeping crossbred animals in the central highland plateaus. These cows can produce, 120-2,500 liters per lactation period. With respect to marketing, the large-scale formal processors include the state dairy enterprise and few large private dairy firms mainly produce for deliveries to formal shops supplied by state farms and a number of large private dairy farms (Ahmed *et al.*, 2003).

The central highlands in general and the Ada'a woreda in particular are highly potential areas for smallholder's dairy production. In these areas, urban and peri-urban market oriented dairy production is developed. According to Tsehay (2001), the peri-urban milk production is developed in areas where the population density is high and agricultural land is shrinking, possessing animal types ranging 50% crosses to high range of Frisian with the objective of obtaining cash income.

Dairy marketing cooperatives could provide farmers with continuous milk outlets and easy access to essential inputs such as (Artificial Insemination) AI, veterinary service and formulated feeds. In this regards, the role of dairy cooperatives in reducing transaction costs the Ada'a Woreda Dairy association is a good example to be mentioned which presently processes milk by its' own plant (Eshetu, 2008). The dairy extension package as part of the livestock development extension package was initiated in 1997. The main strategy was to focus on the rural, peri-urban and urban areas. During the beginning of the extension, dairy was prompted in urban and peri-urban area Bureau of Agriculture and Rural Development

(BoARD). Later on, however, the dairy (milk) extension package was also included for the rural areas. The rural dairy extension package was designed to include bull service, artificial insemination, animal feed, animal health, animal housing, breeding methods and calf management.

The increased coverage of extension services (such as better management skills) and increased use of improved inputs (improved breeds and feeds) and policy changes promoting dairy production have contributed to faster growth of output. Although the results obtained by the sector so far are positive when compared to the past, the historical performance of the dairy sector in Ethiopia has been disappointing given the potential the sector is assumed to have or if it is compared with countries in the region like Kenya and Sudan (Ahmed *et al.*, 2004) and (Nin *et al.*, 2006).

The MODP also may be linked to increased intensification of crop production as implied by the recursive impact of incremental increase in income on purchases of inputs. Some studies recommend that agricultural extension programs should also take this option into consideration (Ahmed *et al.*, 2003).

Dairy production constraints of smallholder farmers vary from one production system to another or from location to location (Sintayehu *et al.*, 2008). These include: Underdeveloped and lack of market oriented production, lack of adequate information on livestock resources, inadequate permanent trade routes and other facilities like feeds, water holding grounds, lack of transport, inadequate infrastructure and institutional set-up, prevalence of diseases and lack of market information are generally mentioned as some of the poor performance of small holders' dairy production. In addition, a value chain approach aimed at a sustainable development of the dairy sector is lacking.

The MoARD aims at stimulating milk marketing and processing in villages. However, urban, peri-urban and rural milk production systems are dominated by informal marketing systems. Besides smallholder dairy production, also commercial specialized dairy farms around the urban centers start to develop with their own processing facilities and marketing (Omite *et al.*,

2004). In summary, dairy production will remain primarily in the hands of small-scale mixed farms in the peri-urban and rural areas, systems due to land and feed availability though the market shares of-urban is high.

2.2. Gender and Smallholders Dairy Production

In relation to promotion of gender aspects of development programs in rural areas of developing countries, the livestock sector offers advantages over other agricultural sectors. This is mainly because of the fact that in mot of the societies all household members have access to livestock, whereas, access to land is often biased to men (Bauman, 2000).

In Ethiopia, the reproductive role of bearing and rearing children and taking the primary responsibility for domestic maintenance reduces the mobility of women (in terms of time and energy) they have to carry on farming activities (Asres, 2005). Consequently, they tend to concentrate their agricultural activities around homestead. Although certain agricultural tasks or enterprises are regarded as “male,” but women tend to have wider range of activities and enterprises than men. For example, in many African countries men are responsible for looking after large livestock while women are responsible for small ruminants such as goats, sheep and poultry. Also, women are responsible for feeding and milking all types of livestock (FAO, 2000).

According to Saito and Spurling (2000), major reasons for women farmers to access and utilize knowledge and information include: i) land tenure and land title tend to be vested in men, ii) Women oriented technologies are undeveloped and extension systems have failed to reach women, iii) their limited access to credit and input iv) inflexibility of their domestic and agricultural roles and v) women's greater illiteracy and lower school enrolment).

Another study by Addis, *et al* (2001), in Ada’a, Lume and Gimbichu districts of east showa zone, shows that most animal husbandry activities are the responsibility of women and children. Often it is assumed that a household is a unit of production where all members have the same objectives and interests. Experiences show that the husband and wife may have both

shared and separate objectives and interests in dairy production, and each one tries to work toward achieving them (Saito and Spurling, 2000).

A study conducted on the characterization of Shashemene-Dilla dairy production, processing and marketing (Sintayehu, *et al.*, 2008), revealed that women producers in the crop-livestock mixed system and urban households, 89.8% and 71.2% are involved in purchasing and 87.4 % and 66.45% in selling of cattle and 45.8% and 46.6% in breeding activities, respectively.

While routine dairy activities like feeding, milking and feeding of sick animals were operated by family members and hired laborers. Moreover, according to the authors most activities related to milking, milk handling, processing (churning) and milk selling were performed mainly by wives and other adult female children above 15. For example, 86 and 60 % of household wives were involved in milking, in the mixed crop-livestock and urban production systems Shashemene-Dilla areas, respectively.

In contrast to crops, livestock functions are a daily occupation and animal products such as egg and milk are produced, processed and marketed during the whole year. Accordingly, this characteristic of livestock production makes it an interesting sector to promote gender aspects in an ongoing process (Bauman, 2000).

With respect to control over dairy products females in most studied areas had control over milk and it's by products. According to Sintayehu *et.,al* (2008), 73.65% of the females in the mixed crop-livestock system were involved in churning and marketing of dairy products, while in urban area 70% of the household wives involved in the milk marketing activities and 88 % of the case in mixed crop-livestock system. Livestock provide women a good source of income, and dairy products will also improve the nutritional and health status of the family.

In contrast to the findings of the above studies, commercialization of dairy production in the Ethiopian highlands made both men and women better offs in terms of increased income. According to Zewde (2008), the dairy income of women increased, although in relative terms while men's income increased much more. Moreover, women in households using improved

crossbred cows maintained possession of the income allocated to food purchases and continue to purchase more than 70 % of the food eaten at home. Women's abilities to fulfill traditionally defined tasks (such as food purchases and sale of dairy products, (according to gender division of labor) were enhanced by the introduction of market-oriented dairying in the Holeta area of Western Showa zone. To this end, understanding the role of livestock in general and dairying in particular in increasing on farm income and gender relations is very crucial to design appropriate intervention strategies to ensure rural development program.

Given the above situation, during the last decade, gender issues have attracted the attention of many researchers as well as that of government agencies. However, observations are recorded mainly on the type and amount of work performed by women as well as access to and control over resources. Hence, it should be realized that studies must go beyond in order to drive maximum benefit from development, extension and training programs. In addition, constraints and perception of women with regard to livestock production and their involvement in decision-making must be understood.

2.3. The Role of Knowledge and Information in Smallholder Dairy Production

2.3.1. Concepts of knowledge

According to Leeuwis (2004), knowledge is the one thing that accumulates among humans that can pass from one human to another almost intact, and that can be stored from generation to generation in some non-human form to be rediscovered by the infinity-plus one generation. Solomon and Engle (2000), explain knowledge as the set of concepts, meanings, skills and routines developed over time by individuals or groups as they process information. Moreover, as the primary cognitive content of cultures, knowledge includes all facts, concepts theories, and artifacts that are passed from one generation to another.

Information is another term that has to be understood from the knowledge perspective. Information is clearly a broader term and includes all knowledge. The same authors explain information as explicit part of knowledge, which can be exchanged among people. It is a

pattern imposed on carrier such as paper diskette, electronic cable and/or any sort of written or spoken message.

Knowledge can be converted in to information through speeches, written language, expression graphic representation etc. However, information as a symbolic representation of knowledge is not the only form in which knowledge can be tangible because, in many ways human actions and practices as well as technologies and artifacts e.g. machines, seeds, varieties, roads and bridges can be seen as tangible expression of knowledge, (Leeuwis, 2000).

What actor know (believe) about social conditions, including especially about conditions of their own action, but cannot express discursively no bar of repression, however, protects practical consciousness as is the case with unconsciousness (Giddens 1984, cited by Leeuwis, 2004). In this regard, when we equate consciousness with knowledge, we can see that discursive knowledge refers to knowledge we are aware of, have reflected up on and can easily capture in language (i.e. can be converted to information). This type of knowledge is a type of knowledge that farmers are presented in a course, on pest management practical knowledge in a discursive form. Moreover, knowledge can be a “Tacit Knowledge” (as opposed to formal or explicit knowledge) when it cannot be transferred to another person as a result of it being written down or verbalized (Tesfaye *et al.*, 2010). Tacit knowledge is not easily shared and consists often of habits and culture that we do not recognize in ourselves. For example, for effective transfer of tacit knowledge generally requires extensive personal contact and trust.

According to knowledge perspectives, actors generate, transform, integrate, exchange, disseminate and utilize knowledge while going about their daily businesses. Almost all knowledge has potential utility to someone, thus knowledge perspectives are inclined to require some sort of empirical test of utility as well as validity in other senses. Havelock (1986), strengthen this idea and said that a body of knowledge is, therefore not made up of facts, but rather of the idea and values that govern the assignment of meaning. From these definitions, knowledge appears as the psychological state of an organism, which through

processes such as learning, experience and the like has been acquainted to or has mastered some object of its environment.

Moreover, based on scientific validation and utilization, knowledge can be classified according to characteristics like complexity, relative advantage (applicable mostly to instrumental knowledge use), diversity (technical communicability adaptable), communicability (adaptability to receiving cultures) and adaptability (Havelock, 1986).

Regarding agricultural information Umali (1994), classified into two broad groups which include pure agricultural information and agricultural information inherently tied to new physical inventions. Pure agricultural information refers to any information which can be used without the acquisition of a specific physical technology. On the other hand, agricultural inventions or technologies are those that come in the form of agricultural inputs, management, technologies facilitating farm management, marketing and processing equipment.

2.3.2. Knowledge Networking and Communication

According to Solomon and Engel (2000), knowledge networking is explained as individual people who join together to deliberately generate, share, and use ideas, knowledge and information; each participant is both a source and user of information. It is one of the most important ways actors organize themselves to search for the ideas and information they need to change their practices-that is to innovate. Networking is thus, an important part of knowledge management strategy.

(Burnett, 2003), defined knowledge communication as "the exchange of messages" between two or more partners, or establishing "commonness" between two or more parties through a particular medium, or an active, dynamic process in which ideas and information are exchanged leading to modification of people's knowledge, attitudes and practices.

According to NSF9855 (2009), knowledge networking will focus on attaining new level of knowledge integration, information flow and interactivity among people, organizations and communities that includes goals:

- to understand the fundamental processes through which knowledge is created, validated and valued in distributed systems of information (both natural and engineered) and
- to improve the technical, social, educational and economic performance of knowledge generation and use, collaborative computation and remote interaction,

Diffusion of innovation theory predicts that media as well as interpersonal contacts provide information and influence opinion and judgment. Studying how innovation occurs, (Rogers, 1995), argued that it consists of four stages: invention, diffusion (or communication) through the social system, time and consequences. The information flows through networks largely depend on the nature of networks and the roles opinion leaders play in them determine the likelihood that the innovation will be adopted. Accordingly, (Suhermanto, 2002), suggested that two ways of distribution of knowledge and information. First, public sector or government-facilitated efforts might close the gap through the distribution of knowledge and information to the needy. These include: for examples, training, media, publications, leaflets, and the opening of educational institutions.

On the other hand, communication among individuals can help knowledge and information to be transmitted from one individual to another. According to Katungi (2006), a household can participate in information exchange as an information receiver, information provider (sender) or both. Furthermore, social institutions and the underlying social norms within a village influence the extent to which rural households interact and hence, the rate at which information is exchanged. Accordingly, six social institutions were identified in the context of rural Uganda, where households meet and interact: places of worship, market place, weddings or other related celebrations, school open days and village meetings (Katungi, 2006). In order to strengthen these information exchanges, extension can serve as information source and information exchange facilitator. Therefore, agricultural extension service is expected to contribute to the well functioning of the existing local information exchange by taking into account the diverse sources of information such as demonstrations, print and mass Medias and audiovisuals.

2.4. Women Farmers Access to Agricultural Knowledge and Information

It is believed that extension can increase agricultural productivity and rural income by bridging the gap between new technological knowledge and farmers own practice. In addition, effective extension systems elicit information about farmer's needs and concerns and convey them to research technology centers (Saito and Spurling, 2002). In Ethiopia, Agricultural development sector is the largest unit at the woreda level and responsible for the extension service. According to WoARD (2008), in the study area, extension services are categorized into (minimum) household package and regular package. Household extension packages are based on the selection of a package of technologies from a menu of package choices provided to farmers (WoARD, 2008). While regular extension package program aims at enabling farmers adopt improved seeds with commercial fertilizers and improved management practices and soil conservation measures.

According to (Berehanu *et al.*, 2006), the extension service is generally biased towards crop production; the household package program appears to give better attention to the livestock sector. For example, dairy production, fattening of small ruminants and cattle, poultry and apiculture are important components of some of the household technology packages. With respect to effectiveness of the national extension services, extension methodology is not considered as something that has to be based on professional scientific principles of information communication and technology knowledge and skill development. And also, little recognition and appreciation is given for the role of agricultural extension discipline as a separate area of expertise (Berhanu *et al.*, 2006).

Women heads of households, lack of credit and labour to participate in extension packages, face a problem to contact Development Agents (DAs). In the MoARD, the rural women's affairs department promotes gender development in the agricultural sector at the federal level. The gender and the nutrition aspect with in the agricultural extension and rural women's affairs department places more emphasis on home economics (Bogalech, 1998). Consequently, this has mirrored at the regional level where home agents in the BoARD and WoARD are responsible for supporting rural women involvement in credit and savings,

income generating activities (such as horticulture, and small animals production), home gardening and improving the household well being. Furthermore, according to Bezabeh and Hadija (2003), 62 % of women acknowledge that they receive services, out of which only 25 % are women and the extension services provided are concerned with crop production. Also extension services rendered to women, most often it deals with home management as reported by 67 % of women participation.

Innumerable development projects, government programs, research studies, and theoretical models have demonstrated that the improvement of women's access to research and extension services must be within the analysis of women and men participation in the agricultural production processes along two related dimensions: the role in agriculture and the role in the household (Jiggins *et al.*, 2009). Therefore, in order to promote enhanced extension service, knowledge and information, channel of communication and an environment that enables the client to take advantage of knowledge and information should be in place. In this regard, it is important to mention that women's group in all parts of the developing world has proven to be effective contacts for extension. For example, an experience of Kenya indicates that field extension agent's work with women groups and such groups constitute an important means of reaching the less progressive farmers and these women tend to adapt extension message more rapidly than individual contact farmers (Jiggins *et al.*, 2009).

2.5. Factors Affecting Access and Utilization of Agricultural Knowledge and Information

A number of empirical studies have been conducted by (Sintayehu *et al.*, 2008), (Haji, 2003) and (Habtemariam, 2004) on the adoption of different agricultural technologies and improved practices within Ethiopia. However, there is limitation of empirical studies related to the factors influencing access to and utilization of agricultural knowledge and information. In this section, the literature review mainly based on different utilization (adoption) of agricultural technologies such as dairy, cereals, horticultural crops and fertilizers is presented. Conceptually, the variables are categorized as household personal and demographic characteristics, socio-economic, psychological and institutional factors.

2.5.1. Personal-demographic characteristics

Household personal and demographic characteristics like age, education, family size, are among the most common characteristics expected to influence farmers' knowledge access and its utilization. Accordingly, from this category, variables of sex, age, education and family size were reviewed.

Sex: Gender is another factor that limits access to and utilization of Agricultural Knowledge and Information) (AKI). According to Katungi, (2006), due to the prevailing socio-cultural values and norms males have freedom of mobility; participate in different meetings and trainings that consequently exposed them to have greater access to information. Moreover, male headed households appear to make more friendship in general and maintain more links with individuals in off-farm activities than female headed households. Female headed households may experience more barriers than their counterparts to acquire social capital for communication. Various studies conducted by (Mahlet, 2005; Daniel, 2008; Asres, 2009) indicate that indicated that Male headed households to have more access to technologies and information.

Age of the Household Head: Age is one of the demographic factors that are helpful to illustrate households' personal situation. It is generally assumed that elder people have more farming experience which enables them to easily adopt new technologies and also because they have better involvement in different formal and informal groups, which helps them to easily access services and resources.

A study conducted about the knowledge of dairy woman farmers (Deribe, 2007); prove that age has a negative influence on agricultural information net work of farm women. The studies conducted reason out negative relationship of age and farming might be due to the fact that older women do not seek many new ideas, since they try to conform to practices they followed for a long time in their life.

Education: Education increases the likelihood of participating in formal organizations and thus acquiring information from formal sources, and it can lower the likelihood of relying on informal mechanisms of information exchange and utilization of knowledge. Education is one of the factors which accelerate growth and development in agriculture. Study conducted by Kutangi (2006), on social capital and information exchange in rural Uganda indicated that households headed by better educated individuals are more likely to join economically oriented organization when an individual is better educated. In addition, better educated individuals may also join agricultural organization because they are more targeted in rural interventions most of which use a group based approach. Moreover, another study conducted in Adami Tullu woreda by (Ebrahim, 2006) about adoption of dairy innovation, its income and gender implication found that adoption of dairy technology and formal education has significant and positive relationship. (Habtemariam, 2004) found that farmers education level and farm land size have positive and significant relationship with farmers adoption of maize and dairy production packages.

In the same line, several authors reported significant and positive relationships that exist between formal education and literacy level and adoption (Haji, 2003). Also, (Wolday, 1999); (Mulugeta, 2000) have reported that education has positive relation with adoption behavior. In addition, since farming is by large family professions, all members of a family performs various farm related tasks and so are capable of affecting improvement in farming. Hence, educational level of all members of the family, therefore, is important for the acquisition, comprehension and acceptance of information about improved farming.

2.5.2. Socio-economic variables

Wealth status is expected to affect technology use for a number of reasons, including that wealthier farmers have greater access to resources and may be more able to assume risk. The form of tenure may also affect the adoption decisions, not only through the wealth effects, but also through the farmer's willingness to invest in the long-term quality of the land. A study conducted to identify effects of key factors and policies on Ethiopian dairy development (Sintayehu *et al.*, 2008), revealed that the past poor performances of the dairy sub-sector has

been attributed to socio- economic, infrastructural, and technological constraints, inadequate research and extension.

Land holding: Farm land size is also an indicator of wealth and proxy for social status and influence. Since size of land holding is an important component of socio-economic status, productive land is the basic asset of farmers. More land enables farmers to increase production which provides more income that can be used to buy farming inputs. Deribe (2007), found that land holding is positively related to respondents' knowledge of dairy farming output. While in the contrary, (Haji ,2003), in his study conducted on the adoption of cross bred cows in Arsi zone, Tiyo and Limu-bilbilo woredas, found that total area of cultivated land and market distance were found to be negative and significant with the adoption of cross bred dairy cows.

Insecurity of women's land tenure is one of the most serious obstacles to increase productivity of agriculture and livestock and the income of rural women, Due to their status within the family, in most societies men are the most owner of land. Private land is mostly transmitted from the father to the son and often daughters are only taking into consideration if no male successor is available (Bauman, 2000). Hence, enabling women to have more access to land and resources will likely improve their knowledge and information access.

Livestock holding: In crop-livestock farming system, farm animals are sources of drought power food (meat, milk) cash, animal manure and services for transportation and tractions. Also studies indicate that farmers attach strong value to livestock possession for one thing that the more cattle owned by an individual farmer the highest social prestige he/she has in the society, (Van Den Ban and Hawkins, 1996).

According to Haji (2003), the size of local livestock owned positively and significantly influences farmers' adoption decision of dairy cows. Also (Habtemariam, 2004) reported that livestock size influence technology adoption positively. In summary, since livestock output in the country are from animals that are kept under traditional management system and poor

genetic structure, it is crucial to create a meaningful and sustainable dairy development strategy through transferring dairy technologies that have developed by different institutions.

Social participation: Social participation is a social asset which creates an opportunity to share experience and exchange information in innovation in the farming community. (Rogers 1995), cited in (Ebrahim, 2006) indicated that the core of technology diffusion consists of interpersonal network of information exchange between those individuals who have already adopted innovation and those who are then influenced to do so. Reports indicate that membership and leadership in community organization assumes that farmers who have some position in PA and different cooperatives are more likely to be aware of new practices as they are easily exposed to information. The findings of (Deribe,2007), also indicated a positive relationship between social participation and enhanced knowledge of dairy women farmers; (Habtemariam, 2004) and (Asres, 2005), reported that social participation was statistically insignificant in access to dairy technology and utilization of reproductive, productive and community role information of women, respectively.

2.5.3. Psychological variables

Psychological factors also play influential role in the access and utilization of agricultural information and technologies. In this study innovation proneness, production motivation and information seeking behavior were considered as important variable having influence on access to and utilization of agricultural knowledge and information.

Information seeking behavior: Is a broad term encompassing the ways individuals articulate their information needs, seek, evaluate, select, and use information. In other words, information-seeking behavior is purposive in nature and is a consequence of a need to satisfy some goal. According to Pettigrew (1996), information-seeking behavior involves personal reasons for seeking information, the kinds of information which are being sought and the ways and sources with which needed information is being sought. On the other hand, barriers that prevent individuals from seeking and getting information are also of great importance in understanding the information-seeking behavior of individuals and organizations. Gholamreza and Naser, (2005), investigated the factors influencing information-seeking behavior of

Extension workers in Zanjan Province, Iran. Their research showed that there was a significant relationship between age, level of education, years of experience, and the worker's level of job-related information with information-seeking behavior.

Innovation proneness: In this study it was operationally defined as the receptivity of the individual to new ideas related to different agricultural information. A study conducted in Dire Dawa administrative council, eastern Ethiopia, (Asres, 2005), reported that innovation proneness was statistically significant relationship with access to productive role information and utilization of accessible development information by women. The household production orientation is also expected to influence participation in specific organization from incentives derived from production. Households engaged full time in agriculture might drive more incentives from agricultural innovations. They are also likely to be targeted by external agents promoting group based approaches, creating an up-ward bias in participation.

