



**Agricultural Knowledge Management: the  
Case of Dairy Production Improvement in  
Bure Woreda, West Gojjam Zone, Amhara  
Region**

**By**

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**ADDIS ABABA**

SCHOOL OF GRADUATE STUDIES  
INSTITUTE OF REGIONAL AND LOCAL DEVELOPMENT STUDIES

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## Acronyms

AI	Artificial Insemination
AKIS	Agricultural Knowledge and Information System
BUADO	Bure Urban Agriculture Development Office
BWARDO	Bure Woreda Agricultural and Rural Development
CRADA	Collaborative Research and Development Agreement
ESSP	Ethiopia Strategy Support Program
GO	Government Organization
IFPRI	International Food Policy Research Institute
IK	Indigenous Knowledge
IFPRI	International Food Policy Research Institute
IPMS	Improving Productivity and Market Success
KM	Knowledge Management
NGOs	None Governmental Organizations
R4D	Research for Development
REKSS	Rural Economy Knowledge Support system
RD	Research and Development
SAKSS	Strategic Analysis Knowledge Support Systems

## ABSTRACT

*The government of Ethiopia gives great attention to agriculture and rural development for the country's economy development. Dairy development is one of the components of agricultural development. To improve dairy production in certain locality, dairy producers should be able to access and use appropriate knowledge for the particular problem at the right time. This research was conducted to assess agricultural knowledge management system and its challenges and opportunities of knowledge management processes in Bure district. To address these objectives, both primary and secondary data were used. These were collected from primary (i.e. dairy producers and experts of different GOs and NGOs using semi-structured questionnaire and checklist) and secondary sources (i.e. literature reviews). To select representative respondents, multi stage sampling techniques were used. SPSS software (version 15) was used to analyze the data which is collected by questionnaire. As survey result, the major objective of the majority respondents engaged in dairy farming is for milk consumption and obtaining ox for draught power. Keeping the health condition of animals, feed green pasture to their milking cows, animal selection and using crossbreed cow are the major mechanisms, which are used by dairy producers, to improve the milk production in the district. They obtain these knowledge/mechanisms from WARDO, their own experience neighbors and family through different means. These are observing the farmer's farm, listening to radio, experience sharing sessions and on-farm demonstrations.. Majority of the dairy producers use the new knowledge by doing partial modification. They also transferred their knowledge to their neighbors, friends, relative and children. Dairy production in the district is not market oriented, rather it is used for household consumption and obtaining ox for draught power. Therefore, to change this production system into market oriented, concerned bodies should provide adequate dairy technologies and trainings to dairy producers. Besides, promoting and strengthening the existing good practices in knowledge management processes.*

# CHAPTER ONE

## INTRODUCTION

### 1.1. Background of the study

The Government of Ethiopia gives high priority to agriculture and rural development as an engine of pro-poor growth and efforts to enhance agricultural productivity, increase the commercialization of smallholder surpluses and reduce rural poverty are cornerstones of the government's economic growth strategy i.e. Agriculture Development-Led Industrialization (J. Spielman D., et al, 2008). Agriculture is pivotal to Ethiopian economy. According to Teklu (2008) it contributes on average 46 percent of the real GDP and 85 percent of export earnings, and the sector employs about 85% of the population and about this 85% of the population lives in rural areas and practices subsistence agriculture and livestock production. Therefore, the development of Ethiopian agriculture will have direct impact on the overall development of the country.

The majority of smallholder farms depend on animals for draught power, cultivation and transport of goods. The sub-sector also makes significant contribution to the food supply in terms of meat and dairy products as well as to export in terms of hides and skins, which make up the second major export category. However, the productivity of the sub-sector is decreasing because of poor management systems, shortage of feed and inadequate healthcare services (Belay and Abebaw, 2004).