Achievement motivation: Human motivation is complex and distinguished by great variation behavior, goals and performance. According to Elizabeth (1998), achievement motivation is a capacity to drive the satisfaction by attaining some standard of excellence. Moreover, according to the author, human motives can be measured by using the Thematic Apperception Test (TAT), and the achievement motive or capacity to drive the satisfaction by attaining some standard of excellence, have been studied extensively in this manner. In this regard, high scorers tend to attribute failure or success to internal factors while low scorers tend to attribute failure to lack of ability. Farmers have been trained to be achievement oriented and a variety of techniques including the encouragement of high achievement fantasies, appear to be effective. By concentrating on the study of the achievement motive, or the capacity to drive satisfaction some standard of excellence, we can see how these motives can be measured and analyzed and how knowledge gained from studying them might have practical benefit. Experts on behavioral science suggest that one of the main constraints to the development that many farmers face is isolation and a feeling that there is little they can do to change their lives. It is therefore, equally important for extension to motivate and bring self confidence for farmers by working with them, helping them to take the initiative and generally encouraging them to become involved in extension activities.

Mass media exposure: Mass media play greater role in creating awareness in shortest time possible over large area coverage. Mass media, viz, radio, newspaper, TV, print etc could be effective in influencing symbolic adoption of rural women on agricultural technologies. A study conducted by (Pathiraand and Ponusamy, 2009), in Tamil Nadu India, on the adoption of breeds, followed by feeding, housing, disease and rabbit management practices, indicated that mass media formats like Radio, TV, internet and print materials were effective enough in convincing the respondents to mentally adopt the technologies. The findings revealed that of the technologies, breeds have higher rate of adoption followed by feeding, housing, disease and rabbit management practices. Moreover, there existed significant differences in the effectiveness of the four channels at recommended technologies (breed, feed). The radio exposed group differed significantly from other group in symbolic adoption. It was found that radio as the most effective and superior treatment. FAO (2009) suggests the potential of new information and communication technologies to reduce the educational disadvantages faced by older rural women through the development and dissemination of need-based information in appropriate formats and accessible mediums should be leveraged.

2.5.4. Institutional variables

Institutional factors include various formal and informal institutions, and organizations. Accordingly, factors facilitating and enhancing the access and utilization of agricultural information include services such as credit, and joint planning, development agent contact, visiting market place and different formal and informal organizations.

Credit services: Access to credit can relax the financial constraints of women farmers. Accordingly, a study conducted by (Sisay, 2008), to determine smallholder farmers' access to formal credit found out that FHHs still have limited credit access and the difference between the wealth groups and in accessing credit from the formal sources was also statistically significant. Moreover, the study revealed that farmers acknowledge group lending that solves the problems of collateral requirements by lending institutions, control misuse of borrowed funds and minimize the risk of default and they are also recognize the provision of saving services by Micro Finance Institutions (MFI). Smaller loan size, earlier saving requirement which was not convenient to the farmers and repayment period by MFI were among the

critical problems. Similarly, a study conducted about the performance of micro finance in Ethiopia indicates that the overall share of women borrowers to be 41%, with five out of twelve MFIs having less than 50% borrowers while all the relatively younger MFIs have greater than 50% women borrowers. Studies of Mulugeta,(2000) and Minkinay (2008), have shown that access to credit plays a significant role in enhancing the use of improved technologies and significantly related with adoption. To this end, innovative credit schemes without isolation of poor women needs to be promoted.

Extension participation and extension contact: Access to extension services refers to the availability and existence of technical advices, trial and demonstrations to farmers. Extension service is one of the major sources of information about modern technologies. It is through extension service that farmers get trainings on technical practices and characteristics of all modern technologies.

Studies conducted by (Deribe, 2007; Daniel, 2008); Ebrahim, 2006) indicated that access to extension services has significant influence on adoption of agricultural technologies. On the contrary, findings of (Bulale, 2000), indicated that extension contact has no influence on adoption of all dairy production technologies. Therefore, the frequency of extension contact important role in the access to and utilization of agricultural information.

Market access/Distance to the main road: Distance from market is a major factor that prohibited farmers from sale of whole fresh milk to urban consumers. Market distance and frequency of market visiting is also another factor in the dissemination of agricultural information and utilization. In addition, a study conducted by (Katungi, 2006), in Uganda explained that market serve as forum for the exchange of goods, and organized weekly, biweekly or monthly and constitute an important place where agricultural information is exchanged and men go to markets more often than women. Moreover, farmers located near to a market will have a chance to get information from other farmers and input suppliers. Therefore, rural roads need to be expanded for the improvement of marketing of agricultural inputs and out put as well as frequent market visit.

2.6. Conceptual Framework of the Study

Many constraints of agricultural productivity are gender neutral, although resource endowments and social factors may have greater influence on access to extension services and factor of production than gender. Many studies conclude that within each social and economic group, women tend to face more constraints than men. And women tend to be heavily represented among the resource poor and low-technology farmers. This is mainly because of socio-cultural interactions as well as time constraints due to their multiple responsibilities. Therefore, new extension service delivery techniques will have to be devised, if extension is to serve the needs of woman farmers effectively. The conceptual framework of this study is based on the assumption that access to and utilization of agricultural knowledge and information are influenced by different constraints opportunities and personal, socio-economical, institutional and psychological factors of the women dairy farmers. In this regard, conceptual diagram of the study is presented in (Figure1).

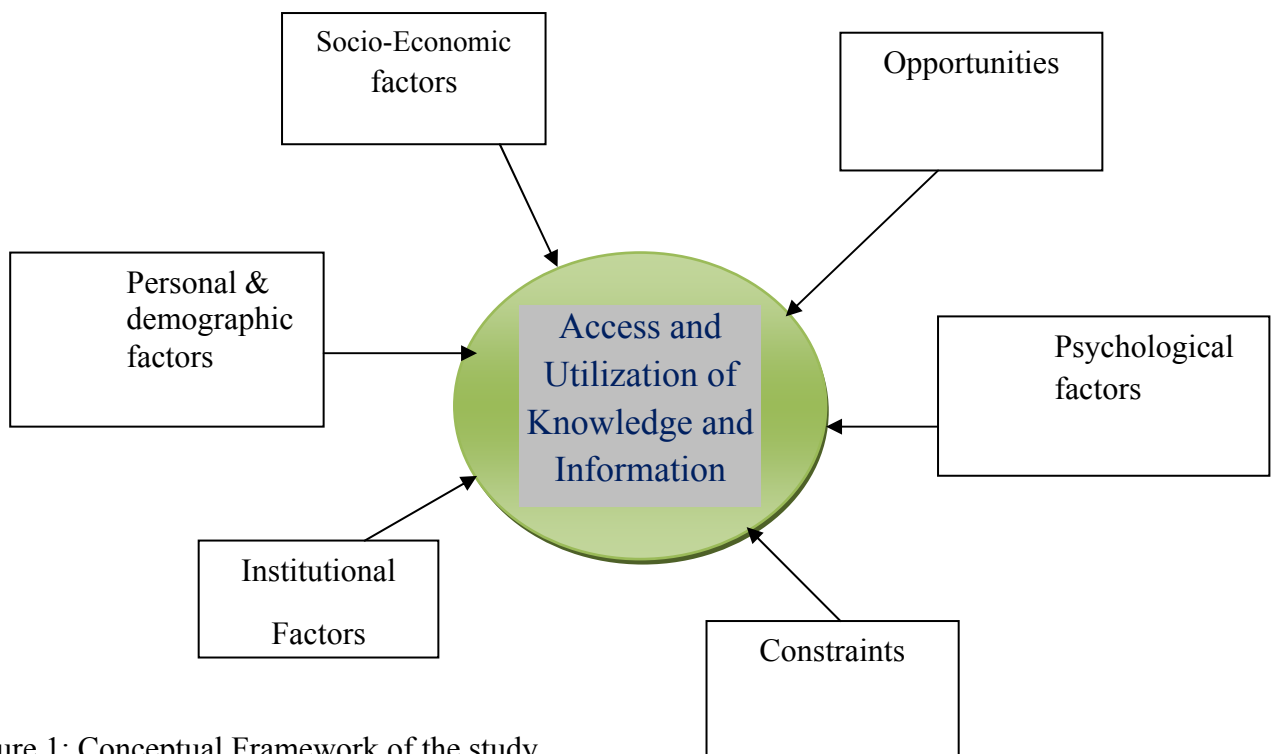


Figure 1: Conceptual Framework of the study
Source: (Asres, 2005) with modifications

3. RESEARCH METHODOLOGY

In this chapter different aspects of the study area are presented. It also provides technique of sampling procedure, data type and data source, method of data collection and analysis. Lastly it concludes with specifying Multiple Linear Regression (MLR) model used and the variables used.

3.1. Description of the Study Area

In this section, demography, climatic conditions, agricultural potential as well as actors and institutions involved in service provision are discussed. In addition, dairy production sub systems of the Ada'a milk shed is presented.

3.1.1. The Ada'a Woreda

Ada'a woreda is found in the Oromia regional state, East Showa zone, and located 45 kms south east of the capital Addis Ababa and 55 km west of Adama, the capital of East Showa zone. The area lies with altitudes ranging from 1592-2937 (meters above sea level (m.a.s.l)) with an average of 1896m (IPMS, 2005). It receives an annual rainfall of 854-1130 mm with an average of 919 mm.

There are 27 kebele administrations in Ada'a woreda in addition to 9 urban kebeles in Debrezeit municipality with 20,362 households in Ada'a and 17,490 in Debrezeit town. The total population living in Debre Zeit town was 84,943 of which 64.6 % are females, and the number of people living in the rural and peri-urban areas is 144,289 of which 49 % are females (CSA, 2008).

Livestock is an integral part of the production system of the study area. Production of cattle, sheep, goat, horse, donkey, mule and poultry is a very common practice and there is an existing market-oriented dairy production system. According to the information obtained from the WoARD, total livestock population of the woreda in 2008 was 291,539 of which both local and crossbred cows accounted 34,066. There is a fast growing smallholder dairy

production system with a strong milk marketing cooperative which involves 850 (450 males and 400 females) smallholder dairy farmers. Major crops grown around Ada'a area are cereals such as *teff*, wheat, barely, chickpea lentils and vegetables like onions, tomato and cabbage. Annual crops are predominant and rain fed agriculture is mainly practiced using oxen drought power. Out of the total area of crop land, 81.76% accounts for crop land, 2.8% for grazing, and 6.22% for forests and 0.01% for other purposes (WoARD, 2008).

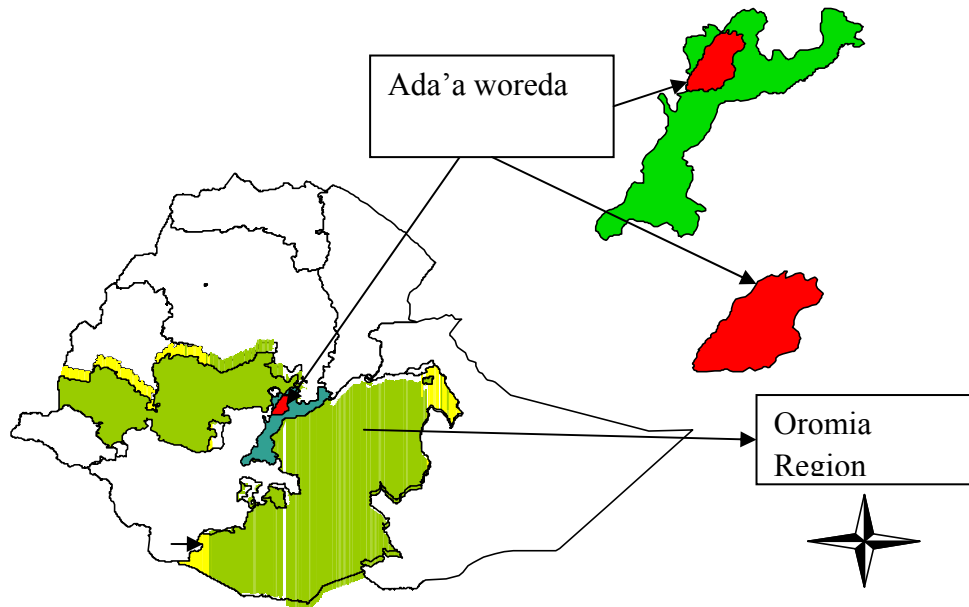


Figure 2: Map of the study area
Source: IPMS, 2006.

Infrastructures and facilities like telecommunication, electric power and schools are highly advancing in the capital of the district. Moreover, the National Veterinary Research Institute, Faculty of Veterinary Medicine, the Debrezeit Agricultural Research Center etc. contributed a lot. There are a number of farmers' primary cooperatives in the woreda organized under ten types of cooperatives. In the district there is one dairy cooperative (Ada'a Dairy Cooperative), which is the biggest and advanced dairy cooperative in Ethiopia, both in terms of number of members and volume of production with its own feed and milk processing plants (Eshetu, 2008). Also, one of the known unions ("Yerer" farmers' cooperative union) which is found in the district purchase improved seeds (wheat, chickpeas) from farmers and undertakes grain marketing activities for both local and export market.

In the study area, farmers have reached critical stage to extend their land holdings. In this regard, intensification of production and diversification of products are the only means for farmers to sustain their livelihoods. In addition to the potentialities of agriculture, the presence of different Governmental, Non-Government and research and educational organizations that are dealing with research and development gives the district huge opportunities to capitalize on.

3.1.2. Dairy production systems of the study area

According to Janke (1998), the crop-livestock integrated farming system can be further sub divided in to two broad sub-divisions namely crop-livestock and livestock-crop systems. In the study area, crop-livestock farming system is vital for the security and survival of large number of people. In this regard, livestock generate cash income, provide drought power, manure, and utilize crop residuals and by-products.

Milk production system can be broadly categorized in to three systems based on marketing situation such as urban, peri-urban and rural milk production systems (Tsehay, 2002). Accordingly, in rural and remote Kebeles of the study area, milk production is non-market oriented, where surplus is processed and marketed through informal market and with very little or no specialized inputs (feed, veterinary services etc) to their dairy enterprise.

The other milk production system of the study area is peri-urban milk production which is found in densely populated agricultural land and land that is shrinking due to urbanization. According to Sintayehu *et al.*, (2008), this system includes smallholders and medium commercial farmers who possess animal type ranging from 50% crosses to high grade of Frisian. In addition, in the municipality of Debre Zeit, smallholders and commercial dairy farmers keep dairy animals mainly for cash income by utilization of resources like land feed, labor, capital etc.

Feed shortage was identified as the most important production constraint of farmers in the study area. According to Berehanu *et al.*, (2008), sources of animal feed in Ada'a woreda include: communal grazing lands, crop residuals of *teff* and barley, wheat straw and

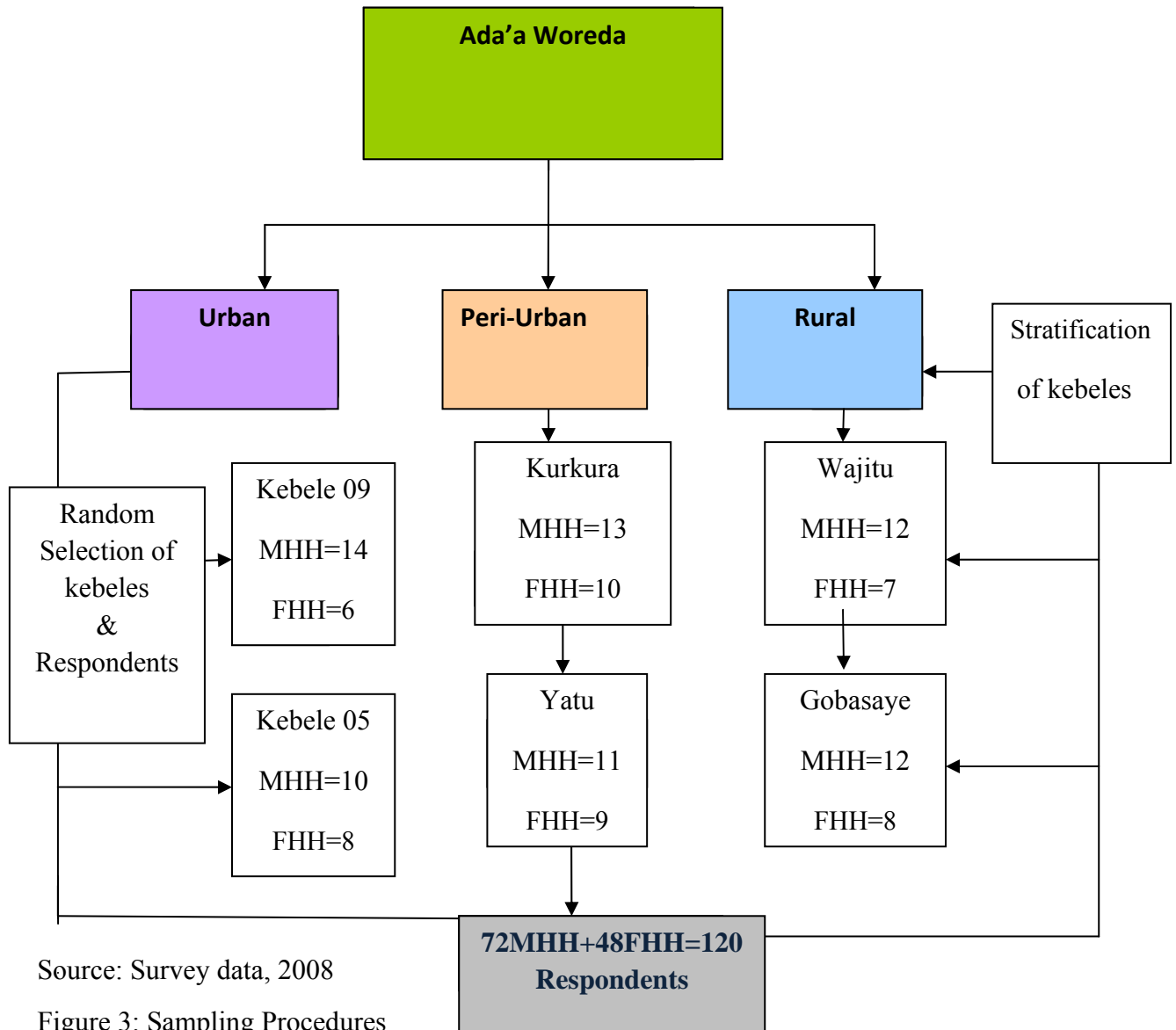
commercial feed of hay and factory by-products of oil seed cake and wheat bran. *Teff* straw is an important feed resource in Ada'a woreda. Ada'a woreda also has a better commercial feed supply.

In the study area, livestock diseases were also reported to be the most important constraints of livestock production, followed by feed shortage. In this regard, common livestock disease identified Improving Productivity and Market Success (IPMS) project pilot learning woredas including Ada'a include: Sheep and goat pox, liver fluke, pastrolosis trypanosomes, mastitis and blood urine. With regard to veterinary services, WoARD, the Ada'a milk cooperative and private diagnostic and drug dealers are main sources of veterinary services. Whenever there is livestock disease outbreak, veterinarians positioned at the woreda capital are also called upon to provide veterinarian services in the affected areas.

WoARD is the sole public organization mandated to provide veterinary and other dairy production related services throughout the country. These include: Promotion of animal fattening, forage development, feed practices, improved dairy management (housing) and veterinary services (BoARD, 2008). Particularly in urban and per-urban market oriented dairying, farmers' practice of housing management is better than the rural areas dairy production system. However, due to little livestock extension coverage related to the needs of farmers, there is little improvement of housing practices amongst market oriented dairy farmers.

3.2. Sample Size and Method of Sampling

Sample size and the sample selection process procedures should assure the representativeness of the population. Sample size determination has its own scientific approach. In this study, to determine sample size, different factors such as research cost, time, human resource, accessibility and availability of transport facilities were taken into consideration. By taking these factors into account, 120 respondents were selected (Figure 3).



Source: Survey data, 2008

Figure 3: Sampling Procedures

For the propose of this study, Ada'a Woreda is selected purposively due to active and significant role of women in market oriented dairy production and accessibility of the area. In addition, it is one of the IPMS project pilot learning woreda, where milk is identified as a commodity for market oriented development.

This study used a four stage sampling procedure. In the first stage based on market orientation, purposively selection of urban system and stratification kebeles into, peri-urban and rural systems was done. In the second stage followed random selection of two kebeles

each from urban, peri-urban and rural systems. In the third stage, dairy cattle owning MHHs and FHHs in urban, peri-urban and rural kebeles were identified. In the fourth stage, from list of identified dairy cattle owners, sample MHHs and FHHs were randomly selected by employing proportional to size simple random selection method, respectively. In this sampling stage, the proportion of FHH and MHH has not been made equal due to insufficient number of FHHs with dairy cows (Table1).The selection of peri-urban and rural kebeles was within the radius of 10 km from the town of Debre Zeit assuming to be the ideal distance for marketing.

Table 1: Selected households in sample kebeles

(N=120)

S.N	Sampled kebeles	Dairy producer HHs			Total
		(Number)	MHHs	FHHs	
Urban					
1	Kebele 05	186	10	8	18
2	Kebele09	254	14	6	20
	Total	440	24	14	38
Peri-urban					
3	Kurkura	189	13	10	23
4	Yatu	178	11	9	20
	Total	367	24	19	43
Rural					
5	Gobasaye	221	12	8	20
6	Wajitu	183	12	7	19
	Total	404	24	15	39
	Sub Total	1221	72	48	120

Source: Survey data, 2008

Note: MHHs= Male headed households, FHH= Female headed households

3.3. Data Types and Source

For the purpose of this study, both quantitative and qualitative data were collected. And both primary and secondary data sources were used. The primary data sources were MHHs and FHHs respondents, Woreda Subject Matter Specialists (SMS), DAs and other concerned key informants. Type of data include: Sources of knowledge and information, inputs, technologies, and service; level of knowledge access and the actual utilization of knowledge on the recommended improved dairy practices and constraints of access to and utilization of knowledge. In addition, demographical, socio-economic, psychological and institutional factors which could influence women dairy farmers to access and utilize knowledge and

information also included. Secondary data sources used include: Reports, published and unpublished documents. Qualitative data were also collected from key informants of DAs, SMS, cooperative leaders and group of women and men farmers.

3.4. Methods of Data Collection

For the purpose of data collection, enumerators who have knowledge of the culture, acquaintance with socio-economic concepts and proficiency of local language were recruited, trained and employed before actual data collection commenced. Data were collected by using a structured questionnaire (interview schedule) which was pre-tested and translated in to Afan Oromo and Amharic languages. In addition, by employing checklists or topical guideline, focus group discussion, key-informant interview, field visits and observation were made to provide additional information.

3.5. Methods of Data Analysis

Data collected for the objectives of this study were analyzed using appropriate statistical software of Statistical Package for Social Sciences (SPSS version 15). Survey results were reported using descriptive and inferential statistics. The quantitative data were analyzed using descriptive statistics like frequency, mean, percentage, standard deviation, chi-square, t- test, while pear sons' correlation and multiple linear regression analysis, were used to test the magnitude of the relationship and influence among independent and dependent variables. The qualitative data were also analyzed on spot during data collection to avoid forgetting and to be able to fill the gaps in the data.

Karl Pearson's coefficient of correlation (r) is also known as the Product Moment Correlation Coefficient. The value of ' r ' lies between. +1 and -1 Positive values of ' r ' indicate positive correlation between the two variables (*i.e.*, changes in both variables take place in the same direction), whereas negative values of ' r ' indicate negative correlation *i.e.*, changes in the two variables taking place in the opposite directions. A zero value of ' r ' indicates that there is no association between the two variables. When $r = (+) 1$, it indicates perfect positive correlation

and when it is (-) 1, it indicates perfect negative correlation. The value of 'r' nearer to +1 or -1 indicates high degree of correlation between the two variables (Kothari, 2003).

Multiple linear regression (MLR) analysis was the statistical technique used to analyze the influence among variables (i.e. single dependent variable and single independent variable) with the objective of using the independent variables whose values were known to predict the single dependent variable (Hair, *et al.*, 1998).

According to Bowen and Star (1982) the regression equation takes the form;

$$Y = a + b_1X_1 + b_2X_2 + \dots + b_pX_p$$

Where Y= dependent variable

x= independent variable

a= y intercept

b= slope of the line

Estimation procedure: Following the completion of the data collection, the responses were coded and entered into SPSS version 15 for analysis. Before estimating the models, it was necessary to check if multi-collinearity exists among the explanatory variables. If multi-collinearity turns out to be significant, the simultaneous presence of the two variables will reinforce the individual effects of these variables. According to Gujarati (1995) there are various indicators of multi-collinearity and no single diagnostic give us a complete handle over the multi- collinearity problem. For this particular study, Variance Inflation Factor (VIF) and Condition Index (CI) were used for continues variables. The larger the value of VIF, the more it is troublesome. As a rule of thumb, if the VIF of a variable exceeds 10 (this will happen if R_i^2 exceeds 0.95), that variable is said to be highly collinear Gujarati, (1995).

Following Gujarati (1995), the VIF is given as:

$$VIF(\chi_i) = \frac{1}{1 - R_i^2}$$

Where, R_i^2 is the coefficient of determination when. the variable χ_i is regressed on the other explanatory variables. A condition index greater than 15 indicates a possible problem and an index greater than 30 suggests a serious problem with multi-collinearity

Where, C is coefficient of contingency, χ^2 is chi-square test and N = total sample size.

3.6. Operational Definitions of Variables and Working Hypothesis

The important variables investigated in the research are, dependent and independent variables. Dependent variable is a variable that is affected or explained by another variable. An independent variable is a variable that causes change in another (Sarantakos, 1998).

3.6.1. Definition of the dependent variables

One of the objectives of this study is to assess determinants of access to and utilization of agricultural knowledge and information by women dairy farmers. In this regard, knowing the level of knowledge access and its' utilization will pave the way for further analysis of the situation in relation to promotion of dairy technologies among smallholder women dairy farmers. Hence, access to and utilization of knowledge and information by women dairy farmers were treated as dependent variables of this study.

Access to agricultural knowledge and information: Access to agricultural knowledge and information is one of the dependent variables of this study. It was measured using the score given for the accessed knowledge and information sources on dairy production practices. The knowledge and information of dairy practices and their possible sources were identified by the discussion held with Bureau and woreda Subject Mater Specialists (SMS) and review of similar studies. In this regard, dairy production areas namely feeding, breeding, milk preservation and processing and input and output marketing with possible sources and frequency of accessing were identified and a minimum and maximum score of 0 and 48 were given for the overall activities, respectively (Appendix III Interview schedule).

Accordingly, for the knowledge and information access the value never (0) was given for those respondents who had no information access for a particular practice, the value sometimes (1) was given to those respondents who access knowledge and information once in four month and more, the value often (2) was given for those respondents who access

information once in two to three month and the value always (3) was given for those respondents knowledge and information once in a week to one month (see 7.2 Appendix II).

Utilization of agricultural Knowledge and information: Utilization of agricultural knowledge and information, technology, services and practices of dairy production is the second dependent variable of this study. It was measured using the score given for the frequency of utilized knowledge/information, technology, services and practices of dairy production in terms of improved feeding, breeding, milk preservation and processing and input/output marketing. For the utilization of knowledge and information, services and practices on dairy production, a value (0) never was given for those respondents who didn't utilize knowledge and information, services and practices, a value of (2) sometimes was given for those respondents who utilize once in the last three years and the value of (4) always was given for those respondents who utilized for the last three years successively Accordingly, a minimum score of 0 and maximum of 4 scores from (eight activities) was given. Besides, for the utilization of credit services from the accessed source a minimum of 0 and maximum of 2 scores was given and maximum 10 potential scores can be obtained from 5 sources. This makes the maximum and minimum overall utilization potential score 0 and 42, respectively (See 7.2 Appendix II)

3.6.2. Definition of the independent variables and hypothesized relations

The following independent variables that may influence the access and utilization of knowledge and information of women dairy farmers in the study area were hypothesized. Here efforts have been made to explain each general level concept to the operational level to facilitate measurements of hypothesized independent variables. The 15 hypothesized explanatory variables are defined and explained as follows.

Age of Household Head: It refers to the chronological age of household head in years at the time of survey. It was measured in number of years. As the age of the household head increases, the probability of access to and utilization of knowledge and information decreases. Because, with age, a farmer can become more risk averse and then tend to be reluctant to new

technologies. Therefore, it was hypothesized that age of household head is more likely to affect access and utilization of dairy innovation negatively.

2. Household head Education: The individuals to read and write and the amount of formal education, he/she possesses, will effect the manner information which the individuals gathers data and relates himself /herself to his /her environment. Operationally, it refers to formal education that the respondent received and academic qualification of the respondents acquired through formal education in grade of school. Educational level makes difference in adoption of farm practices. Reason for this assumption, is that education enhances farmers' ability to obtain and analyze information that helps them to make appropriate decision. Therefore, it is expected that education will affect access and utilization of knowledge and information positively.

3. Education of the family members: It refers to the academic qualification of all of the family members acquired through formal training and schooling. The years of schooling of different family members were quantified by giving scores as per socio-economic scale of Pareek and Rao (1974). First each eligible member of the family was given a score and then overall educational level of the family was computed by using the formula.

$$\text{Family education score} = \frac{\text{Total education score of the family}}{\text{Total number of eligible member of the family}}$$

Hence, education levels of household members will likely influence households' access to and utilization of agricultural knowledge and information, positively

4. Social participation: In this study social participation refers to the degree, with which the respondents involved in formal and non-formal organizations and regularity to their attendance. Thus, social participation is voluntary sharing in person to group and group to group relationships, beyond the immediate household. The total score of social participation was taken to see the general influence of social participation in accessing and also utilizing dairy production technologies and practices by farmers. The total scores of the farmers were

calculated on the basis of scores given for their membership and status. Accordingly, score of zero was given for non participant, score of 1 was given for those who are members only, and score of 2 was given for those who are leaders of organization. To see each farmer's level of social participation in different formal and informal groups, 21 organizations were included in the interview schedule (7.2. Appendix II). Therefore, this variable was expected to influence access and utilization of Agricultural knowledge and information positively.

5: Farm land size holding: In the present investigation farm size is defined as total farm size owned and rented by the household head in hectares. It is a continuous variable; it was measured by number of hectares. Therefore, it was hypothesized that this variable will influence access to and utilization of knowledge and information positively.

6. Family size: Operationally, this variable is referred to the total number of the family consisting of husband wife, children and other dependents. It is a continuous variable measured by the total family members. Since family size is more related to household efforts of rural women, negative relationship was expected between family size and access and utilization of knowledge and information.

7. Livestock possession: Since dairy production is capital-intensive business, initial financial capacity is vital and livestock could be used as one of the important financial sources to begin with. For the simplicity of the analysis based on Freeman *et al.*, (1996), the livestock number was converted to Tropical Livestock Unit (TLU). It refers to the total number of animal heads like oxen, dairy cow, equines, sheep, goat, poultry possessed by the household in "TLU" (Appendix II). Based on this assumption, this variable was hypothesized to have positive relation with women farmers' access to and utilization of knowledge and information.

8. Cosmopolitaness: Is the degree of orientation of the respondents towards outside the social system to which she/he belongs. It is measured in terms of frequency of visits to outside her village and the purpose of such visits by using a scale designed Singh (1994 as cited in Gogoi, 1990). Cosmopolitaness was expected to have positive relationship with the dependent variables since it provides more chance of exposure to external information. Therefore, this

variable is assumed to influence access to and utilization of agricultural knowledge and information positively.

9. Mass media exposure: Mass media play the greater role in creating awareness in shortest time possible over large area of coverage. It is measured in terms of frequency of contact with different media (TV, radio, print and public meeting). Therefore, it is expected to have positive influence on access and utilization of agricultural knowledge and information.

10. Innovation proneness: Farmers having quickly accepting behaviour will have higher probability of utilizing agricultural knowledge and information. This variable is measured based on rapidity of accepting new idea relative to others (3 = whenever I come across a new idea, 2 = after consulting others who are more knowledgeable, 1= after most of the people accept it, 0 = never) and is based on the receptivity of the individual to new ideas. So, this variable is expected to influence access to and utilization of agricultural knowledge and information positively.

11. Information seeking behavior: It refers to eagerness of a person to get information from various sources on different roles. A person with this behavior will have a chance to access agricultural knowledge and information than those who have not such behavior. It was measured based on the farmer's effort to get a range of information, frequency and range of sources using the scale suggested by Pareek and Rao (1974), with slight modifications. When a person is eager to get information from various sources, he/she will have been motivated to access and consequently utilize the agricultural information. In this section, first six major agricultural information sources (office of agriculture, mass media, input dealers, market place, friends/neighbors and other farmers) and 13 major agricultural activities in the study area were identified in consultation with woreda experts. The information needs of these agricultural activities were rated in 3 level frequency (0 = Never, 1 = Some times, 2 = Always), and depending on the need to get new information, each respondent was evaluated out of 26 scores. Totally, these variables have 32 scores value (7.2.Appendix II). So, this variable is hypothesized to have positive influence on access and utilization of agricultural knowledge and information

12. Achievement motivation: When the behavior of an individual need to perform different roles with some degree of excellence, there will be a need of agricultural information than those did not have such behavior. This was defined as the need in an individual to perform different roles with some degree of excellence. This variable was measured using the scale suggested by Pareek and Rao (1974), with slight modifications. Hence, this variable is expected to influence access and utilization of agricultural knowledge and information positively.

13. Extension participation: It refers to the frequent participation of farmers in extension events such as demonstration, verification, meeting, training and advice of extension agent. The following scores were assigned to different responses based on the following scales. It is treated as frequent participation: not at all = 0, one up to three times in any extension events =1, three up to eight times in any extension events = 2, eight and above times in any extension events = 3. Extension education helps to cultivate set of farmers' mind and consequently bring about changes in attitude, knowledge and behavior in their way behaving. Hence, this variable is expected to influence access and utilization of agricultural knowledge and information positively.

14. Access to credit: It is a dummy variable, which takes the value 1 if the respondent uses credit and 0 otherwise. Credit is very much useful to purchase inputs such as improved seeds, heifers, feeds and other equipments. Hence, access to credit was expected to influence the effectiveness of improved dairy production practices positively.

15. Distance from the main road: It refers to length between respondents' residence and the nearest main road or all weather feeder roads in kilometers. The closer farmers are to the nearest main road the more likely to access knowledge and utilize new technology. Therefore, it was assumed that distance from main road is likely to influence access and utilization of agricultural knowledge and information negatively.

4. RESULTS AND DISCUSSIONS

Chapter 4 presents and discusses analytical results pertaining to the specific objectives of the thesis. The chapter has been organized in four major sections dealing with, respectively, demographic and socio-economic characteristics of the sample households, dairy production and marketing in the research area, dairy producers' access to knowledge/information, technology, finance/credit, input and supportive services, extent and determinants of extent to access and utilization of knowledge and information. Given women focus of the analysis, the empirical evidence has been disaggregated throughout by gender, particularly by sex of household heads-female-headed and male-headed.

4.1. Personal, demographic, Socio-economic and psychological Characteristic of the Sampled Female Headed and Male Headed Household Respondents

In this section, summary of the survey results of households' and respondents' characteristics in terms of personal and demographic, socio-economic and institutional factors are discussed and presented descriptively.

4.1.1. Personal and demographic characteristics

Results of the study that indicate mean values of family members' age structure are presented in (Table 2). Family labor was assumed to be the main source of labor required for dairy farm operations like feeding, milking, cleaning of barns and marketing.

Table 2: Family size and family members' age structure of the sample households
(N=120)

Variables	Household category						t-value
	MHHs		FHHs		Overall		
	Mean	SD	Mean	SD	Mean	SD	
Family size	7.3	1.9	4.9	2.1	4.9	2.26	-4.882***
Males	1.38	0.51	1.33	0.57	1.43	0.53	.550NS
Children 5 to 15 years	1.96	0.99	1.42	0.78	2.04	1.02	.685 NS
Children and adults 15 to 60years	2.05	0.98	1.9	0.89	2.1	0.98	.346NS
Adults grater than 60 years	1	.00	1.53	1.00	1.00	.00	1.763 NS
Children under 5 years	1.25	.46	1.5	0.7	1.4	0.54	-0.912 NS
Children 5 to 15 years	1.73	.46	1.63	.67	1.67	.66	-1.237 NS
Children and adults 15 to 60years	2.5	.89	2.3	.83	1.6	.71	-1.698*
Adults grater than 60 years	1.0	0.00	1.28	.75	1.00	.00	0.575 NS
Labor force (AE)	1.92	1.04	1.71	1.91	1.84	1.03	1.635 NS

Source: Survey Data, 2008 ***, significant at 1% probability level, NS= Non Significant

The overall average family size of the sample households was 4.9 with SD of 2.26. The average family size of the respondents in MHHs and FHHs was 7.3 and 4.9 with SD of 1.9 and 2.1, respectively (Table 2). The result of the survey further revealed that MHHs had greater size of family members than FHHs which was confirmed by significant mean difference of ($t=-4.882$, $p=.000$) at 1% probability level. As to the availability of labor, the mere presence of high number of members in the family does not mean that there is enough amount of labor force. To get the real picture it is necessary to convert this to adult/man equivalent. In this regard, economically active labor force for the sample households was calculated based on Conversion factor of Strock, *et al.*, (1991) cited in Desalegn, (1991). Accordingly, the age categories lie between 15-60 years was calculated for both MHHs and FHHs groups to see the available working labor force. The overall mean value of working

labor force was 1.84 Adult Equivalent (AE) with SD of 1.03 while it was found to be 1.92 and 1.71 with SD of 1.04 and 1.91 for MHHs and FHH, respectively. On the average MHHs have more working labor force than the FHHs households though it was not statistically significant. In general, women and children in most of the cases are responsible for management of dairy animals and this resulted in less labor requirement. Thus, the above result indicates that family members in the productive age categories were higher than those of the non-productive groups and this in turn implies that households have good source of family labor for different dairy farming activities.

Table 3: Profile of respondents in terms of hypothesized variables

(N=120)

Variables (Demographic & Economical)	Household category						t- test
	MHH=72		FHH=48		Overall		
	Mean	SD	Mean	SD	Mean	SD	
Age of the respondent	42.6	10.89	50	10.47	45.6	11.27	-3.722**
Aggregate family education	12.2	4.38	9.22	4.75	10.57	4.17	3.189**
Cosmopolitaness	3.66	1.28	3.1	1.59	3.44	1.4	-2.118*
Mass media	6.65	3.86	6.23	3.96	6.48	3.8	-.583 NS
Social participation	2.23	1.47	2.23	1.47	2.23	1.37	.634NS
Distance from main roads	1.49	0.5	1.6	0.5	1.51	0.53	.663NS
Land Holding	1.85	1.8	1.4	1.4	1.67	1.7	.672NS
Livestock holding in (TLU)	9.2	5.35	6.09	3.5	7.9	4.9	-3.747**

Source: Survey Data, 2008 **, *,significant at 1% and 5% probability level, respectively NS=Non Significant

Age of the respondents: The mean age value of the total sample respondents was 45.6 years with SD of 11.27 while it was 42.6 and 50 with SD of 10.89 and 10.47 for respondents in MHHs and FHHs, respectively. In this regard, significant mean age difference was observed between respondents' groups ($t=-3.722$, $p=.035$) at 5% probability level (Table 3).The probable reason might be due to age differences between husband and wives or early marriage of girls in rural areas.

Cosmopolitaness: This is the degree of orientation of the respondent towards outside the social system he/she belongs. It is measured in terms of frequency of visits to the nearby town Dairy women farmers' exposure to the outside world was hypothesized to affect access and utilization of knowledge and information since it provides more chance of exposure to external information, technologies and services. In this regard, the result of the survey shows that the overall mean score value for cosmopolitaness was 3.44 with SD of 1.4 while it was found to be 3.66 and 3.1 with SD of 1.28 and 1.59 for respondents in MHHs and FHHs, respectively. In this regard, statistically significant difference was observed between the respondents of the household groups ($t = -2.118$, $p = .042$) at 10 % probability level (Table3). The probable reason for this could be because of the multiple responsibilities of women (FHHs) inside their houses that limit their exposure to external environment and thus the possibility of getting information.

Aggregate education in the family: Since farming by and large is a family profession, all members of the family perform various farm related tasks and so are capable of affecting Educational levels of all family members therefore, are important for acquisition, comprehension and acceptance of information about improved farming. The result of this study revealed that the overall mean score value of aggregate family education to be 10.57 with SD of 4.17 while it was found to be 12.2 and 9.22 with SD of 4.38 and 4.75 for MHHs and FHHs groups, respectively. In this regard, statistically significance mean difference was observed between the household groups in favor of MHHs ($t = 3.189$, $p = .002$) at 1% probability level (Table 3).

4.1.2. Socio-economic factors

Land holding: The result of the study showed that the land holding of the overall sample households was 1.67 hectares and SD of 1.7 while it was found to be 1.85 and 1.4 hectares with SD of 1.8 and 1.4 for MHHs and FHHs, respectively (Table3). The overall mean average land holding in the woreda (1.67 ha) is comparable to the regions' average of 1.5 ha (CSA, 2008). As land is one of the prerequisite for any farming activity, one of the biggest challenges of urban and peri-urban dairy producers in the area is the diminishing land size

they own. Because of rapid urbanization in the area, farmers do not have extra land to grow improved fodder and expand dairy production. In urban dairy production system, dairy cattle are kept in the confined residential compounds.

Table 4: Distribution of households by livestock and dairy cattle holding (N=120)

Livestock holding: Livestock is another important component of the economic activity along with crop production and it is the basis of livelihood for local communities. According to the

Livestock and dairy cattle holding (Mean)	Sub system						F-value
	Urban		Peri-urban		Rural		
	Mean	SD	Mean	SD	Mean	SD	
Total livestock holding in(TLU)	4.28	3.68	9.6	4.84	10.1	4.14	7.674***
Improved cow/Heifer(in number)	2.8	1.61	0.68	1.81	.38	0.8	5.401**
Local cow/Heifer(in number)	0.6	-0.86	2.7	-1.1	2.75	-0.9	2.568*
Oxen/Bull in (TLU)	1	-	4.81	2.31	4.79	2.27	4.243**
Sheep/Goats in (TLU)	3.66	1.52	7.17	4.69	6.84	7.32	5.306***
Donkey/Horse in (TLU)	3.5	0.7	3.03	1.2	3.15	1.52	2.264NS

Source: Survey data, 2008, ***,**,*= significant at 1%, 5% and 10% of probability level respectively, NS=Non Significant

result of the study, average livestock holding for the whole sample households was 7.9 (TLU) with SD of 4.9 while it was 9.2 and 6.09 with SD of 5.35 and 3.5 for MHHs and FHHs, respectively. The independent t-test value also revealed that statistically there is significant variation between household groups ($t=-3.747$, $p=.000$) at 1% probability level. The probable reason for the difference might be due to socio-economic status of FHHs to own such important assets in their production sub systems. Moreover, statistically significant variations were also seen among the sub systems households regarding livestock holdings such as small ruminants in favor of peri-urban and rural sub systems (Table 4). The probable reason might be due to integrated crop-livestock production system of the study area farmers rear different types of animals such as sheep and goats in order to diversify their sources of income. This finding is in confirmation with a study conducted by Yoseph (2008), about small animal production in Ada'a Liben woreda that indicated keeping few numbers of small animals under

the low-input uncontrolled subsistence system to have diminutive contribution to the livelihood of resource poor communities in the central high lands of Ethiopia.

4.1.3. Institutional factor

Extension participation: In the study area, agricultural extension services provided to farmers are the major sources of information. In this regard, it is assumed that farmers with frequent extension participation will likely to access knowledge and information than those who don't.