In Amhara National Regional State (ANRS), agriculture remains as the dominant economic sector. From 1999-2005 agriculture accounted for 58% of the region's GDP and 89% of the population derives its livelihoods from agriculture and related activities. The regional livestock population accounts for 29% of the country's livestock population. Livestock contributes 22% to agriculture and 12.5% to total GDP in the region (BoFED, 2005: cited Adebabay, 2009). Though livestock has considerable contribution in the country's economy, its production and productivity is very low.

Increasing milk production from cattle and buffaloes is a national priority in most developing countries, because milk is one of the most important foods in human nutrition (Devendra C., 2007). To do so, the government of developing countries introduced improved exotic breeds into their country (Ayalew W. et. al, 2009). Besides, for a long period, various research activities have been carried out on livestock sectors, particularly in dairy production development, in regional, national and international research institutions to generate knowledge/improved technologies to tackle livestock problems. These generated knowledge/technologies in mostly remained in the research centers rather than reaching the end users and solve problems related to livestock production. As the result, our research and extension activities did not succeed in solving local development problems particularly in the agriculture sector.

Among other developmental resources, appropriate and relevant knowledge is an important resource. To bring development in dairy production we need to have the right knowledge to solve problems related to dairy management system. Utilizing this knowledge at the right time and place is also crucial to bring development. So, knowledge management (identification, development, use and sharing of vital knowledge) is very important in order to accelerate adoption of improved agricultural technologies and enhance agricultural production and productivity. Understanding knowledge management of a certain locality will help the local planner to develop and implement appropriate local development policies to address local problems.

Therefore, to solve the real problems of the farming community, we need to understand their problems and interests, the farming systems and their local and scientific knowledge management needs regarding observing, creating, utilizing and sharing of agriculture knowledge.

## **1.2. Statement of the problem**

Agriculture is the main economic sector in Ethiopia, and has been given a prior attention in different strategy and policy documents (FDRE, 2002: cited in Abebe, 2007). However, the sector has many problems such as lack of improved agricultural inputs, credit, adequate extension service, marketing access, agricultural knowledge and information and the likes. As a result, agricultural production and productivity of the country is very low and unable to provide safe food, ensure food security and meet the increased agricultural product demand.

The main intent of this study is agricultural knowledge management and its influence in dairy production. In the development strategy of Ethiopia, it is expected that agriculture will bring about structural change in the economy of the nation via its forward and backward linkage with other sectors of the economy.

In developing countries such as Ethiopia, proper and wise utilization of available resource was a prerequisite for development. However, they did not bring development using this development philosophy. As the result in order to achieve an economically sound society, environmentally benign development and judicious utilization of natural resources, it is necessary that a comprehensive information and knowledge system be developed to provide systematic and periodic information to farmers, researchers, planners, decision-makers and developmental agencies. Therefore, Knowledge plays a significant role whenever change, innovation and growth are being pursued in a competitive and complex field (Ermias, 2006).

To improve the production and productivity of livestock particularly dairy production in the study area, vital knowledge has to be created and utilized via appropriate partnerships. Transforming the subsistence dairy production system into modern and commercial production system, knowledge-based dairy production required knowledge based dairy production. For example, an essential prerequisite for improved milk

production is knowledge and understanding of prevailing production systems and the problems and constraints that limit production (Devendra C., 2007).

Knowledge and the management of knowledge are recognized as becoming more important to modern organizations (Kerkhof C. 2003). No agricultural development project can be fostered other than going through Agricultural Knowledge Management System (Malekmohammadi I., 2009).

Indigenous knowledge (IK) provides the basis for problem-solving strategies for local communities, especially the poor. It represents an important component of global knowledge on development issues. IK is an underutilized resource in the development process. Investigating and learning what local communities know can improve understanding of local conditions and provide a productive context for activities designed to help the communities. Understanding IK can increase responsiveness to clients. Adapting international practices to the local setting can help improve the impact and sustainability of development assistance (Woytek R., 1998).

There is consensus among development people about the value of the recognition and use of local knowledge and practices/its management in development initiatives aimed at technology development by and for rural farming communities. Interest amongst research, education and development institutions to investigate and document local knowledge has grown significantly over the last few years (Joshi L., and E. Mulyoutami, 2004) because understanding local knowledge accumulation and dissemination in the form of shared environmental beliefs and rules for production activities is critical for the development and maintenance of complex agricultural systems (Okoye, 1998).