Table 5: Profile of respondents in terms of hypothesized variables

(N=120)

Variables	Household category						t-value
	MHHs N=72		FHHs N=48		Overall		
	Mean	SD	Mean	SD	Mean	SD	
Extension participation	2.72	2.1	1.81	1.77	2.33	2.0	-2.413**
Innovation proneness	8.24	4.17	7.63	3.62	7.99	3.9	-.828NS
Information seeking	5.08	1.7	4.81	1.83	4.98	1.75	-.829 NS
Achievement motivation	8.19	1.93	7.63	1.42	7.87	1.76	-1.748

Source: Survey data, 2008, **= significant at 5 % probability levels, NS=Non Significant

According to the result of the study, mean score value of extension participation for the whole sample was 2.33 with SD of 2.0 while it was 2.72 and 1.81 with SD of 2.1 and 1.77 for respondents in MHHs and FHHs, respectively. In this regard, statistically significant difference was also observed between the groups of respondents ($t = -2.413$, $p = 0.014$) at 5% probability level in favor of respondents in MHHs. The probable reason for the difference might be due to respondents in MHHs better participation in extension events like demonstration, visits, exhibitions etc. than FHHs respondents who might use informal sources of information such as neighbors, relatives and friends to access information.

4.2. Dairy Production and Marketing in the Research Area

The study area or the “Ada’a milk shed” is one of the relatively advanced and developed market oriented (urban and peri-urban) dairy production systems. The dairy systems in Ada’a are relatively characterized by high prevalence of crossbred cows; presence of licensed concentrate livestock feed processors and suppliers and agro-processing industries, (which are important sources of by-products for livestock feeds). Also there are many public, private and civil societies, research and development organizations supporting smallholder dairy development through the provision of knowledge/information, finance, production inputs and services for animal health and breeding and facilitation of market linkages. Moreover, proximity of the area to the major cities and better roads make access to inputs and output markets far better in Ada’a milk shed. This section will look into dairy production and management, services and marketing activities in the study area.

4.2.1. Dairy Production

The sample households covered by the current survey are those keeping dairy cattle. The households were selected from urban, peri-urban and rural areas of Ada’a District. This subsection provides descriptive statistics on the dairy production systems of the study area. Accordingly, the results of the study in terms of dairy production and management are discussed and selected variables which are used to characterize the dairy systems are presented in (Table 6).

Table 6: Dairy production characteristics of the ample households (Across the sub systems)

Variables	Total Sample	Sub system			Test-value	
		Urban	Peri-urban	Rural	(χ^2/F)	Sig.
Dairy cows holding (mean)						
Total dairy cattle	3.3	3.4	3.38	3.13		
Crossbred cow & heifers	1.29(1.6)	2.8(1.61)	0.68(1.81)	.38(0.8)	10.401	***
Local cows & heifers	2.02	0.6 (.86)	2.7(1.1)	2.75(0.9)		
Breeding system (%)						
Indigenous Bulls	35	16	16	74.4	13.574	***
Exotic Bulls	38	55	44	15.4		
AI	14	11	21	10.3		
AI and exotic Bulls	20.5	21.3	28.3	7.7		
Feeding type/system (%)						
Nughe cake/wheat bran	64.4	57.9	50.7	10.3	37.423	***
Supplementary(concentrate)	10.81	23.7	17.2	7.5		
Farm Crop residue	42.84		23.7	71.8		
Forage legume	6.5	0	8.4	10.3		
Purchased crop residue	8.39	18	0	0		
Improved housing (%)						
Fenced Barn	49.16	73.93	46.6	30.79	13.638	***
Bar n without roof	11.7	26.5	9.3	0		
Bar n with grass roof	13.3	10.53	14	15.4		
Bar n with iron sheet roof	9.16	0	9.3	7.69		
Bar n with iron sheet roof	15	36.9	14	7.7		
(Total N)	120	38	43	39		

Source: Survey data, 2008, ***, significant at 1 and 1% of probability level, respectively.

Note: F-value was used to compare the mean differences.

Dairy cattle composition of sample households recorded by the study indicates the presence of local and crossbred cows and heifers with average cattle size of 3.4, 3.38 and 3.13 in urban, peri-urban and rural sub systems, respectively. The overall average crossbred cows/heifers

possession per household was 1.26 while it was 2.8, .9 and 0.68 0.38 for urban, peri-urban and rural sub systems households, respectively. Statistically significant mean difference was observed across the sub systems ($F= 10.401$, $p=0.21$) at 5% probability level of significance regarding possession of cross bred dairy cows in favor of urban systems. The probable reason might be due to adoption of higher proportions of exotic blood cows by market oriented urban dairy producers than the rural.

With regard to breeding system, dairy farmers utilized three breeding means namely exotic blood bulls, indigenous bulls and AI. According to the study result, in urban and peri-urban sub system, 55.1 and 44 % of the sample households used exotic bulls for mating their dairy cows, respectively while in rural sub system only 15.4% used exotic blood bulls. The proportion of HHs using AI (11, 21 and 10.3 0%) in urban, peri-urban and rural sub systems, respectively shows low level of AI utilization and coverage. This situation calls for the improvement of the service across the sub systems particularly, in the rural areas where most of the local dairy cow owners are found. On the other hand, due to inadequate AI service and lack of its effectiveness and efficiency, farmers utilized private exotic bulls for breeding their milk cows. Although exotic bulls were considered as the alternate option, venereal disease such as transmission and lack of knowledge about exotic bulls' genetic composition were mentioned as major problems related to bull breeding.

The stall fed cows across the sub systems were provided different feeds, where the proportion of 57.9, 50.7 and 10.3% of the households in urban, peri-urban and rural sub systems, respectively provided wheat bran/nughe cake. With regard to supplementary and concentrate feeding, only 23, 17.2 and 7.5% of the households in urban, peri-urban and rural subsystems, respectively provided for dairy cows. On the other hand, 23.7% of households in peri-urban and 71.8% in rural systems provided dairy cows with crop residues from own farm. The result of feeding practices indicates the low level or amount of important feed utilization which calls for interventions to improve the supply and production of animal feeds while it is also an opportunity to introduce improved feeding practices in the area.

Dairy housing management is also one of the requirements for the productivity of dairy cows particularly the exotic blood breeds. Overall about of 73.93, 46.6 and 30.79% of the households in urban, peri-urban and rural sub systems respectively utilized improved housing practices such as fencing of barns and roofing of houses with grass and iron sheet. In general, housing practices of the area indicate low level of housing and sheltering of dairy cows. This could be due to lack of awareness, extension services and financial capacity of framers to invest in modern dairy housing facilities. Thus, in order to improve smallholders' dairy cows' housing, strengthening extension and advisory services as well as financial support is needed.

4.2.2. Dairy production services in the study area

The following sub sections will discuss about dairy production services in the study area, referring to improved feeding knowledge and information, inputs supply breed and animal health protection services. The results are summarized in terms of their frequency of access by the respondents to get knowledge/information, input, technology and services.

4.2.2.1. Improved feeding knowledge and information services

In the study area, dairy production in general is undertaken mainly using improved practices (in urban and peri-urban sub systems) and by traditional management practices in rural areas. In this regard, the results of the study that indicates sample respondents sources of knowledge and information on improved fodder seeds and feeds services are presented in (Table7).

Table 7: Distribution of households by main sources of improved forage seeds/seedlings and supplementary feeds (N=120)

Variables	Total		Sub system						Test value	
	sample		Urban		Peri-urban		Rural		(χ^2)	Sig.
	No	%	No	%	No	%	No	%		
Fodder seeds/seedlings	No	%	No	%	No	%	No	%		
No source	0	0	0	0	10	23	9	23.1		
WoARD	0	0	0	0	28	42	24	50	1.363	NS
NGO	0	0	0	0	1	2.3	2	5.13	1.294	NS
Dairy cooperatives	0	0	0	0	14	33	0	0		
Supplementary feeds										
No source	61	50.8	12	31.6	22	45.8	27	69.2		
WoARD	0	0	0	0	0	0	0	0		
NGO	0	0	0	0	0	0	0	0		
Dairy cooperative	38	31.7	22	57.9	14	29.2	2	5.13	4.236	*
Private providers	42	35	14	36.8	16	33.3	10	25.5	4.671	**
Total (N)	120		38		43		39			

Source: Survey data, 2008, **, *= significant at 5% and 10% of probability level, respectively, NS= Non Significant.

There are many and diverse public, private and civil society actors engaged in forage and dairy development; with a huge diversity across the sub systems. Accordingly, the study results shows that WoARD to be a source of feeding knowledge and information for about 42 and 50 % of the respondents in peri-urban and rural sub systems, respectively while Ada'a dairy cooperative was also found to be a source for about 33 and 0 % of peri-urban and rural dairy producers, respectively. According to the above results, urban producers are not obtaining extension services form WoARD mainly due to the focus of public extension departments in peri-urban and rural areas. However, dairy production services like breed improvement and animal health protection are provided across the whole sub systems. WoARD is coordinating supply of different inputs required for dairy farming such as fodder seeds and seedlings and drugs. Besides, in cooperation with NGOs and IPMS project in peri-urban and rural sub systems, fodder seeds and cuttings (elephant grass) were distributed to

farmers. On the other hand, dairy cooperative also provide training and advisory service on improved feeds for the dairy cooperative members.

Regarding the supply of concentrate and supplementary feeds, about 31.7 and 57.9, and 29.2 % of the respondents in urban, peri-urban and rural systems, respectively accessed dairy cooperative while 36.8, 33.3 and 25.5%, respectively accessed private feed processors and suppliers. In this regard, chi- square test result ($\chi^2= 4.671, P=.013$) ($\chi^2= 4.236, P= .012$) and assured that there is significant difference between respondents in urban and rural sub systems in terms of frequency of accessing of dairy cooperatives and private suppliers as a source of input, at 5 and 10% probability level of significance, respectively. The probable reason for this significant difference might be due to the availability of dairy input markets in urban areas. In urban system, inputs from private suppliers and dairy cooperative like concentrate and supplementary feeds are widely available. The indication of this finding is that those farmers who are really interested in profitable dairy production will look for the necessary dairy inputs whenever they might be available. Currently, in the town of Debre Ziet, modern feed processing plant known as “*Alema cowdaj*” was established jointly by Alema Farm and Dutch company known as *Cowdaj*”. This modern plant produces standard feeds formulated for poultry, bull fattening and dairy cows, respectively.

To this end, in view of experts, the high cost of traditional supplementary feeds such as oilseed cakes, wheat bran, moll aces etc, the production of forage, especially fodder grasses, is increasingly being advocated by WoARD extension unit NGOs and IPMS project. However, it has not been established whether returns in terms of increased livestock productivity from sown forages will be adequate to encourage smallholder livestock owners to undertake forage production in their limited plots of land for indigenous and cross bred dairy cattle (livestock.)

4.2.2.2. AI/Bull breeding services

In the study area, dairy farmers practice three breeding methods namely; artificial insemination, exotic bulls and indigenous bulls. Dairy cattle breeding services of the study area are provided by public institutions, dairy cooperative, NGOs and private service

providers. In this regard, the results of the study that shows sample households' sources of breeding services are presented in (Table 8).

Table 8: Distribution of households by sources of AI/Bull breeding services

(N=120)

Sources	Sub system								(χ^2) Sig
	Total sample		Urban		Peri-urban		Rural		
	N	%	N	%	N	%	N	%	
No source	42	35	6	16	7	16	29	74.4	
Farmers' exotic bulls	64	32.5	25	66	29	67	10	25.6	5.851 **
WoARD AI	32	15.8	13	34	15	35	4	10.3	4.235 *
F. V.M	2	0.83	1	2.6	1	2.3	0	0	
Dairy Cooperative	9	4.17	4	11	4	9.3	1	2.56	1.573NS
NGO	4	1.67	2	5.3	2	4.7	0	0	
Research	4	0.83	3	7.9	1	2.3	0	0	
Total (N)	120		38		43		39		

Source: Survey data, 2008**,*=significant at 5% and 10% of probability level of significance respectively, NS= Non Significance

Across the whole sample, farmers' exotic bulls, WoARD/AI and Dairy cooperative AI services are the most important sources of breed improvement services for about 66, 34 and 11% in urban and 67, 35 and 9.3% of peri-urban system households, respectively while 25.5, 10.3 and 2.56 % of the respondents in rural sub system accessed farmers' exotic bulls, WoARD/AI and dairy cooperative/AI services, respectively. In this regard, significant differences were observed between peri-urban and rural producers in accessing farmers exotic bulls and WoARD/AI services ($\chi^2=5.851$, $p=0.008$) ($\chi^2= 4.235$, $p=0.024$) at 5% and 10% probability level of significance, respectively in favor peri-urban system producers. The probable reason might be due to WoARD involvement in provision of information, advices and coordination of AI service in all sub systems of the study area. In addition, Ada's dairy cooperative was also provided service by employing its own technicians. The service was provided in collaboration with Ministry of Agriculture particularly in obtaining liquid nitrogen. Besides AI service, NGOs and IPMS project in collaboration with WoARD also

provided exotic blood bull service. Although office of agriculture is the main AI service provider, problems related to timely availability and quality of AI service like failure of semen development led producers to look for alternate option-which is bull-breeding.

With regard to constraints to breeding, group discussion participants also reported that unavailability of AI service, curtailed genetic improvement, long calving interval and late age at first mating. Although calving interval is relatively better in the urban production system, market-oriented farmers were dissatisfied with the unavailability of improved genotypes and AI service. For example, according to the BoARD, frequencies of insemination service per conception or insemination index vary between 1.2 and 2.4 (averaging 2).

The low proportion of rural producers' access to AI breeding service might be due to lack of services and farmers awareness about improved dairy breeds. This indicates the need for breed improvement programmes in order to up-grade the local dairy cows' genetic composition particularly, in rural system where the majority (74.4%) utilizes local bulls as a means of breeding. In summary, although most of the market oriented dairy producers were aware of and have a desire for breeding, limited services coupled with low AI efficiency has influenced dairy development of the study area.

4.2.2.3. Dairy cattle health service

Provision of animal health services are the major and the day-to-day activity and encompass basic animal health education; treatment and vaccination; in laboratory diagnosis and sample collection for regional laboratory and drug supply (Anteneh, 2008). These services are provided by different public organizations, NGOs, private sector and farmers' organization (dairy cooperatives) (Table 9)

Table 9: Distribution of households by sources of AI/Bull breeding services (N=120)

Sources and types services	Sub system						Overall	
	Urban		P-urban		Rural			
	N	%	N	%	N	%	N	%
Clinical service	38	100	36	83.7	14	35.9	88	73.33
WOARD vet clinic	8	21.1	24	55.8	10	25.64	42	35
Ada'a cooperative veterinarian	6	15.8	4	9.3	0	0	10	8.33
Private vet clinic	22	57.9	6	14	4	10.26	32	26.7
Debre Zeit FVM	2	5.26	2	4.65	0	0	4	3.33
No service	0	0	7	16.3	11	28.21	18	15
Vaccination service	36	94.7	40	93	38	97.44	114	95
WOARD vet clinic	28	73.7	38	88.4	0	0	66	55
Ada'a cooperative veterinarian	22	57.9	1	2.33	0	0	23	19.2
Private vet clinic	6	15.8	1	2.33	0	0	7	5.83
Debre Zeit FVM	0	0	0	0	0	0	0	0
No service	0	0	0	0	0	0	0	0
Drug sale	38	100	34	86	39	100	114	95
WOARD vet clinic	8	21.1	4	9.3	4	10.26	16	13.3
Private veterinary	6	15.8	4	9.3	3	7.692	13	10.8
Ada'a cooperative veterinarian	5	13.2	0	0	0	0	5	4.17
Private vet clinic	14	36.8	22	62.8	33	84.62	74	61.7
Debre Zeit FVM	0	0	2	4.65	0	0	2	1.67
No service	0	0	0	0	0	0	0	0
Total (N)	39		43		39		120	

Source: Survey Data,2008

The study result shows that WoARD, dairy cooperative, F.V.M, private veterinarians and drug venders were involved in providing animal health services like clinical service (treatment), vaccination and drug sale to smallholder dairy producers in the study area (Table 9). These services are limited and constrained due to lack of capacity of the service providing

actors, shortages of animal health facilities like diagnostic clinics and drug supply. Moreover, lack of coordination among actors and support institution and regulatory measures of the private service provider was mentioned among the many constraints of animal health services (Appendix Table 7). In summary, according to experts, lack of appropriate animal health management (production) systems and environmental conditions under which cattle are maintained could greatly affect the occurrence of reproductive health problems. Therefore, animal health services to be provided for smallholders should be strengthened through appropriate policy and regulatory measures that considered the roles and responsibilities of the public, private and other third part actors like donors and NGOs.

4.2.2.4. Dairy production input credit services

This section will look into dairy input credit availability for sample households for the last three production year. Access to credit will increase dairy producers' capacity to buy inputs and risk taking decision (Sisay, 2008). In the study area, different formal credit institutions and organizations such as public and farmers' organizations, NGOs as well as informal lenders are involved in providing financial services to smallholder farmers (Table 10).

Table 10: Distribution of respondents by sources of credit services

(N=120)

Sources of credit services	Sub system								(χ^2) Sig
	Urban		Peri-urban		Rural		Overall		
	No	%	No	%	No	%	No	%	
No source	25	65.8	20	46.51	8	20.5	53	44	
WoARD	0	0	14	32.56	22	56.4	36	30	4.462 *
NGOs	1	2.63	5	11.63	0	0	6	5	.328NS
Cooperatives	12	31.6	8	18.6	2	5.13	22	18	2.517NS
Micro-finance	4	10.5	6	13.95	10	25.6	20	17	1.432NS
Relatives	1	2.63	2	4.651	7	17.9	10	8.3	2.83NS
Total (N)	38		43		39		120		

Source: Survey data, 2008, *= significant at 10% of probability level, NS= Non significant.

Regarding credit acquisition for the purpose of dairy production (purchase of heifers and milk cows), almost all of the sampled respondents replied that they had never taken loans for three years prior to the survey. However, for the purpose of general agricultural development activities and input purchase, farmers accessed different formal and informal credit sources. According to the results of the study, WoARD, NGOs, Development Bank, Rural Micro-finance and relatives were mentioned as major credit sources. Out of the total sample, 0, and 31 and 32.56 and 18.6% of respondents in urban and peri-urban systems, respectively accessed WoARD and cooperative for input credit while 56.4 and 5.13% of the rural producers accessed WoARD and dairy cooperative, respectively as a source of input credit. Statistically significant difference was observed between the peri-urban and rural producers in accessing WoARD as a credit source ($\chi^2 = 4.462$, $P = 0.081$) at 10% probability level in favor of rural producers. WoARD was prioritized as important source of credit because, through extension program that inputs like seeds, feeds and fertilizer which have been provided in a form of credit. Also, cooperatives have provided credit in collaboration with some NGOs like Land O'Laks and SNV. At the same time, informal-lenders were also considered as important sources mainly due to ease of access and less procedures for credit formalities. During the group discussion sessions, respondents indicated that, another reason for not taking loans from financial institutions is because of uncertainty of raising money from dairying with CBC insufficient quantities to repay the loans. For example, risks associated in dairying with CBC are animal diseases, instable milk and dairy product prices, and payments scarcity and costs of feeds, etc (Appendix Table 6).

To this end, according to Anteneh (2008), though the credit market is responsive to the liberalized economy in the country, the service of commercial and private cooperative banks is limited to large investors who are not interested to invest in dairy sector mainly due to long gestation period of the investment. This indicates that women dairy farmers do not have the cash to invest in productivity increasing facilities and technologies. In the study area, since women are the main dairy operators, their inability to obtain necessary cash and credit maybe a constraint to expanding market oriented smallholders dairying.

In summary, sustainability of efficient pluralistic service requires the availability of competent service providers that respond to diverse demands by dairy producers.

4.2.3. Production and marketing

4.2.3.1. Milk yields

In this section, important production performance indicators for smallholder dairy production which are assessed by breed type and dairy production systems are discussed and the results are presented in (Table 11). Smallholder dairy cattle are characterized by low productivity and calving intervals in which particularly local dairy cows are found to be less productive compared to cross bred cows.

Table 11: Milk yields of the sample kebeles (wet and dry season)

(N=120)

Variables	Total sample	Sub system			Test- value	
		Urban	P-urban	Rural	(F-test)	Sig
Dairy cow productivity (wet season)						
Local cow (lit/day/cow)	2.66	3.03	2.85	2.1	5.457	**
Crossbred cow (lit/day/cow)	8.06	9.08	7.55	4.89	3.594	***
Local cow lactation length (months)	8.59	8.49	8.71	8.58	-2.877	**
Crossbred cow lactation length (months)	6.35	6.96	6.51	5.57	0.531	NS
Dairy cow productivity (dry season)						
Local cow (lit/day/cow)	2.15	1.97	1.97	1.58	3.878	**
Crossbred cow (lit/day/cow)	7.04	8.5	6.56	4.2	-8.061	***
Local cow lactation length (months)	6.48	6.39	6.56	6.48	0.575	NS
Crossbred cow lactation length (months)	8.07	8.36	7.32	8.53	-1.039	NS
Overall productivity Mean						
Local cow (lit/day/cow)	2.4	2.5	2.42	1.84	1.976	**
Crossbred cow (lit/day/cow)	7.4	8.77	7.65	4.45	4.352	***
Total (N)	120	38	43	39		

Source: Survey data, 2008, ***, **, = significant at 1% and 5% of probability level, respectively, NS= Non significant.

According to the study results, there are variations among the subsystems in wet and dry seasons daily milk yield/cow. The overall average milk yield from a local cow is 2.5 lit/day/cow in urban, 2.42 lit/day/cow in peri-urban and the lowest 1.84 lit/day/cow in rural sub system, respectively. Similarly, overall mean crossbred cow productivity (for both seasons) varies across the sub systems which are the highest for cows in urban system 8.77(lit/day/cows), peri-urban 7.65 (lit/day/cows) and the lowest in rural sub system which is 4.45 (lit/day/cow). Test of mean difference using one way ANOVA also showed that there were significant mean differences across the sub systems in mean daily milk day/cow ($F=1.976$, $p= 0.17$) and ($F=4.352$, $p=0.002$) at 10 and 5% probability level for local and cross bred cows, respectively. The low amount of milk yield found in rural sub system may be due to shortage of nutritious feeds and/or poor management conditions. This implies that low productivity could be a serious problem to smallholders' dairy development and competitiveness which in turn indicates the need for launching comprehensive programs with respect to genetic improvement, feed and feeding systems, animal health care and other management aspects in order to improve the productivity of smallholder dairying.