Understanding the indigenous knowledge and the overall agricultural knowledge management system is very important to develop, acquire, use and diffuse vital agricultural knowledge and to develop appropriate ways to make developmental interventions by local planners, extension workers and researchers. By doing so, we can

mesh scientific and ethno-scientific knowledge to produce socially acceptable, economically feasible and environmental friendly dairy technology.

There is no research that assesses knowledge management practices in the study area i.e. Bure worda. Therefore, the main intention of this study is to try to investigate the role of agricultural knowledge management system on dairy production and its challenges. Thus, this research has been conducted based on following objectives.

### **1.3 Objectives of the study**

#### **General objective of the study**

The general objective of the study is to assess agricultural knowledge management system on dairy production.

#### **Specific objectives**

- To identify agricultural knowledge/practices to improve dairy production
- To assess the sources of knowledge about dairy technology for dairy producer
- To identify the means of knowledge transferring among the major actors in dairy production
- To assess the nature of new knowledge utilization among dairy producers
- To point out major challenges and opportunities on agricultural knowledge management practices

#### **1.4. Research questions**

1. What kinds of practices are there among dairy producers?
2. What are the sources of knowledge for these practices?
3. How is knowledge transferred?
4. How is knowledge utilized by dairy producers?
5. What are the factors that hinder dairy producers on knowledge acquisition and transfer on?

#### **1.5. The Significance of the study**

Understanding agricultural knowledge management system is important for agricultural development because identifying and providing appropriate knowledge to dairy producers can bring overall local development. Therefore, the result of this study can have important contributions since individuals or institutions working in dairy development as well as dairy policy development arena. In addition, the study will add to knowledge base in this area and can serve as a springboard for the future researchers, developmental workers and policy makers.

#### **1.6. Scope of the Study**

This study is focused on only dairy production system specifically on knowledge management system within the dairy production in Bure district of west Gojjam of Amhara National Regional state. As Adebabay's (2009) study shows, there are three dairy production systems in the study woreda. For this study, sample respondents were selected from the three dairy production systems. Namely: urban (inside Bure town), peri-urban (around Bure town) and rural (the rural part of the district). From each subsystem, 30 respondents were selected. In addition, extension workers, IPMS, research institutions and college of agriculture were included. Therefore, the scope of this paper is delineated to dairy production improvement techniques or knowledge management system in the three dairy production systems. Geographically this study focuses on Bure district, west Gojjam Zone, Amhara Region.

## **1.7. Organization of the paper**

The paper is organized into five chapters. The first chapter is the introduction section of the study. Chapter two presents the research methodology and brief description of the study area. The review of related literature and analytical framework are presented in chapter three. Chapter four includes discussion and analysis of the research results while chapter five gives conclusion and recommendations based on the results of the research.

## **1.8. Limitation of the study**

Though the final output of this research is significant, it passed various challenges from data collection up to data analysis and findings. The KM concept is new for both interviewers and interviewees. As the result it was sometimes difficult to comprehend some questions in the questionnaire. Intensive orientation was given for interviewers to make it easier for them in order to overcome the problem. Beside, in terms of time, the research was expected to be completed within six month. Therefore, it was difficult to finish within this short time. Some farmers and officers were also resistant to give information at the data collection phase of the research.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1. Concept of knowledge and knowledge management**

##### **2.1.1. Definition of knowledge**

Knowledge is an inherently dynamic entity continuously changing and evolving (Maliappis M. T. and Sideridis A. B., 2004). Knowledge does not have precise and comprehensive definition. According to Davenport and Prusak (1998); (cited in Ondari-Okemwa E., 2006) knowledge is defined as a fluid mix of framed experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information. It is originated and applied in the minds of the knower's. The core essentials of all definitions consider "knowledge" as the sum of all coherent information, which conforms to detectable environmental conditions (GRONAU 2004: 12; cited in Kemper et al, 2008).