4.2.3.2. Marketing of milk and products

The physical access to markets determines the frequency of a household going to local market place and this can be affected by the distance to market place, infrastructure available (all weather roads) and access to transportation facilities. In this regard, the Ada'a milk shed has a proximity to major urban market centers and main road of Addis Ababa-Adama. In the study area, the sale of milk and dairy products is the main source of income and employment of the market oriented dairy farmers (Anteneh, 2008). It is the first link in the marketing chain that reaches all the way up to processing firms. In the following section dairy producers market outlets and proportions of milk selling and processing are discussed and the results of the survey are presented in (Table 12).

Table 12: Distribution of households by milk market link and proportion of milk and products selling (N=120)

Variables	Sub system				Test value	
	Urban	Pi-urban	Rural	Overall	(χ^2)	Sig.
Market link (%)						
Ada'a milk cooperative	37	15	5.1	35	5.572	**
Contract (Neighbor/Café)	23	38	5	23	5.304	**
Private milk processors	13	8	5.1	12	2.515	NS
No link	10	72.2	89	32	72.134	***
% of milk marketed from local cows	46	5	7.7	19	41.131	***
% of milk marketed from cross cows	85	71	18	51	37.273	***
% of milk processed from local cows	18	31	74	40	10.290	***
% of milk processed from cross cows	4	5	2.5	2.5	.907	NS
% of local cow milk products marketed	64	78	23	34	2.631	NS
(Total N)	38	43	39	120		

Source: Survey data, 2008, ***= significant at 10% of probability level, NS= Non significant.

According to the findings of the study, the main formal milk marketing outlets for the producers in the study area were Ada'a dairy cooperative, Mama Milk, Lema milk and Genesis farm. Besides, hotels, bars and consumer households and private informal milk collectors were found as informal milk marketing outlets in the town of Debre Zeit and its surroundings. As shown in (Table 12), there were variations among the sub system producers in accessing formal milk market. For example, about 37 and 15% and 13 and 8% of the producers found in urban and per-urban systems are linked to Ada'a dairy cooperative and private milk processors, respectively, while only 5.1% of the rural producers were linked to Ada'a milk cooperative and private milk processors, respectively. The three subsystem also showed a highly significance differences in milk market link where 10 % of the urban producers, 72.2 and 89 % of the peri-urban and rural producers, respectively are not linked to any formal milk marketing organizations. In this regard chi-square test result ($\chi^2 = 72.134$, $p=000$) also indicated the variation between the urban and rural systems at less than 1% of probability level.). This is probably due to low milk yield, lack of access roads to market and market information as well as seasonal variation in milk demand. According to key

informants, Ada's milk cooperative and private milk processing firms are engaged mainly in bulking raw milk from the producers, processing and marketing of processed dairy products. They are also the one who fix milk price in the area.

With regard to the proportion of marketed milk, variations were also observed across the sub systems. For instance, the proportion of milk marketed from crosses was also higher for the urban and peri-urban producers which are 85 and 71%, respectively. With respect to processing of milk from local cows, 18, 31 and 74% of the urban, peri-urban and rural producers, respectively process in to different milk products. Statistically significant differences were seen between peri-urban and rural producers regarding marketed and processed milk ($\chi^2 = 37.273$, $p=000$) and ($\chi^2= 10.290$, $p=000$) at 1% probability level of significance in favor of peri-urban system. The probable reason might be due to lack of market access, low milk yield and marketing services in the rural sub system.

The progress seen in expansion of milk marketing by cooperatives and private sectors is limited to urban and peri-urban areas (Omiti *et al.*, 1997). This was confirmed by key informant interview which indicated that the capacity of the cooperative and other milk processing firms operating in the study area is limited in terms of milk collected and processed, geographical coverage and number of PAs and producers involved. The major reason for limited marketing activities were lack of accessible roads, seasonal demand for milk and products and most importantly under capacity operation of processing plants of both dairy cooperative and the private firms. This indicates the need for up-grading the capacity of the cooperative in terms of milk collection, processing and marketing, organization and linkage of producers to processors as well as up-grading dairy value chain of the area in order to benefit smallholders and women dairy producers. At the same time, extending marketing services and training on improved milk preservation and supplying of milk utensils in rural and peri-urban systems is important where much proportion of the un-marketed milk is found.

All formal milk collecting and processing organizations (private firms and Ada's dairy cooperative), provide milk quality test at the collection center. Milk quality test is a requirement which qualify milk to be accepted for processing.

Therefore, improving local marketing service has a paramount importance to make local producers more market oriented and competitiveness in the market. This can be achieved by creating milk market, linking producers with big dairy cooperative and private milk processors which are concentrated in the urban and peri-urban cities of the country (Anteneh, 2008).

Constraints faced by sample producers among production sub systems were different: lack of roads to the market is the major constraint to rural farmers followed by shortage of market information and low price and productivity while in urban and peri-urban system low price was mentioned as a major problem followed by shortage of market information, seasonal variations in milk demand and lack of alternate market place (Appendix Table 6). Hence, improving marketing system and services to reduce supply-demand gap is very important for meeting cash requirement of dairy producing households. For example, changing markets; alternative options, such as contract farming, should be explored and promoted where appropriate institutional mechanisms for enhancing smallholder participation in growing local markets – co-operatives but also contract farming and other forms of farmer groups (Tesfaye *et al.*, 2010).

4.3. Female-Headed and Male-Headed Households Access to and Utilization of Knowledge/information, Technology and Services in Dairy Production

In this section, the results of frequency of access to and utilization of knowledge and information, technologies and services on improved dairy production will be discussed. The empirical results are disaggregated by gender (sex) of head of households (FHHs and MHHs) and across production sub systems (urban, peri-urban and rural).

4.3.1. Access to knowledge and information

There can be many sources of knowledge and information for different types of dairy production activities in relation to public, donors and/or non-governmental programs. Formal organizations involved in providing knowledge/information, technology and services and

informal networks are usually the most trusted sources of relevant knowledge/information. This section assesses sample respondent access to improved dairy production knowledge and information services in terms of improved feeding, milk preservation and processing and input and output marketing.

4.3.1.1. Women dairy farmers' sources of knowledge and information

This sub section analyzes the relative importance of different actors as a source of knowledge and information for respondents in MHHs and FHHs comparatively. Accordingly, the score of perceived frequency by each respondent was taken (according to the degree of importance of sources) and ranking was made. In this regard, the source that has higher score is taken to be the most important. In this regard, the result of the study that shows respondents' perceived ranking order of actors in order of their importance as a source of knowledge and information is presented in (Table13).

Table 13: Respondents ranking order of actors according to the degree of importance
(N=120)

Sources	Degree of importance (MHHs)(N=72)					Degree of importance (FHHs)(N=48)				
	of	M/I	S/I	V/I		M/I	S/I	V/I		
Knowledge/Information	(1)	(2)	(3)	Score	Rank	(1)	(2)	(3)	Score	Rank
Friends/Neighbors	26	14	32	150	4	2	10	36	130	1
WoA RD	6	15	51	189	1	2	15	31	125	2
Development Agents	13	10	49	180	2	5	16	27	118	3
Contact farmers	25	25	22	141	5	7	16	25	114	4
Administration of PAs	35	14	23	132	7	10	16	22	108	5
Input traders	32	15	25	137	6	10	17	19	101	6
Cooperatives	18	27	27	153	3	19	10	17	90	8
NGOs	52	9	11	103	9	31	8	9	74	9
Private animal health	43	10	19	120	8	23	5	20	93	7
Research	54	10	8	98	10	30	13	5	71	10

Source: Survey Data, 2008

Note: MI=Minor important, SI= Somehow Important and VI= Very Important

The result of this study revealed that there is a difference between respondents in MHHs and FHHs in prioritizing actors such as WoARD, DAs, neighbors and dairy cooperatives as a source of knowledge and information. More respondents in MHHs indicated that WoARD, DAs and cooperatives as knowledge and information sources. These three sources are vital to the development of farmers and their importance is further justified by low rating of other sources. Therefore, the development of these sources of information is a necessary step towards sustainable agricultural extension and dairy advisory services.

On the other hand neighbors or friends were ranked as the first priority by FHHs. The probable reason for ranking neighbors or friends could be due to FHHs low level of contact

with DAs, participation in extension events and cooperatives. Therefore, FHHs are highly reliant on informal knowledge and information sources than respondents in MHHs. These finding is more or less in line with the results of a study conducted by (Deribe, 2007 and Mikinay, 2008) indicating that women farmers rely on informal sources et knowledge, information and resources.

4.3.1.2. Access to improved feeding knowledge and information

This section explores key actors who involved in the dissemination of knowledge and information on improved feeding. Promotion of improved feeding based on the existing farming system and resources will enable farmers efficiently utilize their resources and increase productivity.

Table14: Distribution of respondents by source of Knowledge/Information on feed improvement

(N=120)

Sources of Knowledge/Information (%)	Sub system						Overall		Test value (χ^2) Sig
	Urban		Peri-urban		Rural		MHH	FHH	
	MHH	FHH	MHH	FHH	MHH	FHH			
Neighbors	38	50	46	50	54	67	45	55	
WoARD	21	0	29	20	27	33	25	18	.0976NS
Model farmer	5.9	0	11	10	12	0	9.1	4	2.804NS
Cooperatives	15	18.8	14	0	0	0	10	6	2.631NS
NGO	0	0	0	0	7.7	0	2.3	0	
Research	0	0	0	0	0	0	0	0	
Private/Trader	21	31.3	0	0	0	0	8	10	2.517NS
Total(N)	24	14	24	19	24	15	72	48	
Means of obtaining (%)									
Other farmer	43	50	35	42	48	47	41	46	.086NS
Demonstration	0	0	35	0	3.7	0	15	0	4.871**
Exposure Visits	13	0	0	0	0	0	4.3	0	.323NS
Training	3.3	0	5.4	4.2	0	5.3	3.2	3	.390NS
Media/Radio	10	6.25	2.7	4.2	3.7	5.3	5.3	5	.907 NS
Meetings	30	43.8	22	50	44	42	31	46	2.517NS
Total(N)	24	14	24	19	24	15	72	48	

Source: survey Data, 2008, **,*= significant at 5% and 10% of probability level, NS=Non Significant

In the study area, dairy production knowledge and information was disseminated by different public organizations, NGOs, dairy cooperative and the private sector through different methods.

According to the study result, sources of knowledge and information on improved feeding were WoARD, NGOs, dairy cooperative, research and informal sources like neighbors and/or friends. Out of the total sample, 45 and 55% and 25 and 18% of respondents in MHH and

FHHs, respectively accessed neighbors and WoARD as a source of improved feeding knowledge/information while the other 9.1 and 4% and 8 and 10% of the respondents in MHHs and FHHs, respectively accessed cooperatives and private providers. In the study area, different actors are involved in coordinating and facilitating the supply and promotion of feed inputs, technology and delivering of knowledge and information on feed improvement to dairy farmers (Table 14). In this regard it worth to mention efforts of concentrate feed processing company (*Alemacowdaj*) that disseminate a leaf let containing information on different types of feeds formulated for the purposes of dairy production, bull fattening and poultry feeding. *Alemacowdaj* animal feed processing company is also a member of Ada'a dairy platform where knowledge and information among dairy production and marketing actors exchanged. Experiential learning of Ada'a dairy platform could be exemplary for other market oriented milk sheds found in the proximity of Addis Ababa and major market centers.

To this end, lack of feeding knowledge/information and technologies would have implications on the smallholders' dairy production and productivity. Hence, promotion of animal feeding activities needs to be widely planned in the extension system and advisory services of all concerned value chain actors and service providers.

4.3.1.3. Access to improved milk preservation and processing knowledge and information

Proper handling of milk before and after delivery is very important to ensure the safety and quality of marketable milk and products there by increase the income of smallholder producers. In the study area, knowledge and information on improved milk preservation and processing was provided by different public organizations, NGOs, cooperative and the private sector (Table 15).

Table 15: Distribution of respondents by sources of Knowledge/Information on milk preservation and processing

(N=120)

Sources of Knowledge/Information (%)	Sub system						Overall	Test value	
	Urban		Peri-urban		Rural				
	MHH	FHH	MHH	FHH	MHH	MHH	MHH	FHH	(χ^2) Sig
No source	17.6	8.33	28	14.8	34.8	21.4	27.7	15.2	
Neighbors	52.9	58.3	48	33.3	52.2	39.3	50.8	43	.323 NS
WoARD	0	0	12	29.6	8.7	21.4	7.69	17.7	3.207 NS
Model farmer	0	0	4	3.7	0	3.57	1.54	2.53	1.432 NS
Cooperatives	17.6	25	4	11.1	0	0	6.15	11.4	3.304 *
NGO	0	0	0	0	0	7.14	0	2.53	086 NS
Research	0	0	0	0	0	0	0	0	
Private/Firms	11.8	8.33	4	7.41	4.35	7.14	6.15	7.59	.177 NS
Means of obtaining (%)									
No means	17.6	8.33	28	14.8	34.8	21.4	27.7	15.2	.907 NS
Other farmer	52.9	46.7	42.3	43.3	41.7	46.9	44.8	45.7	.807 NS
Demonstration	0	0	3.85	0	0	3.13	1.49	1.09	.380 NS
Visits	0	3.33	7.69	6.67	0	3.13	2.99	4.35	2.542 NS
Training	5.88	3.33	0	10	0	6.25	1.49	6.52	2.617 NS
Media/Radio	0	10	0	0	0	0	0	3.26	2.916 NS
Meetings	23.5	16.7	19.2	20	20.8	15.6	20.9	17.4	.323 NS
Total (N)	24	14	24	19	24	15	72	48	

Source: survey Data, 2008, *= significant at 10% of probability level, NS=Non Significant

The study results indicated that, 50.8 and 43% and 7.69 and 17.7 % of respondents in MHHs and FHHs, respectively accessed Neighbors and WoARD, as a source of knowledge and information on improved milk preservation and processing while 6.15 and 11.4 % of the respondents in MHHs and FHHs accessed dairy cooperatives as a source of milk preservation and processing knowledge/information. In this regard significant difference was observed

between the household groups in accessing cooperative ($\chi^2=3.304$, $P=.030$) at 10% significant level favoring for MHHs. The probable reason might be due to less participation of FHHs in dairy cooperative to access knowledge and resources unlike MHHs wives. Similar findings were also reported by Mकिनay, (2008) in Alamata woreda of southern Tigray in which lesser number of women vegetable producers were found to be members of cooperatives. In the study area WoARD, Ada'a milk cooperative and private milk processing firms provide training and information on milk preservation and processing. Ada'a dairy cooperative and WoARD were supplying milk collecting and processing equipments for dairy cooperative members and women milk units in urban and peri-urban areas. Moreover, group discussion participants also reported that only few members of the cooperative obtained information regarding milk preservation and handling and milk collecting canes.

Milk preservation and processing knowledge/information has a paramount importance to increase income of smallholders' dairy farmers particularly, without fluid milk market link. This in turn calls for the provision of regular training on hygienic milk collection and quality testing and supply of milk processing equipment. In this regard, proper training should be given to create awareness among producers in different aspects of milk handling, preservation and processing.

4.3.1.4. Access to dairy input/output marketing knowledge and information

Across the production sub systems, different actors of public organization, NGOs, cooperatives and private milk processing firms are involved in the provision of dairy production input and output marketing knowledge and information (Table16).

Table 16: Distribution of respondents by source of Knowledge/Information on input and output marketing (N=120)

Source (%) of Knowledge/Information	Sub system								Test-value (χ^2) Sig
	Urban		Peri-urban		Rural		Overall		
	MHH	FHH	MHH	FHH	MHH	FHH	MHH	FHH	
No source	23.1	17.6	21.4	29.2	33.3	46.7	25.64	30.4	2.554
Neighbor	23.1	52.9	28.6	29.2	25	33.3	25.64	37.5	5.641**
WoARD	0	0	17.9	4.17	25	20	14.1	7.14	4.134 *
Model farmer	7.69	0	3.57	4.17	16.7	0	8.974	1.79	.907 NS
Cooperatives	34.6	29.4	21.4	25	0	0	19.23	19.6	.807 NS
NGO	0	0	0	0	0	0	0	0	
Research	0	0	0	0	0	0	0	0	
Private/Firms	11.5	0	7.14	8.33	0	0	6.41	3.57	.380 NS
Total(N)	24	14	24	19	24	15	72	48	
Means of obtaining (%)									
No means	23.1	17.6	21.4	29.2	33.3	46.7	25.64	30.4	2.542 NS
Other farmer	39.4	45	32	39.3	25	22.7	30.68	31.8	2.617 NS
Demonstration	0	5	4	0	4.17	0	2.27	1.52	2.916 NS
Exposure Visits	15.2	0	16	10.7	0	0	10.2	4.55	.323 NS
Training	6.06	5	8	7.14	0	9.09	4.54	7.58	2.813NS
Print media/Radio	0	0	4	0	8.33	0	3.40	0	
Meetings	21.2	30	36	17.9	29.2	27.3	26.14	25.8	0.236NS
Total	24	14	24	19	24	15	72	48	

Survey data, 2008 **,*= significant at 5% and 10% of probability level, respectively, NS=Non Significant.

Though WoARD, NGOs, dairy cooperatives and private milk collecting firms operating in the study area are involved in provision of marketing services, about 25.64, and 30.4% of respondents in MHHs and FHHs, respectively had no access to these sources. Among the sample respondents who had access to input/output marketing knowledge and information about and 25.64 and 37.5 and 14.1 and 7.14 % of the respondents in MHHs and FHHs

accessed neighbors and WoARD, respectively. In this regard there were significant differences between the groups of the household in accessing the sources of neighbors and WoARD with chi-square value of ($\chi^2=5.641$ P=.021), ($\chi^2=4.134$, P=0.032), respectively at 5% and 10% probability level in favor of FHHs for neighbors and WoARD for respondents in MHHs.

Respondents also reported to have very little access to formal market information. Smallholder dairy producers depend mainly on actual market day information or market information obtained from relative, neighbors and/or friends for prices and selling decision. On the other hand, poor dairy products quality and unhygienic handling are widespread, particularly when the products are sold through informal channel due to producers' and traders' low safety and quality consciousness, poor packaging and transportation, and problems relating to feeding (Tesfaye *et al.*,2010).

In the study area, dairy cooperative has been providing continuous training on improved dairy husbandry (milk processing, hygiene, handling, quality and in milk processing), in collaboration with ILRI-DZ, EIAR-DZ, SNV and IPMS (Eshetu, 2008). Among the efforts of NGOs in this regard, Land O'Lakes has introduced milk fat content instrument (Lactometer) and provided continuous trainings on milk quality test for dairy cooperative members found in major milk shed around Addis Ababa. This activity can be considered as a good start to fill the gap and introduce more voluntary quality and standards of the marketable milk among the milk value chain actors. Therefore, in order to enable producers and milk collectors supply the required quality norms of milk to processors training and awareness creation through dairy cooperative and milk units is important.

4.3.2 Access to improved technology and services

In this section, different actors and stakeholders as a source of technology and services were assessed in order to know their importance as a source of each service for respondents in MHHs and FHHs, comparatively. The contribution of the sources will be operational zed in terms of their frequency of access by the respondent to get technology and services in terms

of breeding and animal health protection displayed across the sub systems to see the difference between the groups of respondents.

4.3.2.1. Access to breed improvement services

A study results that indicates sources of AI/bull/service to dairy producers are presented in (Table 17). In the study area, breeding services of AI and exotic bull are major means of getting dairy cow crosses mainly provided by WoARD, cooperative and through private service providers.

Table 17: Distribution of households by sources of breeding services

Source of AI/Bull services (%)	Sub system								Test-value (χ^2) Sig
	Urban		Peri-urban		Rural		Overall		
	MHH	FHH	MHH	FHH	MHH	FHH	MHH	FHH	
No source	8.33	29	16.7	15.8	70.8	62.5	31.9	46	
Farmers' exotic bulls	66.7	64	87.5	42.1	29.2	12.5	61.1	42	4.441 *
WoARD AI	37.5	29	45.8	21.1	50	12.5	44.4	23	4.871 **
F. V.M	12.5	7.1	4.17	0	0	0	5.56	2.1	2.556 NS
NGO	4.17	7.1	4.17	0	0	0	2.78	2.1	.177 NS
Research	4.17	0	0	5.26	0	0	1.39	2.1	2.517 NS
Total(N)	24	14	24	19	24	15	72	48	

Source: Survey data, 2008, **,*= significant at 5% and 10% of probability level, NS=Non Significant..

Out of the total sample about 31.9 and 46% of the respondents in MHHs and FHHs, respectively reported that they didn't had access to breed improvement services provided by actors, while 61.1 and 42 and 44.4 and 23% of MHHs and FHHs, respectively accessed farmers' exotic bulls and WoARD AI. In this regard, significant differences were observed between household categories ($\chi^2=4.441$, $P=0.034$) and ($\chi^2=4.871$, $P=0.021$) at 1 and 5% probability level of significance in favor of MHHs, respectively in accessing farmers exotic

bulls and WoARD/AI. The probable reason might be due to better position of MHHs to interact and communicate with service providers to get the necessary services.

In the study area, WoARD is a major source of AI service. The other AI service provider is the Ada'a dairy cooperative which is currently providing the service by its own fulltime AI technician since 2003 (Eshetu, 2008). In addition, private AI service providers are also operating in the area. AI is the most appropriate means of breeding due to easier application and free of risks of disease. According to experts, on average, there are more AI services per conception than natural services probably, due to poor AI techniques, poor quality semen or poor heat detection technique (Azage. *et al.*, 1997). Moreover, AI services are limited due to shortages of technicians, liquid nitrogen and most importantly the operation is not complying with the heat period of dairy cows. Thus, intervention to increase farmers' awareness and knowledge about breeding as well as improving the services provided by the public and private sector needs due attention.

4.3.2.2. Dairy cattle health services

Provision of animal health services are the major and the day-to-day activity and encompass basic animal health education; treatment and vaccination; in laboratory diagnosis and sample collection for regional laboratory. These services are provided by different public, private and farmers' organization (dairy cooperative). Accordingly, the results of the survey that indicates sources and types of animal health services are presented in (Table18).

Table 18: Distribution of respondents by source of veterinary services (by HH groups)

(N=120)

Sources	Sub system							
	Urban		P-Urban		Rural		Overall	
	MHH	FHH	MHH	FHH	MHH	FHH	MHH	FHH
Clinical service (%)								
WOARD veterinary clinic	100	100	108	53	46	20	84.7	56.3
Ada'a cooperative veterinarian	21	21.4	75	32	29	20	41.7	25
Private veterinary clinic	21	7.14	13	5.3	0	0	11.1	4.17
Debre Zeit FVM	58	57.1	21	5.3	0	0	26.4	18.8
No service	8.3	0	4.2	5.3	0	0	4.17	2.08
Vaccination service (%)								
WOARD veterinary clinic	100	85.7	117	63	100	100	100	81.3
Ada'a cooperative veterinarian	83	57.1	100	74	0	0	61.1	45.8
Private vet clinic	58	57.1	4.2	0	0	0	20.8	16.7
Debre Zeit FVM	17	14.3	4.2	0	0	0	6.94	4.17
No service	0	0	0	0	0	0	0	0
Drug sale (%)								
WOARD vet clinic	25	14.3	13	5.3	13	6.7	16.7	8.33
Ada'a cooperative veterinarian	17	14.3	13	5.3	13	0	13.9	6.25
Private drug venders	46	21.4	71	53	71	40	62.5	39.6
Debre Zeit FVM	0	0	4.2	5.3	0	0	1.39	2.1
No service	0	0	0	0	0	0	0	0
Total (N)	24	14	24	19	24	15	72	48

Source :Survey data, 2008

The survey result revealed that the overall WoARD animal health involvement was 84.7 and 56.3% of clinical service (treatment) and 100 and 81% of vaccination services for MHHs and

FHHs, respectively while it provided only 16.7 and 8.33 % drug sale. The Ada'a dairy cooperative also provides animal health services that account 41.7 and 25 of clinical service (treatment) and 61 and 45.8% of vaccination and 10.4 and 0% of drug sale for MHHs and FHHs, respectively. On the other hand, the private veterinary clinics and drug venders also provided 11.1 and 4.17% of animal health services for clinical treatment, and 20.8 and 16.7% vaccination and 13.9 and 6.25% of drug sale, respectively while private drug venders provides 62.5 and 39.6% of the drug sale for MHHs and FHHs, respectively (Table18).

According to the respondents, veterinary services across the production sub systems couldn't be covered by the government assigned animal health workers. Particularly, in rural areas, government veterinary staff is few in number and cannot cover such a vast area and adequately address the veterinary needs of the livestock keepers (Anteneh, 2008). In general, poor animal health services and lack of improved management are the major constraints to dairy development in the study area, which caused poor performance across the production sub systems. Therefore, in order to improve animal health services, efficient pluralistic services which requires the availability of competent service providers that respond to diverse demands by dairy producers is important.

4.3.3. Extent of access to dairy knowledge and information

This subsection, discuss respondents' frequency of access to component dairy production knowledge and information in terms of feed and breed improvement, improved milk preservation and processing as well as input/output marketing knowledge and information. Results of the study that indicates respondents' frequency of access to component dairy knowledge and information are presented in (Table 19).

4.3.3. 1.Extent of access to component dairy knowledge and information

Breed improvement

Due to low milk yield potential of the local cattle breeds, farmers seek to compensate this by crossbreeding with more productive exotic blood dairy cattle. In this regard, the national dairy extension package recommended that farmers stock their units with high graded dairy cows.

Table 19: Distribution of respondents by frequency of access to dairy knowledge and information

(N=120)

Variables	Sub system						Overall		Test value (χ^2) Sig.
	Urban		Peri-Urban		Rural		MHH	FHH	
Breed improvement	MHH	FHH	MHH	FHH	MHH	FHH	MHH	FHH	
Never	37.5	71.43	33.3	42.1	25	33.33	31.9	46	
Sometimes	41.67	14.28	50	47.4	58.3	60	50	41.7	
Always	20.83	14.29	16.7	10.5	16.7	6.67	18.1	12.3	2.71 NS
Feed improvement (%)									
Never	37.5	35.71	33.4	26.34	25	20	32	27.1	
Sometimes	45.83	42.86	45.8	68.4	58.3	73.33	50	62.5	
Always	16.67	21.43	20.8	5.26	16.7	6.67	18	10.4	2.417NS
Milk preservation and processing (%)									
Never	29.17	21.43	29.2	10.5	25	13.33	27.7	15.8	
Sometimes	50	71.43	50	73.7	50	80	56	77	
Always	20.83	7.14	20.8	15.8	25	6.67	16.3	8.2	2.823 NS
Input/output marketing (%)									
Never	41.67	42.85	33.4	21.1	16.7	13.33	25.6	30.4	
Sometimes	37.5	42.86	45.8	57.9	75	80	57	55	2.193NS
Always	20.83	14.29	20.8	21	8.3	6.67	17.4	14.6	
Total (N)	24	14	24	19	24	15	72	48	

Source: Survey Data, 2008, NS= Non Significant

Out of the total sample, 31.9 and 46 % of the respondents in MHH and FHH, respectively reported that they didn't had access to breed improvement knowledge and information provided by actors while 50 and 41.7 % and 18.1 and 12.3% of sample respondents in MHH and FHHs, respectively were reported having at sometimes and always level of frequency of access, respectively .

With regard to feed improvement, about 32 and 27.1 % of the respondents in MHH and FHH, respectively reported that they didn't accessed knowledge and information provided by actors,

while 50 and 62.5 and 18 and 10.4 % of the respondents in MHH and FHHs, respectively were reported having at sometimes and always level of frequency of access. There is no significant association between sample respondents groups regarding frequency of access to feed improvement. Knowledge and information are critical inputs for improving productivity and market success. This is mainly attributed to limitations in their capacity, operational resources and incentives; and weak linkages with another actors.

With respect to milk preservation and processing knowledge and information access 27.7 and 15.8 reported that they didn't had any access to while the rest of 56% and 77 and 16.3 and 8.2 % of the respondents in MMH and FHHs had access in frequencies of sometimes and always respectively.

Information and advices regarding milk handling in terms of preservation and processing are important parameters for increasing income of the producers. According to the survey results, out of the total sample respondents, 25.6 and 30.4 % of respondents in MHHs and FHHs didn't accessed input output marketing knowledge and information while 57 and 55% and 17.4 and 14.6% of the respondents in MHHs and FHHs accessed in frequencies of sometimes and always, respectively.

The low levels frequency of access to milk preservation and input/out marketing knowledge and information of the respondents shows lack of systematic and coordinated knowledge delivery mechanism by the actors in the study area. This calls for designing strategies and planning of development programs in order up-grade smallholders' dairy systems in the study area.

4.3.3.2. Extent of access to the overall dairy production knowledge and information

In this section, combined scores of respondents' extent of access to knowledge and information in respect of four selected dairy production activities, namely breed and feed improvement, milk preservation and processing and input and output marketing was computed. Accordingly, observed overall access scores of respondents ranged from 0 to 27 against the possible range of 48. The overall mean score was 12.98 with SD of 8.13. On the basis of the overall extent of

access scores, respondents were categorized in to two categories, namely low and Medium-high categories.

Table 20 (a): Categorization of respondents based on their level of knowledge & information access (by household category)

(N=120)

Category	Household category						χ^2 -test
	MHH		FHH		Total		
	No	%	No	%	No	%	
Low	52	72.2	34	70.83	86	71.7	
Medium-High	20	27.8	14	29.17	34	28.3	
Total(N)	72	100	48	100	120	100	

Source: survey data, 2008, NS=Non Significant

Table 20 (b): Categorization of respondents based on their level of knowledge & information access (across the sub systems)

(N=120)

Category	Sub system						Total	χ^2 -test	
	Urban		p-urban		Rural				
	No	%	No	%	No	%			
Low	13	34.21	37	86	36	92.31	86	71.7	
Medium-high	25	65.79	6	14	3	7.69	34	28.3	16.515***
Total	38	100	43	100	39	100	120		

Source: Survey data, 2008; ***, significant at 1 % probability level

Results of the study showed that most of the respondents of peri-urban and rural systems were belonged to low level of knowledge and information access and significant variations were also observed among the respondents across the sub systems. The study result revealed that about 34.21, 86 and 92.31% of respondents in urban, peri-urban and rural systems, respectively belonged to low level access category. The chi-square test result also indicated that there is a difference across the sub system respondents in accessing the overall dairy production knowledge and information ($\chi^2=16.515$, $p=000$) at less than 1% probability level

of significance in favor of urban system. The probable reason might be due to the fact that urban farmers can access dairy production information from different sources such as NGOs, research and dairy cooperative as well knowledgeable commercial farmers. On the other hand, constraints of accessing and lack of institutions to provide relevant information on the recommended dairy practices may also contributed to the low level of access. This was further confirmed by group discussion participants indicating that most of the time extension services were focusing on crop production and they were not compatible with women's production objectives and household obligations. Therefore, in order to up-grade market oriented smallholders dairying, systematically delivering knowledge and information on animal feed and breed improvement, milk preservation and processing and input/output marketing knowledge and information to smallholder farmers particularly, in peri urban and rural areas needs attention.

4.3.3.3. Constraints of access to agricultural knowledge and information

In this study, constraints are factors and conditions that limited farmers' access to agricultural knowledge and information on dairy production respondents' major dairy production constraints in terms of access to knowledge and information were identified from sample households by employing interview schedule in which possible constraints were included. In addition, the identification of the constraints was made by review of literature and discussion made with WoARD experts. Accordingly, the most frequently mentioned constraint by most of the respondents were taken as the most important constraints and the lesser frequency or percentages were taken as the minor constraints. (Appendix Table 6, 7 and 8)

4.3.4. Extent of use of dairy production knowledge/information, inputs, technologies and practices.

In this section, sample respondents extent of utilization of knowledge and information, technology and services in terms of breed improvement, animal health protection and improved milk preservation and processing is discussed. Extent of utilization of component dairy production knowledge/information, technology and services was operational zed in terms of frequency of using each of knowledge and information, technology and services by

the respondents and the results of the study are presented by group of sample households (across the sub system) in (Table 21).

4.3.4.1. Extent of use of dairy feeds and s and practices

The results of the study that shows respondents frequency of utilization of feeding and milk preservation and processing practices are presented in (Table 21)

Table 21: Distribution of respondents by frequency of use of feeds and milk preservation and processing knowledge and information
(N=120)

Variables	Subsystem								Test value (χ^2) Sig.
	Urban		Peri urban		Rural		Overall		
	MHH	FHH	MHH	FHH	MHH	FHH	MHH	FHH	
On farm fodder production (%)									
Never	0	0	33.3	47.37	20.8	86.7	31.9	45.8	
Sometimes	0	0	50	36.84	50	13.3	33.3	18.8	
Always	0	0	16.7	15.79	29.2	0	15.3	6.25	4.125*
Mineral block									
Never	20.83	50	16.7	42.1	12.5	73.33	16.7	54.2	
Sometimes	54.17	35.71	62.5	42.11	62.5	20	59.7	23.3	
Always	25	14.29	20.8	15.79	25	6.67	23.6	22.5	.675 NS
Concentrate feeds									
Never	20.83	30	27.5	30.11	50	20	27	33.33	
Sometimes	60	54.29	55	43.16	37.5	80	56	52	
Always	19.17	15.71	17.5	26.73	12.5	0	17	14.67	.851 NS
Milk preservation & processing									
Never	37.5	21.43	29.2	15.79	16.7	13.3	27.8	16.7	
Sometimes	41.67	57.14	62.5	68.42	66.7	73.3	56.9	66.7	
Often	20.83	21.43	8.3	15.79	16.6	13.4	15.3	16.6	.353 NS
Total(N)	24	14	24	19	24	15	72	48	

Source: Survey data, 2008; *, significant at 10 % probability level

According to the study results, 31.9 and 45.8% of the MHHs and FHHs, respectively didn't utilized on farm fodder production while 33.3 and 18.8% and 15.3 and 6.25 %, MHHs and FHHs, respectively utilized to the extent of sometimes and always. Statistically significant difference was observed between the respondents groups regarding utilization of on farm fodder production (χ^2 -4.125, $p=.032$) at 10% probability level of significant. The probable reason for the difference might be due to MHHs better resource endowment and access to financial sources to produce and purchase important nutritious feeds. Shortage of nutritious dairy cattle feeds could influence dairy productivity and income of smallholders' dairy farmers. Moreover, Potential feed problem could vary depending on the resource base of the area. In this regard, potential intervention could include: better utilization and conservation of the available feeds (treatment of straw) provision of seed, and back yard forage development (Tesfaye *et al.*, 2010).

Furthermore, the awareness on these types of additional feed sources could be used to introduce supplementary feeding strategies in the locality. Therefore, the key to increasing the impact of extension efforts was to introduce the various components of a more intensive livestock system, giving special emphasis to the smart selection of fodder crops as this was considered to be the main bottleneck in adopting improved dairy cattle.

Utilization of milk handling and marketing knowledge and information is important product management operation for market oriented dairy farmers. Accordingly, in this regard there is no significant difference between the groups of respondents. In the study area, there is a lack of systematic knowledge transfer mechanism regarding milk handling, processing and marketing.

4.3.4.2. Extent of use of breeding and health services

In this section sample households' frequency of utilization of breeding and health services and practices is discussed and descriptive results of the study are presented in (Table 22).

The source of initial stock for farmers in the study area include purchase from commercial dairy farms, farmer-to-farmer exchange and supply of improved heifers from WoARD as part of household extension package program (Anteneh,2008). At the same time following milk market opportunities of the area farmers have adopted high graded exotic dairy cows. Lack of appropriate and timely breeding services could be a bottleneck for market oriented dairying. Therefore, improving breeding services by considering the available options and small holders condition is important.

Table 22: Distribution of respondents by extent of utilized breeding and animal health services (N=120)

Variables	Sub system								Test value (χ^2) Sig.
	Urban		Peri-urban		Rural		Overall		
AI/Bull services	MHH	FHH	MHH	FHH	MHH	FHH	MHH	FHH	
Never	25	42	25	31.6	45.8	73	32	48	
Sometimes	20.83	8	25	26.3	33.4	18	26.33	31.2	
Always	54.17	50	50	42.1	20.8	9	41.67	20.8	9.401 ***
Clinical (%)									
Never	21	42	20.84	31.58	20.87	20	20.83	29.17	
Sometimes	71	38	33.33	36.84	70.8	72	48.33	51.67	
Always	8	20	45.83	31.58	8.33	8	30.84	19.17	4.325 *
Delivery %									
Never	38	17	37.5	57.9	70.8	71.8	43.06	58.33	
Sometimes	44	45	45.83	21.05	29.2	24	41.66	22.92	
Always	18	38	16.67	21.05	0	4.2	15.28	18.75	1.684 NS
Vaccination									
Never	26	17	20.83	10.53	20.8	20	20.83	16.67	
Sometimes	64	45	16.67	26.32	16.7	26.67	16.67	25	
Always	10	38	62.5	63.15	62.5	53.33	62.5	58.33	1.325 NS
External parasite									
Never	32	17	12.5	10.53	12.5	20	12.5	16.67	
Sometimes	54	45	25	31.58	33.3	46.67	27.78	39.58	3.134 NS
Always	14	38	62.5	57.89	54.2	33.33	59.72	43.75	
Total(N=120)	24	14	24	19	24	15	72	48	

Source: Survey data, 2008, ***,*= significant at 1 and 10% of probability level respectively, NS=Non Significant

Followed by feed shortage, livestock diseases were reported to be the most important dairy production constraints. Therefore, the usage of veterinary services and other dairy farming technologies remains important for every livestock farmer as diseases and high mortality are major constraints on livestock production.

According to WoARD annual report, livestock disease like pastrolosis, mastitis, anthrax and black leg were identified as important diseases constrained livestock production in the study area. The results of this study showed that out of the total sample, 32 and 48% of MHHs and FHHs had never utilized breeding services while 26.33 and 31.2% and 41.68 and 20.8%, respectively utilized to the level of frequency sometime and always (Table 22). In this regard chi-square result ($\chi^2=9.401$ $p= 0.07$) at 1% probability level showed significant variation between the group of households in favor of MHH. The reason for the observed difference could be due to better economic position of the MHHs that enables them to access and utilized the services than FHHs who mostly lack access to resources and services.

As it can be seen from (Table 22), there is difference between respondents in MHHs and FHHs in terms of frequency of utilizing clinical services. Out of the total sample, about 20.83 and 29.17% of MHHs and FHHs respectively didn't utilized clinical services while 48.33 and 51.67 % and 30.84 and 19.17% utilized to the extent of sometimes and always, respectively. In this regard, statistically significant difference was seen between the respondents group in utilizing clinical services ($\chi^2=4.325$, $p= 0.023$) at 10% probability level in favor of MHHs. The probable reason for the difference might be due to better economic position of MHHs and more access to resources than the FHHs.

With respect to utilizing vaccination service, it could be noticed that only 20.83 and 16.67% of the MHHs and FHHs, respectively did not utilized vaccination against diseases like black leg and anthrax. This indicates that most of the farmers are aware of the benefits of vaccination to try to prevent animal death. In order to improve animal health protection, available animal health technologies that can be used for dairy cattle common disease diagnosis can help improve animal health. Particularly, women from urban and peri-urban

systems, where the marketing of milk is organized and services for inputs and veterinary are advanced did feel they could earn a substantial income and manage improved milk cows.

In the study area, private service providers reported that, increasing demand for private input and animal health service provision is evident due to improved dairy management and increasing income from dairying. However, the seasonal nature of demand for inputs and animal health service, illegal trade and ineffective control mechanism, and capital limitations were identified as important challenges for the viability and expansion of private service provision (Tesfaye *et al.*, 2010).

4.3.4. 3. Extent of use of input credit

Availability of financial resources and access to credit has a decisive role in the process of agricultural production process. Accordingly, dairy production input credit use patterns were assessed to see sample respondents frequency of using of input credit from different sources (Table 23). In this study, utilization of agricultural and dairy production inputs was considered as proxy credit utilization.

23: Distribution of respondents by extent of input credit utilization

(N=120)

Sources of credit	Sub system								Test-value (χ^2) Sig.
	Urban		Peri-urban		Rural		Overall		
	FHH	MHH	FHH	MHH	FHH	MHH	FHH	MHH	
WoARD (%)									
Never	85.7	83.3	89.5	83.3	73.3	75	83.3	81	
Sometimes	7.14	8.33	10.5	8.3	20	16.7	12.5	11	
Always	7.16	8.37	0	8.4	6.7	8.3	4.2	8	2.517 NS
Micro-finance (%)									
Never	78.6	88	66.7	87.5	79	79	75	84.7	
Sometimes	14.3	8	20	8.33	16	13	17	9.7	
Always	7.1	4	13.3	4.17	5	8	8	5.6	1.842 NS
Cooperative (%)									
Never	78.6	87.5	89.5	95.8	93.3	95.8	85.5	93	
Sometimes	14.3	8.33	5.26	4.2	6.7	4.2	8.3	5.6	
Always	7.1	4.17	5.26	0	0	0	6.2	1.4	3.027 NS
NGOs (%)									
Never	92.9	100	84.2	83.3	100	100	91.7	94.4	
Sometimes	7.1	0	10.5	8.37	0	0	6.25	2.8	
Always	0	0	5.3	8.34	0	0	2.05	2.8	0.502NS
Relatives (%)									
Never	92.9	100	94.7	95.8	80	87.5	89.6	94	
Sometimes	7.1	0	5.3	4.2	13.3	4.17	8.33	2.8	
Always	0	0	0	0	6.7	8.33	2.07	3.2	.295 NS
Total (N)	24	14	24	19	24	15	48	72	

The result of the study in (Table 23), shows that among total sample 85.5 and 93% of respondents in MHH and FHHs, respectively had never used credit from dairy cooperative (for the last three years) while 8.3 and 5.6% and 6.2 and 1.4% of the respondents in MHH and FHHs, respectively, utilized credit of dairy cooperative to the extent of sometimes and always. In this regard statistically there is no significant difference was observed credit schemes, NGOs, and relatives, there is no significant difference observed between the household groups. However, according to the result shown above relatively more respondents in rural and peri urban areas utilized credit from WoARD the urban households while on the contrary, more urban households utilized credit of Ada'a dairy cooperative. The probable reason for the difference might be due to the fact that urban households' utilization of

different agricultural and dairy production inputs in a form of credit from cooperative. On the other hand, rural and peri urban households also utilize different inputs like seeds and fertilizers in form of credit from WoARD.

In the study area market oriented dairy farmers realized that at growing economy, demand for milk and dairy products is going to increase and that more productive crossbreeds would provide additional cash income opportunities. Hence, appropriate loan and other rural financial products need to be designed for supporting smallholder dairy and private service provision. This requires that the Agricultural Bureaus, woreda offices, and cooperatives have to proactively engage with the rural financial organizations to support the design and delivery of such products.

4.3.4.4. Extent of use of overall dairy production knowledge and information

Extent of utilization of dairy technologies and practice is one of the dependent variables of this study. In order to have an understanding of the combined utilization level on knowledge and information in respect of five selected dairy production practices and technologies, an overall score was computed for each respondent. Accordingly, observed overall utilization scores of respondents ranged from 1 to 27 against the possible range of 0 to 42. The overall mean score was 10.33 with SD of 6.91. On the basis of the overall utilization mean score and SD, the respondents were categorized into two categories, namely low and medium-high levels of utilization. In this section, categorization of sample respondents based on obtained scores of the overall recommended dairy production practices in terms breeding, feeding animal health and milk preservation and processing knowledge and information utilization is presented.