The term "knowledge" is understood as the conscious or subconscious perception, information processing and accumulation of experiences (Bergeron B., 2003). It includes familiarity, awareness and understanding gained through experience or study, and results from making comparisons, identifying consequences, and making connections. In organizational terms, knowledge is generally thought of as being "know how", or "applied action (Servin G. 2005). The appropriate inclusive framework consists of (1) school, as learnable education, (2) lifelong learning, skill development formed by experiences, coincidences and existing social structures and (3) individual knowledge accumulation through organized education transmission beyond the school system in forms of consulting, campaigns or media (MEUSBERGER 2003; STEHR 2001: cited in Kemper et al, 2008).

Knowledge can be externalized by signs, news or pictures, saved and distributed by diverse sources through space and time. In turn, externalized and accessible knowledge can be channeled as information. Thus, the intermediation of knowledge is possible via

an externalization process that makes it feasible to be interpreted, constructively acquired and modified by individuals and groups (Kemper et al, 2008).

## **2.1.2. Types of knowledge**

### **2.1.2.1 Tacit verses explicit**

Base on its nature, knowledge can be classified into two types. It may be explicit (codifiable) or tacit (intuition, experience, know-how) (Ermias 2006).

**1. Explicit knowledge** is knowledge that can be captured and written down in documents or databases (NHS National Library for Health, 2005). As the result, we can store and search knowledge, and can be a good catalyst for connecting people together (Collison C. and parcel G., 2004). Examples: instruction manuals, written procedures, best practices, lessons learned and research findings. Explicit knowledge can be categorized as either structured or unstructured. Documents, databases, and spreadsheets are examples of structured knowledge, because the data or information in them is organized in a particular way for future retrieval. In contrast, e-mails, images, training courses, and audio and video selections are examples of unstructured knowledge because the information they contain is not referenced for retrieval (Servin G. 2005).

**2. Tacit knowledge** is the knowledge that people carry in their heads. It is much less concrete than explicit knowledge. It is more of an “unspoken understanding” about something (Servin G. 2005). It is not possible to capture the full richness of what is in people’s heads (Collison C. and parcel G., 2004) and it is more difficult to write down in a document or a database. Example, knowing how to ride a bicycle– you know how to do it but it is difficult to document this knowledge. In fact, most people are not aware of the knowledge they themselves possess or of its value to others. Tacit knowledge is considered more valuable because it provides context for people, places, ideas and experiences. It generally requires extensive personal contact and trust to share effectively (Servin G. 2005).

### **2.1.2.2. Indigenous knowledge versus scientific knowledge**

Knowledge can be classified based on its source of origin since knowledge can be obtained from different sources. The basic origins of agricultural knowledge that the farmers used for their farming system are illustrated as follow:

#### **1. Indigenous knowledge/practices**

The literature on indigenous knowledge did not provide a common definition of the concept. This is in part due to differences in background and perspectives of the authors, ranging from social anthropology to agricultural engineering. Nevertheless, the various definitions also have some common traits (Woytek, 1998). Broadly, indigenous knowledge is variously regarded as ethno-science, folk knowledge, traditional knowledge, local knowledge, people's knowledge, among others. IK is knowledge that is unique to a given culture or society. Communities use IK at the local level as the basis of decision making pertaining to vital activities in which food security is included. As such, IK is the most important and often only asset for many poor, rural societies and its significance increases as other resources disappear or dwindle (ibid).

#### **2. Scientific Knowledge/practices**

Scientific knowledge is knowledge created as a result of applying scientific methods, procedures and tools, with the endorsement of peer groups involved in that particular knowledge (Amanul et al, 2009 ). Scientific knowledge is a knowledge that can be tested or proven. It is cumulative, representing generations of experience, careful observations and trial and error experiments (Louise, 1998; cited in Akullo D. et al, 2007).

According to Fedyen and Cannella (2004) (cited in Ondari-Okemwa E., 2006), knowledge, therefore, has been recognized as one of the most important resources of the 21<sup>st</sup> century and has received considerable attention in management literature.

### **2.1.3. Theories of knowledge management**

#### **2.1.3.1 Right knowledge, right place and right time**

Can knowledge be managed? The words management and knowledge at first sight appear uneasy bedfellows. Knowledge is largely cognitive and highly personal, while management involves organizational processes (Mulugeta, 2006). Due to this, management of knowledge is difficult concept in the mind of some people. As the result, people mistakenly assume that knowledge management (KM) is about capturing all the practices and knowledge that people possess and storing it in a computer system in the hope that one day it will be useful (Servin G. 2005).

The viability of a KM program varies as a function of the work performed by the company, how risk is managed, the personality and management philosophy (Bergeron B., 2003). The holy grail of knowledge management is the ability to selectively capture, archive, and access the best practices of work-related knowledge and decision making from employees and managers for both individual and group behaviors in company (ibid).

Knowledge management is the explicit and systematic management of vital knowledge and its associated processes of creating, gathering, organizing, diffusion, use and exploitation (Skyrme D., 1997) and it aims to provide instruments to optimise the control and management of the most crucial production factor within organisations, in our case dairy production. It requires turning personal knowledge into corporate knowledge then can be widely shared throughout an organization and appropriately applied (ibid). Hence, it is a set of activities with its own tools and techniques and a method for gathering information and making it available to others (Malekmohammadi I.2009).

Good knowledge management is all about getting the right knowledge, in the right place, at the right time (Servin G. 2005). The right knowledge is the knowledge that you need in order to be able to do your job to the best of your ability (ibid), it means identifying agricultural problems, developing appropriate solution, making a decision, adopting new

technology, etc. Information and knowledge can usually be found in variety of places – research papers, reports and manuals, databases etc. Often it will be in people’s heads – yours and other people’s. The right place, however, is the point of action or decision – the meeting, workshop, solving farmers’ problems, farmers’ field, farmers’ animal etc. The right time is when you (the person or the team doing the work) need it (ibid). In practice, knowledge management often encompasses identifying and mapping intellectual assets within the organization, generating new knowledge for competitive advantage within the organization, making vast amount of corporate information accessible, sharing of best practices and technologies that enable all of the above including groupware and intranets (Amanuel et al, 2009 ).

Therefore, knowledge management theorized in this paper is that it is a processes of agricultural knowledge generation, acquisition, absorption and diffusion in the certain farming system. It is a process of creating conducive environment through which agricultural knowledge can be generated, accessed, utilized and diffused by the main actors in agricultural development. This can help to both the experts and the end users of the new knowledge to generate, access, utilize and diffuse the right knowledge at the right time and places. Thus, this research focuses to assess the knowledge management processes in the study area regarding dairy production improvement.

### **2.1.3.2. Historical evolution of knowledge management**

The concept of knowledge management is relatively new to many organizations in the sub-Saharan region of Africa (Ondari-Okemwa E., 2006). Historically, the term “knowledge management” was first introduced in a 1986 keynote address to a European Management Conference (Baker K. and G. Badamshina, 2002; cited in Malekmohammadi I. 2009). In addition, knowledge management emerged as a scientific discipline in the earlier 1990s (From Wikipedia, the free encyclopedia).

Indeed the closer relationship between knowledge and political as well as economic power has been observed for centuries. It is perhaps ironic, then, that the realization has

only recently become widespread. From mid-1990s, there has been rapid growth of interest across the world in knowledge and how it might be managed within and between organizations. Politicians around the globe now routinely emphasize the contribution of knowledge to economic growth and competitiveness. This widespread interest follows a long history of attention that has remained on the periphery of management thought and practice unit now (Little et al, 2002).