Table 24 (a): Categorization of households based on their extent of knowledge and Information utilization

(N=120)

Categories of levels utilization	Household category				Total		χ^2 -test
	MHH		FHH		No	%	
	No	%	No	%			
Low	28	38.9	17	35.4	45	37.5	3.432NS
Medium-High	44	61.1	31	64.6	75	62.5	
Total	72	100	48	100	120	100	

Source: Survey data, 2008, NS=Non Significant

Table 24 (b): Categorization of households based on their extent of knowledge and Information utilization

(N=120)

Categories of levels utilization	Sub systems						Total		χ^2 - test
	Urban		P-urban		Rural		No	%	
	No	%	No	%	No	%			
Low	9	18.4	13	20.9	23	61.5	45	37.5	26.606***
Medium-High	29	81.6	30	79.1	16	38.5	75	62.5	
Total	38	100	43	100	39	100	120	100	

Source: Survey data, 2008, ***=significant at 1% probability, NS=Non Significant

With regard to the utilization of overall knowledge and information, technology and services, variation was seen across the sub systems in which 18.4, 20.9 and 61.5 % of households in urban, peri-urban and rural sub systems, respectively belonged to low level of category while 81, 79.1 and 38.5% of the households belonged to medium-high level of utilization category. The chi-square test result ($\chi^2=26.606$, $p=000$) also indicated a difference between households in rural and peri urban systems at less than 1% probability level of significance in their level of utilizing dairy production knowledge and information, technology and services. The probable reason for this significant difference could be lack of access to dairy production knowledge and information, extension, credit, breeding and veterinary services in the rural area. Hence, interventions to enhance dairy production in rural area are needed. Moreover,

concerned bodies should focus in strengthening the existing extension system and launching of dairy development programs to enhance dairy production and marketing in rural areas.

4.4. Determinants of Extent of Access to and Utilization of Knowledge and Information

In this section, the results of personal, demographic, socio-economic, psychological and institutional factors influencing respondents' access to and utilization of agricultural knowledge and information on dairy production is discussed by looking into the relationships between the independent and dependent variables.

4.4.1. Relationship between the hypothesized independent and dependent variables of access to and utilization of agricultural knowledge and information.

The findings on the relationship between access to and utilization of agricultural knowledge and information regarding dairy technologies and practices (dependent variables) and independent variables of (demographic, psychological, economical and institutional factors) obtained through Pearson's Product Correlation analysis for continuous variables are presented in (Appendix 1).

4.2.2. Results of the Multiple Linear Regression Model

In the preceding section of the thesis, the selected independent variables were put to Multiple Linear Regression (MLR) model to identify the factors influencing access to and utilization of agricultural knowledge and information. Before estimating the models, it was necessary to check if multi-collinearity exists among the explanatory variables. In this regard, the Variance Inflation Factor (VIF) and Conditioned Index (CI) for the two dependent variables are given in (Appendix Table 2).

The values of VIF and CI for continuous variables were found to be less than 10 and 30, respectively. To avoid serious problem of multi-collinearity, it is quite essential to omit the variables with VIF value greater than or equal to 10 and CI value greater than or equal to 30 from the MLR analysis. Based on VIF result, the data have no serious problem of multi-collinearity. In order to obtain the best set of explanatory variables in terms of contributions,

the method of step-wise multiple regression was employed. In this regard, all the six continuous independent variables for the dependent variables of access and nine independent variables for the dependent variable of utilization were included in the model and used in the MLR analysis, respectively. The overall goodness of fit for the MLR model parameter estimate is assessed and the null hypothesis for the log-likelihood ratio test is that all coefficients are jointly zero. The model F-test applying appropriate degree of freedom indicate that the overall goodness-of-fit for the MLR model are statistically significant at probability level of 1% for both access and utilization of knowledge and information, respectively see ANOVA results in (Table 25a) and (Table 25b).

Table 25 (a):- ANOVA of the regression function for the independent variables of access

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	405.612	6	67.602	7.812***	.000
Residual	891.343	103	8.654		
Total	1296.955	109			

Source: Survey Data, 2008, ***, significant at 1% probability level

Table 25 (b): ANOVA, the regression functions for the independent variables of utilization

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2814.941	9	312.771	12.322***	.000
Residual	2538.232	100	25.382		
Total	5353.173	109			

Source: Survey Data, 2008; ***= significant at 1% probability level

The maximum likelihood estimate of the parameters and the effect of independent variables on the dependent variables of access and utilization were analyzed and presented in (Table26).

The coefficients of MLR model estimation are given in the 2nd and 5th columns of (Table 26). The result shows that out of six and nine factors considered in the model, only four and six variables were found to be significantly influencing respondents' access to and utilization of knowledge and information on dairy farming at 1% probability level, respectively. According to the respondents, extension services regarding breed improvement knowledge and information like animals of good genetic potential and proven semen as well as to make farmers aware of heat detection were not fully delivered.

The multiple correlation coefficient measures ($R=0.313$) indicates that the relationship between access to knowledge and information on dairy farming and continuous independent variables is positive. The only exception is livestock holding which had negative relationship. The R^2 value of 0.313 with F value of 7.812 indicates its significance at less than 1% probability level and revealed that 31.3% variation in access to knowledge and information among dairy farming households could be explained with the help of these four variables. Moreover, the variables derived as an output of the R^2 value of 0.526 with F value 12.322 indicates its significance at 1% probability level and revealed that 52.6% variation in utilization of dairy farming technologies and practices among farming households could be explained with the help of these six variables. Regarding the direction of the influence of explanatory variables on the dependent variable, all of them showed expected sign (positive) in confirmation of the hypotheses. The only exception is livestock possession and distance from main road which had negative relationship.

Table 26: Coefficients of independent variables for ML R analysis

Variables	Dependent Variables						
	Access			Utilization			
	β			β			
	Coefficient	St.d.Error	t-Value	Coefficient	St.d.Error	t-Value	
Constant	1.397	1.799	0.777	-2.079	3.951	-0.526	
TOTLIVES	-0.107	0.061	-1.743	-0.287	0.11	-2.598	
ACHIMOTI	0.209	0.165	1.266	0.066	0.284	0.233	
MASMEX	0.215	0.095	2.259	0.517	0.163	3.167	
FREXCONT	0.354	0.208	1.703	0.248	0.358	0.693	
OSMOPO	0.527	0.211	2.502	1.172	0.388	3.022	
DISFRROD	-0.347	0.269	-1.288	-1.024	0.47	-2.18	
EDLEOFAM				0.177	0.093	1.916	
INOPRON				0.874	0.443	1.972	
INFSEBEH				0.495	0.456	1.086	
HH Sex	0.22	0.173	0.149	0.236	0.183	0.121	
F-test	12.322***			F-test			7.812***
R=	0.42			R			0.741
R ²	0.313			R ²			0.52
Overall prediction	31.3%			Overall prediction			52.6%

Source: Survey Data, 2008. ***= significant at 1% probability level

4.4.3. Determinants of extent of probability to access and utilize knowledge and information

The variables, derived as an out put of the model are described below.

Total Livestock holding of the household (TOTLIVES) X₁ : The result of the study showed that as Livestock size of a household increased by 1 unit, access to and utilization of knowledge and information on improved dairy farming would be decreased by 1.07 and

2.87%, respectively. This implies that when the households' livestock population of different animals increases, the households' desire to access and utilize knowledge and information on modern dairy farming decreases. The probable reason may be that the household is utilizing local breeds for dairy production which may not require intensive management. On the other hand, if a household own and rear diversified types of animals like equines, sheep poultry etc for income generation, the household may not focus on improved dairy farming as a means of income generation. This finding is in confirmation with the result of a study conducted about adoption of improved dairy cows in the same study area by Yohannes., *et al* (1993) that also indicated households before taking decision for dairy innovation reducing the number of cattle they possess.

Mass media exposure of the respondent (MASMEX) X₂: The output of MLR analysis proves that as the respondents' exposure to different Medias like radio, Television, newspaper, posters and leaflets increases by one unit, access to and utilization of knowledge and information of respondents is also increases by 2.15 and 5.17%, respectively. This means that farmers who have better exposure to mass media are more likely to be aware of different types of new information and practices of farming regarding improved dairy production. The finding was supported by Deribe, (2007), which revealed that mass media positively influenced women dairy farmers' knowledge output in Dale woreda, SNNPR. Mass media plays the greatest role in provision of information in shortest time possible over large area of coverage.

Cosmopolitaness (COSMOPOL) X₄: Frequency of respondents' movement to fulfill different social and personal obligations out of his/her social settings has contributed positively to the model. A result of the MLR output showed that as cosmopolitaness of the respondent increases by one unit, access to and utilization of knowledge and information also increases by 5.17and11.7%, respectively. The findings of this study is more or less in agreement with the findings of the studies conducted by Asres, (2005) and Deribe, (2007) Respondents with frequent travel out of their area will likely search for or have a chance to get information, inputs and can observe relevant practices with regard to dairy farming.

Distance from main road (DISFRROD) X₅: The study revealed that the coefficient of respondents' distance from main road was negatively and significantly correlated with utilization of knowledge and information signifying that holding the values of all other variables constant, a unit increase in a respondents distance from main road, would be accompanied by decrease in the utilization of knowledge and information of dairy farmers by 10.2 %. Also, it is worse to note that a study conducted by (Julio *et al.*, 2001) to measure milk bacterial load indicated that the more farmers transport milk produce more kilometers to milk collection points, the more milk bacterial load was observed. The implication of this finding calls for improved roads system and transportation in order to improve market access.

Education of the family members (EDOFAM) X₆: According to the result of the MLR analyses, the coefficient of model output indicated that family members' education is positively and significantly correlated with respondents' utilization of knowledge and information on dairy farming. Accordingly, a unit increase in family education would be accompanied by an increase of 1.77 % knowledge and information utilization. This means that increased education of the family members' increases utilization of knowledge and information technology and services of dairy production. This finding is in line with the result of similar study about overall adoption behavior of dairy farming technology in Azerbaijan, Iran that indicated family education status had positive and significant relationship with adoption of improved dairy practices. The probable reason may be that educated members of the family would likely to influence respondents to practice recommended dairy packages that they accessed through formal or informal contacts. For example, this can be justified by information obtained during the group discussion session which revealed that family members working with ILRI, Office of Agriculture and milk cooperative, communicate with experts and obtained written materials that enable them to share knowledge with their family members.

Innovation proneness (INOPRON) X₇: This variable has positively influenced utilization of knowledge and information at 1% probability level and it accounted for about 8.4 % of the variation in utilization of dairy knowledge and information. This finding is in conformation with a study conducted by Asres, (2005) and Daniel, (2008) in Dire Dawa administrative

council, eastern Ethiopia, that reported that innovation proneness has statistically significant relationship with access to productive role information utilization of women and resettles in Metema woreda, North Gondar, Ethiopia, respectively.

Frequency of Extension Contact (FREXCNT): Farmers who had access to agricultural knowledge and information through various extension services have made use of the available farm information and improved their production. A result of the MLR output showed that as frequency of extension contact of the respondent increases by one unit, access to knowledge and information also increases by 3.54 %. The findings of this study is more or less in agreement with the findings of the studies conducted by Getahun, (2008), and Deribe, (2007) Respondents with frequent Frequency of Extension Contact with DAs, exposure visit and participating in farmers field days will get information, inputs and can observe relevant practices dairy, production, processing and marketing. Therefore, those respondents who have frequently participated in extension events, trainings and field visits will likely to gain skill and knowledge on modern dairying. It is through extension services that the farmers get training on feed and breed improvement, milk preservation and processing practices and utilize all aspect of modern agricultural technologies. Thus, the availability of extension services in urban, peri-urban and rural areas is of a paramount importance to smallholder dairy farmers.

Summary

According to the MLR model output analysis, respondent households' determinants of probability to access and utilize knowledge and information in the context of Ada'a milk shed were the above seven discussed factors. While to access and utilize knowledge and information the results of regression analysis indicated that sex of household head didn't influenced the dependent variables significantly. Rather, personal and behavioral characteristics, resource endowment and institutional factors have more influence on knowledge access and utilization in the context of Ada'a milk shed. This implies that provision of advisory services, trainings and other technical services on dairy production were not biased towards MHHs, rather the services are lacking for the livestock sub-sector in general and dairy in particular. This situation is in line with report of (Berehanu *et al.*, 2006), which indicate that public extinction service was biased towards crop production. Therefore,

enhancing women's access to resources and motivating for dairy production entrepreneurship is highly important.

4.5. Opportunities for dairy development in the study area

The available opportunities of dairy development in the study area have been assessed qualitatively through group discussion made with 8 woreda SMSs, 4 model farmers, 4 dairy cooperative leaders, and 10 DAs. During the group discussion session, participants were given a chance to list down important existing and/or emerging opportunities in the study area. In addition, findings of dairy development studies in different milk sheds were also reviewed. Accordingly, the result of the group discussion regarding dairy development opportunities in the study area is given in Box 1

Box 1: Opportunities and Perspective of Dairy Development

Intensification of dairy production has been shown to potentially raise milk production and income, especially where demand and infrastructure are favorable (Staal *et al*, 1997). Although many problems and constraints have hindered dairy development in the study area, many farmers have willingness to continue with the farming in the future. Currently, peri-urban producers are more willing to continue and expand dairy production due to market opportunities and linkage to cooperatives and private milk processing and collecting organizations, availability of adequate land and of crop residual by products in their farming system. Moreover, the cooperative, or more general the proximity of the market, gives the farmers an incentive to invest in their livestock, buying more cows of a better breed, and thereby generates positive externalities of co-specialization. The other future opportunity for dairy development in rural areas is fast growing urbanization and industrialization. In this regard, feeder roads construction, water supply, electrification, communication activities would favor dairy development of remote areas. In Ada'a farmers have access to most crop production technologies and that they show strong interest in adopting improved crop varieties. Hence, increased income from crop production would likely to influence the expansion of modern dairying in the area. Furthermore, dairy as an enterprise is an option available to landless and socially marginalized groups in this regard current fast growing industrialization of the study area can be considered as growth in urban population and demand as

well as opportunity for displaced farmers (being paid compensation) to choose dairy as profitable enterprise.

The numbers of extension workers who provide services at the kebele level are increasing. In all kebeles at present time there are three diploma holder DAs or FTC trainers assigned and trained in the areas of crop production, animal husbandry and natural resource management. In addition, one cooperative management and animal health extension worker were assigned for every three FTCs found in kebeles across the woreda.

5. SUMMARY, CONCLUSION AND RECOMMENDATION

In this section, the findings of the study and its implications are briefly discussed. Besides, the strategies for promoting dairy development by empowering women farmers also has been pointed out on the basis of empirical findings of the study and researchers' observations.

5.1. Summary

Adoption of dairy technology offers good opportunities for improving the standard of living of smallholders through increasing income, employment, and family nutritious food consumption. Ethiopian rural women make significant contribution to agriculture and are the mainstay of the farm labor. In addition to their active engagement in agriculture, women are also responsible for all household chores. Nevertheless, the significant role of women in dairy production, processing and marketing, so far no systematic study has been undertaken with regard to their sources, level of access and utilization of knowledge and information and the factors influencing the same. Hence, this research is designed to look into these issues.

This study used a four stage sampling procedure. In the first stage based on market orientation, purposively selection of urban system and stratification of kebeles into peri-urban and rural sub systems was done. In the second and third stage followed random selection of two kebeles and dairy cattle owing MHHs and FHHs each from urban, peri-urban and rural systems, respectively. Lastly, from list of identified dairy cattle owners, sample MHHs and FHHs were randomly selected by employing proportional to size simple random selection method, respectively.

Both quantitative and qualitative data were collected. And both primary and secondary data sources were used. Data were collected by using a structured questionnaire (interview schedule) which was pre-tested and translated in to Afan Oromo and Amharic languages. In addition, focus group discussion, key-informant interview, field visits and observation were made to provide additional information. Survey results were reported using descriptive and inferential statistics.

The study area or the “Ada’a milk shed” is one of the relatively advanced and developed market oriented (urban and peri-urban) dairy production systems. The dairy systems in Ada’a, are characterized relatively by high prevalence of crossbred cows; presence of licensed concentrate livestock feed processors and suppliers and agro-processing industries as well as many public, private and civil societies, research and development organizations supporting smallholder dairy development

In the study area, different actors which include: public organizations, dairy cooperatives NGOs and the private sector are involved in providing improved feeding knowledge and information services such as breeding, animal health, credit and extension services.

In the study area, the sale of milk and dairy products is the main source of income and employment. It is the first link in the marketing chain that reaches all the way up to processing firms. The main milk marketing outlets for the producers in the study area were Ada’a milk cooperative, Mama Milk, Lema milk and Genesis farm. Besides, hotels, bars and consumer households were found as informal milk marketing outlets in the town of Debre Zeit and its surroundings., Ada’a milk cooperative and private milk processing organizations like Genesis farm and Mama Milk processing company were also provide information and advices on milk quality and handling

AI and exotic bull services are major means of getting dairy crosses mainly provided by WoARD, dairy cooperative and through private service providers. Office of agriculture is a major actor for the activity of AI service; however, due to inadequate AI service and lack of its effectiveness and efficiency, farmers utilized private exotic bulls for mating milk cows though it is also constrained by different problems such as lack of information on the genotype of the bull, shortage and non-replacement of exotic bulls and disease transmission. Followed by feed shortage, livestock diseases were reported to be the most important dairy production constraints. According to WoARD annual report, livestock disease like pastrolosis, mastitis, anthrax and black leg were identified as important diseases constrained livestock production in the study area.

Respondents' extent of access to dairy production knowledge and information was analyzed to in terms of feeding and breed improvement, improved milk preservation and processing and input and output marketing information. In this view the study result indicated that 34.21,86 and 92.31% of the respondents urban, peri-urban and rural subsystems, respectively were fall in to low categories of knowledge and information access while 65.79,14 and 7.69% of the respondents urban, peri-urban and rural subsystems respectively belonged to medium-high access category. With regard to the overall utilization level of knowledge and information, about 18.4, 20.9and61.5%of the respondents urban, peri-urban and rural subsystems, respectively were belonged to low level of utilization categories while 91.6, 79.1 and 38.5%, respectively belonged to medium-high utilization category.

The overall goodness of fit for the MLR model parameter estimate is assessed and the null hypothesis for the log-likelihood ratio test is that all coefficients are jointly zero. The model F-test applying appropriate degree of freedom indicate that the overall goodness-of-fit for the MLR model are statistically significant at probability level of 1% for both access and utilization of knowledge and information, respectively The result shows that out of six and nine factors considered in the model, only four and six variables were found to be significantly influencing respondents' access to and utilization of knowledge and information on dairy farming at 1% probability level, respectively

The multiple correlation coefficient measures ($R=0.313$) indicates that the relationship between access to knowledge and information on dairy farming and continuous independent variables is positive. The only exception is livestock holding which had negative relationship. The R^2 value of 0.313 with F value of 7.812 indicates its significance at less than 1% probability level and revealed that 31.3% variation in access to knowledge and information among dairy arming households could be explained with the help of these four variables.

Moreover, the variables derived as an output of the R^2 value of 0.526 with F value 12.322 indicates its significance at 1% probability level and revealed that 52.6% variation in utilization of dairy farming technologies and practices among farming households could be explained with the help of these six variables. Regarding the direction of the influence of

explanatory variables on the dependent variable, all of them showed expected sign (positive) in confirmation of the hypotheses. The only exception is livestock possession and distance from main road which had negative relationship

With regard to access and utilization of knowledge and information, the results of regression analysis indicated that sex of household head didn't influence the dependent variables significantly. Rather, personal and behavioral characteristics, resource endowment and institutional factors have more influence on knowledge access and utilization in the context of Ada'a milk shed. This implies that provision of advisory services, trainings and other technical services on dairy production were not biased towards MHHs, rather the services are lacking for the livestock sub-sector in general and dairy in particular. This situation is in line with report of (Berehanu *et al.*, 2006), which indicate that public extension service was biased towards crop production. Therefore, enhancing women's access to resources and motivating for dairy production entrepreneurship is highly important.

5.2. Conclusion and Recommendation

This study was conducted to indicate some policy directions to improve the livelihood of stallholder dairy farmers in the study area. Based on the above mentioned idea, the following points are noted as conclusion and recommendation at each significant point.

1. In line with knowledge and information accessibility, available knowledge and information sources were also surveyed and some results were found. In this regard, multiple sources that include neighbors/friends, public institutions, NGOs, cooperative, private sector and farmers organizations involved in the activities of knowledge and information generation, dissemination, input supply and provision of services for smallholder dairy farmers. However, there is no mechanism to coordinate them as a system. Therefore, purposeful focus has to be given on these knowledge and information sources in such a way that they will be coordinated and farmers will be able to easily access them at any time of interest. Moreover, pluralistic advisory service delivery mechanism should be strengthened in a coordinated and networked way in which Public departments like animal husbandry, extension agencies and

other organizations in the promotion of dairy enterprise and rural women participate. In addition, coordinating cooperatives, NGOs and private service providers to play more efficient roles with in a pluralistic service delivery system is imperative

2. Sample respondents' access to relevant dairy knowledge and information across the sub systems showed variations, where the majority of the respondents belonged to low level of overall access. This is probably due to the constraints of accessing and lack of institutions that provide relevant information and information delivering system on the recommended dairy practices. Moreover, there were significant differences between FHHs and respondents in MHHs in accessing neighbors,

Moreover, utilization pattern of knowledge and information practices, and services on dairy production components were also found to have less frequencies of utilization by the sample respondents. In this regard, significant differences were seen between the respondents in MHHs and FHHs group in utilizing on farm fodder production, concentrate feeds utilization and clinical and vaccination services. Also utilization level of overall dairy farming knowledge, technologies, services and practices was found to be higher amongst the farmers of urban and peri-urban than those of rural production systems. This might be due to lack of knowledge and information delivery mechanism and other which are not having significant role in extension program. Therefore, concerned stakeholders should give attention to the important dairy production services like credit, extension, breeding and animal health protection, particularly, in rural sub system producers.

3. In the study area, opportunities like rapid urbanization and population increase, availability of feeds and services, linkage of producers with private milk processors and dairy cooperatives, farmers' willingness to pay and favorable national policy framework exist for achieving productivity improvement and market-orientation in smallholder dairy systems. On the other hand, however, constraints and challenges relating to production, market and supportive services, technical or supply side factors such as feed scarcity, poor breeding, veterinary and credit services, and limited access to market supply side factors. In addition, factors such as high marketing costs, highly seasonal price fluctuations and low milk

consumption habit, and safety and quality concerns are demand side-side factors that constrained small holders' dairy farmers. Therefore, ensuring the transfer of knowledge and services through institutionalizing and promotion of fodder seed and feed production, improving access to credit, linkage of farmers to the emerging formal and informal markets, and promoting small farmers' economic organizations should be considered.