The first international conference 'knowledge as strategic imperative', was held in Houston as recently as September 1995, and the first periodical on the topic including knowledge management, knowledge Inc, knowledge management review and Journal of Knowledge management appeared as recently as 1997 (Little et al, 2002). In 1999, the term [personal knowledge management](#) was introduced which refers to the management of knowledge at the individual level (Wikipedia, the free encyclopedia). Today most large organizations have some form of knowledge management initiative. Many companies have created knowledge teams and appointed Chief Knowledge Officers. As the result, knowledge has become firmly established on the strategic agenda of development (Mulugeta, 2006).

In recent years, we have seen an explosion in conferences, articles and books on the subject of knowledge management and associated topics such as intellectual capital and intangible assets. Today this congruence is leading to the introduction of knowledge management initiatives in many firms, particularly those that are knowledge intensive, such as high technology, oil, chemical and pharmaceutical companies, financial services and management consultancies (Skyrme D., 1997).

The issue of managing knowledge becomes apparent both at national and organizational levels, particularly in the growing competition and increasing effect of globalization. In the developed economies, it has been well recognized in the corporate environments as well as public sectors, and is considered the main means of accumulation of wealth. On the contrary, in the developing economies, knowledge management is at its infancy. Even though the initiation of knowledge management in the developing economies is at its

very early stage, knowledge has been created, accumulated, shared and used at various levels of social and economic structures (Mulugeta 2006).

KM in agriculture as the process of systematically and actively managing and leveraging the stores of knowledge and also the process of transforming information and intellectual assets into enduring values within agricultural knowledge and information system partners (Malekmohammadi I.2009).

#### **2.1.4. Processes of knowledge management**

From a KM point of view, we need to be more specific about what kinds of knowledge we are interested in, how it needs to be shared, and by what means ([www.greenchameleon.com/.../](http://www.greenchameleon.com/.../)). Knowledge management has different stages in its process. For example according to Ermias (2006) stages of knowledge process are including identification, creation, storing, sharing, and using of knowledge. KM has four stages and in each stage, there are major processes (Malekmohammadi I., 2009). In this study, KM has the following processes.

##### **2.1.4.1. Absorptive capacity: creation and acquiring knowledge**

The absorptive capacity concept has proven to be flexible enough to be used not only for different units of analysis but also in many fields of research, e.g. industrial organization, strategic management, international business and technology management. It has been used in most cases as a firm's ability to 'identify, assimilate and exploit knowledge from the environment' (Schmidt T., 2009). The absorptive capacity is the ability of the farmers that can identify, assimilate and exploit agricultural knowledge for their day-to-day farming activities.

Farmers acquire new knowledge and technologies from a variety of sources, but not all farmers have equal access to or they are not equally active in seeking new information, discussing problems or sharing experiences (FAO, 1996). In general, farmers' access to, or use of, a given agricultural technology or knowledge is, to some extent, a function of

the information sources available to them regarding alternative practices (Okoye, 1998). Farmers can get new knowledge both from indigenous and scientific knowledge. Farmers received agriculture information from sources which we may refer to as personal locality sources (parents/relations, fellow farmers and cooperatives), personal cosmopolite sources (the extension agents), the mass media, books and exhibitions. 'School' and 'books' relate to adult literacy classes which some of the farmers attend (Okoye, 1998).

In the creation and acquisition phase of the Knowledge Management life cycle, information is authored internally by knowledge workers, acquired through outsourcing, or purchased from an outside source (Bergeron B., 2003). It also can be process descriptions and personal best practices. External sources of information are increasingly significant in most knowledge organizations (Malekmohammadi I., 2009).

In Rwanda, three processes can be identified through which farmers acquire agro-forestry knowledge. These are the generation of new knowledge through their own experimental efforts, the adaptation of ideas (knowledge and/or technologies) from exogenous knowledge systems (this may or may not involve experimentation) and wholesale adoption of exogenous knowledge and technologies without further adaptation (FAO, 1996). There are a number of inter-related activities associated with these processes including decision-making about species choice, farm and field location and planting methods; implementation of a species trial; and evaluation and determination of suitability, usefulness and benefits(ibid).

Farmer experimentation is an important element of site-specific learning. It helps them adapt practices to the specific local conditions in which they live and work because it can build on farmers' particular interests, and on their capacity to observe, experiment, and interpret the results of new techniques (Deugd et al., 1998: cited in Corbeels M., et al. 2000)

#### **2.1.4.2. Knowledge utilization**

The work of Rogers and Shoemaker (1971) and Rogers et al (1976) on communication of innovations and that of Meehan (1980) on agricultural knowledge utilization (AKU) that are cited in Okoye (1998), provide us with some basis for characterizing and understanding these processes. Agricultural knowledge utilization refers to the process by which scientific knowledge produced in agricultural research institutions and experiment stations is utilized in systematic conjunction with the ethno-scientific knowledge of farmers to effect widespread distribution of agricultural innovations.

#### **2.1.4.3. Disseminating; *flow, sharing, alert, push***

Knowledge sharing is an activity through which knowledge (i.e. information, skills, or expertise) is exchanged among people, friends, or members of a family, a community (e.g. Wikipedia) or an organization (Wikipedia, the free encyclopedia) and it can increase the absorptive capacity of the individual farmers because improve a firm's absorptive capacity through knowledge sharing (Schmidt T., 2009).

Early models of organisational knowledge transfer looked at knowledge as if it was an object that could be passed on from the creator to a translator who would adapt it in order to transmit the information to the user (Dissanayake, 1986: cited in Rees R., et. al, 2000). Within this paradigm, the user is viewed as a passive actor and the context within which the transfer occurs is completely ignored. This model implies a hierarchical top down relationship between the generator of knowledge who holds the resource (knowledge) and the user who is locked in a dependency stance. In social sciences, this view tends to be even more pernicious because subjects can be assimilated to variables and lose their quality of actors on social reality (ibid).

A useful characterization of knowledge diffusion includes the general acceptance (i.e., adoption) over time of a specific idea, concept, or practice by an individual, group of individuals, or other adopting agents or units. The adopting agents are linked through specific channels of communication to a social system and to a given system of values or

culture (Thomas E. p., 1997). Diffusion, as defined by Roger, is a “process by which an innovation is communicated through certain channels over time among the member of a social system”. This process consists essentially in the communication of a new idea, whether it occurs autonomously, irrespective of any intervention, or directed and managed (Auflage, 2005). If we take a single farmer and a single traditional innovation, it will not be easy to say when adoption stops and diffusion starts or the source of the innovation or who specifically disseminates it (Okoye, 1998) because diffusion is a dynamic process that focuses on the penetration of a social system by introducing innovation (FAO, 2000).

Dissemination to a wider community adds the developmental dimension to the exchange of knowledge and could promote a wider and deeper ripple impact of the knowledge transfer (Woytek R., 1998). The basic diffusion process contains four components: the innovation, the social system in which innovation is being adopted, channels of communication, and time (Mahajan and Peterson, 1985: cited in Okoye, 1998).

The dissemination of agricultural knowledge or technology can be through linear form that is from researchers, disseminators and user functions (Okoye, 1998) or participatory form. To achieve participatory way of knowledge dissemination participatory extension approach is crucial and it relies on interpersonal channels and group mechanisms for diffusing greater awareness and facilitating learning among the group of untrained farmers (Auflage, 2005). One of the mechanisms is Farmer field school approach. This approach relies on two knowledge transmission principles. First, trainings of farmer trainers. Farmers’ field schools graduates are encouraged to undertake a training of farmer trainers, thus becoming facilitators themselves, and subsequently to train other farmers. Second, in addition to this formal diffusion mechanism the transmission of knowledge also work through informal farmer-to-farmer communication (ibid). Informal knowledge flow plays vital role for sharing of experiences among milk producers that in turn build up indigenous knowledge (Adebabay, 2009).

### 2.1.5. Agricultural knowledge management in Ethiopia

Agriculture in Ethiopia is increasingly characterized by new policies, actors, and relationships that influence how smallholders access and use information and knowledge. This growing complexity suggests opportunities for Ethiopian smallholders, but little is known about how those opportunities can be effectively leveraged to promote pro-poor processes of rural innovation (J. Spielman D., et al, 2008).