4. This study found out that frequency of extension participation, education of family members and frequency of access to different Medias, cosmopolitaness and innovation proneness, positively influence farmers' access to and utilization of knowledge and information while distance from market and livestock size had negative influence on dairy women farmers' knowledge and information utilization. Therefore, policies should focus on and consider livestock and dairy production as well as the roles and responsibility of women. Moreover, by considering the significant explanatory variables, ensuring the transfer of knowledge and services towards stallholder dairy systems for improving access to and utilization of knowledge and information among women dairy farmers in the study area is important.

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7. APPENDICES

7.1 Appendix I: Tables in Appendix

Appendix Table: Relationship between independent and the dependent variables

Continuous Independent variables		Pearson correlation analyses			
		Access		Utilization	
Personal and demographic factors		R	p	r	P
1	Age of the respondent	-0.002	0.982	0.106	0.271
2	Family members Education l	0.153	0.11	.251**	0.008
3	Family size of the House Hold	-0.033	0.731	0.08	0.404
Socio-economic factors					
4	Total land size of the family	0.134	0.253	-0.051	0.663
5	Total livestock in TLU	-0.226	0.19	-0.352	0.009
Situational Factors					
6	Social participation	0.083	0.401	0.105	0.287
7	Information seeking behavior	0.137	0.163	.226*	0.018
8	Innovation proneness	0.153	0.117	.294**	0.002
9	Extension participation	.297**	0.009	.252*	0.029
10	Distance from main road	-0.400**	0	-.514**	0
11	Mass media exposure	.414**	0	.519**	0

Source: Survey Data, 2008;

Appendix Table 2: Variance inflection factor for the dependent variables

Variables	Access		Utilization	
	Tolerance	VIF	Tolerance	VIF
TOTLIVES	0.766	1.306	0.695	1.439
ACHIMOTI	0.845	1.184	0.837	1.195
MASMEX	0.703	1.422	0.703	1.423
FREXCONT	0.961	1.04	0.951	1.052
COSMOPO	0.769	1.301	0.666	1.502
DISFRROD	0.599	1.67	0.577	1.732
EDLEOFAM			0.855	1.169
INOPRON			0.886	1.129
INFSEBEH			0.785	1.273

Source: Survey Data, 2008

Appendix Table 3: Conversion factor used to compute TLU

Animal			
Categories	TLU	Animal Categories	TLU
Calf	0.25	Donkey (young)	0.35
Weaned Calf	0.34	Camel	1.25
Heifer	0.75	Sheep and Goat (adult)	0.13
Cow and Ox	1	Sheep and Goat (young)	0.06
Horse	1.1	Chicken	0.013
Donkey (adult)	0.7		

Source: Preek U. and T.V Rao, 1992

Appendix Table 4: Correlation Matrix for continuous variables in the model

Variables	1	2	3	4	5	6	7	8	9	10
UKNIDF	1									
TOTLIVES	-0.266	1								
ACHIMOTI	0.172	0.098	1							
MASMEX	0.519	-0.12	0.057	1						
FREXCONT	0.128	-0.1	-0.036	-0.009	1					
COSMOPO	0.493	0.089	0.263	0.391	0.039	1				
DISFRROD	-0.514	0.412	-0.238	-0.432	-0.15	-0.232	1			
EDLEOFAM	0.251	0.185	0.104	0.148	0.104	0.247	-0.17	1		
INOPRON	0.294	-0.01	0.118	0.114	0.052	0.25	-0.12	0.004	1	

Source: Survey Data, 2008

Appendix Table 5: Conversion factor used to compute Man Equivalent (labor) force)

Age group	Male	Female
Less than 10	0	0
13-Oct	0.2	0.2
14-16	0.5	0.4
17-50	1	0.8
>50	0.7	0.5

Source: Strock, et al (1991). Cited in Dessalegne (2008).

Appendix Table 6: Distribution of respondents by perceived constraints to dairy production input supply

(N=120)

Constraints	Total Sample	Sub system		
		Urban	Peri-urban	Rural
Hay supply (%)				
Shortage of production	15.52	15.79	16.3	15.4
Shortage of supply	36.7	44.74	48.8	7.69
High cost	30	68.42	16.3	0
Quality problem	13.3	39.47	2.33	2.56
Shortage of production	7.5	10.53	9.3	0
No problem	28	15.53	31.9	38.6
Wheat Brant (%)				
Shortage of production	29.2	44.74	27.9	17.9
Shortage of supply	33.3	68.42	16.3	0
High cost	30	84.21	9.3	43.6
No problem	30	10.53	34.9	43.6
Nough cake (%)				
High cost	44.2	44.74	48.8	35.9
Quality problem	32.5	47.37	16.3	0
Processed Feed (%)				
Shortage of supply	24.2	31.58	37.2	71.8
High cost	63.3	57.89	60.5	10.3
Unawareness	11.7	10.53	14	30.8
Quality problem	42.5	55.26	41.9	0
No problem	23	12	29	17

Source: Survey Data, 2008

Appendix Table 7: Distribution of respondents by perceived constraints to dairy production credit and animal health services

Credit service (%)	Sub system			
	Urban	Peri-urban	Rural	
No need for the service	36.67	39.53	53.8	15.4
Long procedure to use the service	13.33	11.63	17.9	10.3
Fear of indebtedness	40.83	32.56	48.7	41
Un availability of credit service	19.17	9.302	10.3	38.5
Animal health services				
Timely availability	29.17	15.79	16.3	56.4
Shortage of clinics and drugs	58.33	44.74	48.8	82.1
High costs of drugs and services	66.67	50	62.8	87.2
Inadequacy of service supply	53.33	39.47	48.8	71.8
Less quality of the services	44.17	42.11	48.8	41
Weak extension services	51.16	63.16	39.5	53.9
Total (N)	120	38	43	39

Source: Survey Data, 2008

Appendix Table 8: Distribution of respondents by perceived constraints to dairy production breeding services

(N=120)

Breeding Services		Sub system		
		Urban	Peri-urban	Rural
Timely availability	49.17	44.74	48.8	53.9
Lack of service quality	58.33	55.26	60.5	59
Inadequate services	78.33	68.42	74.4	92.3
Weak extension services	60	42.11	53.5	84.6
Farness of Insemination site	52.5	31.58	55.8	69.2
Accountability of the technicians	15	21.05	11.6	12.8
Total(N)	120	38	43	39

Source: Survey Data, 2008

7. 2. Appendix II: The Interview Schedule.

Haramaya University Department of RD and Agricultural Extension An Interview Schedule for collecting data from survey male and female H.H women dairy farmers For M.sc. Research Thesis Access and Utilization of Agricultural knowledge and Information by Wmen Dairy Farmers

Instructions to enumerators

1. Make brief introduction to each farmer before starting any question, get introduced to the farmers, (greet them in the local way) get his /her name; tell them yours, the institutions you are working for, and make clear the purpose and objective of your questions.
2. Please ask each question so clearly and patiently until the farmer understands (gets your point).
3. Please fill up the questionnaire according to the farmers reply (do not put own opinion).
4. Please do not try to use technical terms while discussing with farmer and do not forget the local unit.

1. General/Demographic of household head

Research Site: Region.....Zone.....Woreda.....

A/Kebele..... Village

1.2 Interviewer full name. Date of interview.....

1.3. Respondents Identification Number.....

1.4. Households

Full Name

Respondents nameSex 01 male 00 female.....

Age..... (Years)

Marital status 01=Married 02=single 03=divorced 04=widowed

.5. Can you read and write? 01= yes 02 00= no

1.6. If yes, level of education: 01 /Literate 02 /Read and write 03 / Elementary school 04 / Secondary school 05 / others

1.7. Family Characteristics .Can you please tell me the members of your family

NB: Family Members Children =1, Adult male=2, Adult female=3, Sick=4,>60 old=5

Family size: Male Female

Number of adults (15-60 years of age): Male Female

Number of children (10-14 years): Male Female

Number of old persons (above 60 years) Male Female

Number of children below 10 years of age

2. Farm Characteristics and Dairy Production

2.1. Farm size (in timad)e

Allocated arable land size _____ Allocated grazing land size _____

Rented in (Cash/Share) arable land _____ Rented out arable land _____

Rented in grazing land _____ Rented out grazing land _____

2.2. Number of Livestock owned by the House Hold

Species	No	Dairy breeds	No.	Dairy breeds*	No
Oxen		Local cows		Crossed cows	
Sheep		Local bull		Improved bull	
Goat		Local heifer		Crossed heifer	
Equines		Local calf		Crossed calf	

2.3. Social Factors

2.3.1. Do you have membership/official status in any formal and informal organization or association?

Membership in formal organization	Tick	Not	Frequency of participation		
	Member	member	Whenever conducted (1)	Sometimes (2)	Never (3)
PA council					
District council					
Marketing group					
Union					
Irrigation association					
Farm research group					
HIV clubs					
Women's association					
Marketing cooperatives					
HIV club					

b. Membership in traditional /Informal organization

Organizations	Member	Not member	Frequency of participation		
/Association	(Tick) (1)	(2)	Whenever conducted (1)	Sometimes (2)	Never (3)
Idir					
Iqubl					
Religious group					
HIV club					

2.3.2. Cosmo politeness

2.3.2.1. How frequently do you visit the near by town or city? () to be included in the variable part

Purpose of travel	Rank based on importance
Agricultural related like Purchase/shopping/marketing	
To Visit friends/relatives	
To get medical treatment	
Participation in social affairs	
Others (specify)	

2.3.2.2. If yes, most of the time, what is the purpose of the visit?

3. Psychological Factors

3.1. How is your motivation to achieve something? (**Achievement Motivation**)

Frequency per year		Once a week	Some times	Never
Daily	Most often			
3.1.1	How true it is to say that your efforts are directed towards success	True (3)	Not sure (2)	Not true (1)
3.1.2	Success brings relief or further determination and not just pleasant feeling	Agree (3)	Not sure (2)	Disagree (1)
3.1.3	How often do you seek opportunity to excel	Always (2)	Sometimes (1)	Never (0)
3.1.4	Would you hesitate to undertake something difficult	Never (3)	Sometimes (2)	Always (1)
3.1.5	In how many occasions your effort might lead to your failing	Mostly (1)	Sometimes (2)	Never (0)
3.1.6	How many situations do you think you will succeed in doing as well as you can	Mostly (2)	Sometimes (1)	Never (0)

Source preek U. and T.V Rao, 1992

3.2. Information seeking behavior

3.2.1. Where is the source of your current agricultural information regarding the following activities?

3.3. Innovation proneness. 3.3. How often you need to get new information on the following activities (information seeking behavior)

3.3.1. Did you previously utilize Agricultural technologies related to cotton, sesame, sorghum, livestock, natural resource, fruit and vegetable production? (in 2005/06)(Tick No, Yes)

3.3.2. yes, what were the technologies? Tick, how the respondent accept/adopt the new idea

1= After most of the people accept/adopt it?

2= After consulting others who are more knowledgeable and using it?

3= whenever I come across a new idea such as after getting training, field visiting etc...

3.3.3. How quickly you wish to accept and adopt a new different idea in your life? (Out of agricultural technologies for those not utilize agricultural technologies)

	Agricultural technologies	Tick		How do you accept/adopt a new idea?		
		Yes	No	1	2	3
1	Crop production					
2	Fodder production & feed preparation					
3	Animal health					
4	Breeding					
5	House management					
6	Milk handling & processing					
	Others (specify)					

4. Communication factors

4.1 Extension participation

4.1.1 Do you get advisory service from extension agents on coffee?

Yes=1 No=0

4, 1, 2 Do you get advisory service from research extension experts?

Yes=1 No=0

4.1.3 How frequently do the extension agents visit you?

0) never 1) annually 2) monthly 3) weekly 4) daily

4.1.4 Do you visit extension agent? Yes=1 No=0

4.1.5. Do you visit research experts? Yes=1 No=0

4.1.6. If yes, when do you visit?

1) During seed preparation 2) during coffee seedling planting 3) during incidence of disease 4) during harvesting 5) any time when there is technical problem

4.1.7 What are other sources of information about coffee FFS management practices?

1) Friends and relatives 2) neighbors 3) PA leaders 4) research centre experts 5) District MOA 6) radio 7) Leaflets and printed materials 8) all of the above.

4.1.8. Do you consult development agents and research experts by your initiatives? Yes=1 No=0

Field day, Demonstration and Visits information access and utilization

Have you ever participated in the following extension events (Field days, Demonstration and Visits) over the last two years?

0. No

1. Yes

No	Extension Events	Frequency of events						Remark
		Did you participate in the last 2 years? Tick		Once per year (1)	Once per six month (2)	Once and more per three month (3)		
		Yes	No					
1	Field days							
2	Demonstration							
3	Visits							
4	All							

If not participated what were the reasons?

1. Not invited
2. I was busy
3. I am not interested
4. In my thinking not relevant
5. I don't have information about good works
6. Others (specify) If no participated, what was the reasons?

4.2. Mass Media exposure

4.2.1. Do you have radio? 01=yes 02=no

4.2.2. **If yes**, how frequently did you have access and utility to media for the last two years/2006/07/? (Tick below)

4.2.3. How frequently did you have access and utilization to media for the last three years?

4.2.4. If you get written materials like bulletins brochures, posters etc that describe about crop-livestock production and health who can interpret or read the materials for you? 01=you yourself 02= your children 03= your husband 04 = your friends or neighbors

5. Sources of Knowledge and information and other services (Access to agricultural knowledge and information)

Code	Mass media type	Frequency of information access				Rank the importance of information based on accessibility	Frequency of accessible information utilization			Rank the importance
		Daily (3)	Once in a week (2)	Some times(1)	Never (0)		Always when there is need (3)	Sometimes -2	Never 0	
1	Radio									
2	TV									
3	Newspaper									
4	Posters									
5	Leaflets									
6	Others specify									

5.2. What are your sources (local/external) of Agricultural Knowledge and Information related to dairy production, processing and handling and frequency of contact and means of communication? (Tick from below)

Rank the above sources according to importance

5.2.1. What are means of communication for the obtained Knowledge and Information? 01= Demonstrations 02=Field visits (Tours) 03=Trainings 04=Written materials 05= others Specify.....

5.2.2. Do you use any information communication technology? 01= yes 00= no 8.4. If yes, mention the type _____ and for what purpose do you use ? 01= for market information 02= for agricultural technical information 03=for input purchase 04= others specify

5.2.3. Did you get written materials like posters, bulletin and brochures that describe about crop and livestock production?

1. NO 2. Yes but I can't read 3. Yes but I am not interested to read and I can read 4. Yes 5. Others specify

5.3. What was the reason for not utilizing the accessible information Tick Below?

Activities related to	WoARD	Radio/TV	Input dealers	Friends/Neighbors	Other farmers	No where	Others (specify)	Sum
	1	2	3	4	5	6	7	
Feed Improvement								
Animal health								
Breed improvement								
Milk preservation & processing								
Input out Marketing information								

Code	Constraints of knowledge/information utilization (crop/dairy)	Rank according to the degree of importance
1	It is not timely/season relevant	
2	Lack of credit for the technology and input purchase	
3	The information are for ideal conditions only	
4	It is not suitable to the prevailing agro-ecological conditions	
5	Not suitable to my economic conditions	
6	Lack of awareness and information	
7	I don't see any production increment	
8	Lack of labour	
9	Any other (specify)	

5.3.1. After you got all information, do you discuss with others to confirm? 01= yes 00= no

5.3.2. Do you share the information with others 01=yes 00= no, If no why ?

5.4. Constraints of knowledge and information accessibility and utilization

5.4.1. Constraints of knowledge and information accessibility

Code	Constraints	Important (1)	Somehow important (2)	Very important (3)
1	Distance to institutions			
2	Unavailability of institutions			
3	Lack of awareness			
4	Lack of awareness			
5	Lack of time			

5.4.2. Constraints of knowledge and information utilization

Code	Constraints	Rank according to the degree of importance		
		Important (1)	Somehow important (2)	Very important (3)
1	Timeliness of information			
2	Lack of Credit			
3	Information ideality			
4	Poor economic Conditions			
5	Lack of Labor			

5.14. Have you ever attended trainings related to Crop/Livestock Production?

01= No 00= Yes

5.14.1. If you did not get what was the reason?

1. I am not invited 2. I was busy 3. I am not interested

4. I am thinking not relevant 5 Previously I was trained 6. Other specify

5.15. If yes, how long per year and at what level utilize it?

6. Sources of inputs and materials (breeds, feed, equipments and chemicals, services & constraints

No	Source	Rank in order of importance	Reason
1	Agricultural office		
2	Dairy Cooperatives		
3	Private dealers		
4	NGOs		
5	Unions		
6	Others(Specify)		
7			

6.1. What are your sources of inputs and materials (breeds, feed, equipments and chemicals etc?

6.2. Major obstacles of input access according to the degree of importance

No	Obstacle	Rank in order of importance	Reason
1	Poor quality of inputs		
2	Insufficient delivery		
3	Unavailability on time		
4	Source from far distance		
5	High price of inputs		
6	Lack of credit for inputs		
7	Less extension support		

What improvements do you suggest?

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

6.3. Sources of Finance/Credit & constraints

6.3.1. Sources of Finance/Credit & constraints

No	Source	Rank in order of importance	Reason
1	Ministry of Agriculture		
2	NGOs		
3	Development Bank		
4	Rural credit sachems		
5	Relatives		
6	Local money lenders		
7	Others (specify)		

6.3.2. Major obstacle of credit

No	Constraints	Rank in order of importance	Reason
1	Unavailability on time		
2	Lack of credit		
3	Lack of collateral		
4	High interest rate		
5	Others specify		

6.3. 3.What improvements do you suggest?

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

6.4. Sources and constraints of vet services

6.4.1. Sources of vet services

No	Source	Rank in order of importance	Reason
1	Ministry of Agriculture		
2	NGOs		
3	cooperatives		
4	Educational organization		
5	Private clinics		
6	Private drug dealers		
7	Others (specify)		

6.4.2. Constraints of vet services

No	Constraints	Rank in order of importance	Reason
1	Unavailability on time		
2	Lack of credit		
3	Shortage of drugs		
4	High cost of drugs and services		
5	Others specify		

6.4.3. What improvements do you suggest?

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

6.5. Bull/AI services and constraints

6.5.1 Bull/AI services and constraints

No	Source	Rank in order of importance	Reason
1	Ministry of Agriculture		
2	NGOs		
3	Cooperative		
4	Educational organization		
5	International organization		
6	Owen improved bull		
7	Others (specify)		

6.5.2. Bull/AI service constraints

Major obstacles

No	Constraints	Rank in order of importance	Reason
1	Unavailability on time		
2	Inadequate service		
3	Poor quality insemination		
4	Source of service from far distance		
5	Others specify		

6.5.3 What improvements do you suggest?

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

6.6. Source and constraints of market information/Market services

6.6.1. Source of market information/Market services

No	Source	Rank in order of importance	Reason
1	Ministry of Agriculture		
2	NGOs		
3	Private dealers		
4	Cooperatives		
5	Relatives		
6	Mass media(Radio)		
7	Others (specify)		

6.6. 2.Cconstraints of market information/Market services

No	Constraints	Rank in order of importance	Reason
1	Unable to get market information		
2	Far distance of market place		
3	Unable to get alternate market		
4	Low price of product		
5	Lack of all weather road		
6	Lack of milk handling equipment		

What improvements do you suggest?

- a. _____
- b. _____
- c. _____

7. Market Link and Market Information

7.2.1 Milk product obtained, consumed, sold and milk quality

Type of dairy cow	no of animals	milk yield/day	utilized for other purpose	milk sold

Milk/milk product	Market source: 1. Ada coop; 2. Genesis farm, 3. Lema milk 4. Neighbor, 5. Local Market(specify)
Milk	Rank 1 st _____, 2 nd _____, 3 rd _____, 4 th _____
Butter	Rank 1 st _____, 2 nd _____, 3 rd _____, 4 th _____
Cheese	Rank 1 st _____, 2 nd _____, 3 rd _____, 4 th _____
Other(specify)	Rank 1 st _____, 2 nd _____, 3 rd _____, 4 th _____

8. Sources and frequency of knowledge access on the recommended dairy practices

8.1. Frequency of knowledge and information access from formal sources (for the last three years)

S.No	Types improved Dairy practices		Sources of dairy knowledge	Frequency		
				often	Sometimes	Never
	Breed improvement (%)			2	1	0
1.1			Neighbor (2)			
1.2			WoARD(2)			
1.3			Model farmer(2)			
1.4			Cooperatives(2)			
1.5			NGO(2)			
1.6			Private/Trader(2)			
	Total score (6*2=12)					
2.	Feed improvement (%)		Neighbor (2)			
2.1			WoARD(2)			
2.2			Model farmer(2)			
2.3			Cooperatives(2)			
2.4			NGO(2)			
2.5			Private/Trader(2)			
	Total score (6*2=12)					
3	Improved milk preservation and processing (%)					
3.1						
3.2			Neighbor (2)			
3.3			WoARD(2)			
3.4			Model farmer(2)			
3.5			Cooperatives(2)			
3.6			NGO(2)			
3.7			Private/Trader(2)			

4	Input and output marketing information (%)				
4.1		Neighbor(2)			
4.2		WoARD(2)			
4.3		Model farmer(2)			
4.4		Cooperative(2)			
4.5		NGOs(2)			
4.6		Private Trader(2)			
	Total score (6*2=12)				
	Grand Total scores=48				

9. Frequency of utilization of knowledge and information, technology and services

Variables	Frequency	Score	Variables	Frequency	Score
			Source of credit		
On farm fodder	Never	0			
	Sometimes	1	WoARD	Never	0
	Always	2		Sometimes	1
				Always	2
Concentrate feeds (%)	Never	0	Micro-finance	Never	0
	Sometimes	1		Sometimes	1
	Always	2		Always	2
Mineral blocks (%)	Never	0	Cooperative	Never	0
	Sometimes	1		Sometimes	1
	Always	2		Always	2
Milk preservation and processing					1
	Never	0			
	Sometimes	1	NGO	Never	0
	Always	2		Sometimes	1
				Always	2
			Relatives (%)	Never	0
				Sometimes	1
				Always	2
	Never	2	Total score 5*2=10	Always	
AI/Bull service	Sometimes	0			
	Always	1			
Vaccination	Never	0			
	Sometimes	1			
	Always	2			
Clinical%	Never	0			
	Sometimes	1			
	Always	2			

Delivery%	Never	0	
	Sometimes	1	
	Always	2	
Grand Total Score: 32+10=42		0	