Knowledge plays a significant role whenever change, innovation and growth are being pursued in a competitive and complex field. Agriculture today in Ethiopia is just such a field. Leveraging knowledge is thus a critical input in the transformation of Ethiopian agriculture from subsistence to market-oriented economic sector. A demand-driven agricultural knowledge management system facilitates access to and adoption of appropriate technologies and processes from research and development institutions based in Ethiopia and elsewhere (Ermias, 2006). As a result, IPMS Project works to assist the Ethiopian Ministry of Agriculture and Rural Development in developing a knowledge management system that can help facilitate such access to agricultural knowledge and information (<http://www.ipms-ethiopia.org/Focus-Area/Knowledge-Management.asp>).

To do so the project focuses on selected knowledge management tools, approaches, and methods that are relevant and practical to on-the-ground realities of the extension staff, DAs and farmers in the Woreda in which it operates. Some of the areas of knowledge management that the project has been trying to develop are. **Ethiopian Agriculture Portal:** It is a web-based gateway to agricultural information resources relevant to Ethiopian agricultural societies by availing timely and relevant agricultural information resources. **Developing Woreda Knowledge Centers** which provide the Woreda extension personnel easier access to agricultural information and thus empower them to be better prepared to discharge their extension duties, **Enhancing the role of Farmer Training Centers** by equipping them with computers, printers, TV sets, DVD Players, books, manuals, demonstration materials, and generators where necessary so as to enhanced and leveraged as venues for knowledge sharing and facilitating linkages with various market actors and service providers, **Study Tours** in order to share practical

knowledge from successful farmers and extension activities, **Field Day/Demonstrations** to share knowledge and to scale out/introduce successful interventions within a village or to other villages/communities in or outside the pilot learning woreda and **technology Exhibitions** which are used both for disseminating knowledge to a broader audience and to showcase community and individual achievements in the agriculture sector (<http://www.ipms-ethiopia.org/Focus-Area/Knowledge-Management.asp>).

International Food Policy Research Institute (IFPRI) is also work on knowledge management for the implementation of rural development of policy of the country. Ethiopia Strategy Support Program (ESSP) IFPRI's is aimed at providing research and knowledge support to the implementation of rural development strategy. Rural Economy knowledge Support System (REKSS), the Ethiopian version of SAKSS, is one of the major pillars of the Ethiopia Strategy Support Program. Rural Economy knowledge Support system is envisioned to build a stronger and more integrated knowledge support system within the country to underpin future food policy analysis and to help inform key rural development strategy decisions at all levels (Mulugeta, 2006).

## **2.2. Source of dairy technology/knowledge**

A crucial element for agricultural development is ensuring farmers' access to technology that enables them enhance productivity. Such a technology has to be generated, replicated and disseminated among the farming community. Dairy Development play a prominent role in the rural economy in supplementing the income of rural house holds, particularly the landless, marginal and small farmers. It also provides subsidiary occupation in semi urban areas and more so far people living in hilly, tribal and drought prone area where crop output may not sustain the family (Meena B., et al, 2009). An essential prerequisite for improving milk production is knowledge and understanding of prevailing production systems and problems that limit production (Devendra C., 2007).

The major sources of knowledge for smallholders are local (neighbors, family, markets and community based organizations). Among the source of knowledge and information government extension is an important sources of information. NGOs are also important

sources of information in those areas where they are active. Churches, community meetings and agricultural companies are significant information sources in some locations (Rees R., et al 2000). Farmers at *Bure* do not only access information about milk production from extension agents but also from other sources such as previous family experience, colleagues, reading text cooperatives, radio, NGOs, and from their own experience (Adebabay, 2009).

### **2.3. Dairy production system in Ethiopia**

Pastoralists, agro-pastoralists, and crop-livestock farmers raise livestock in all of the farming system of Ethiopia. The main source of milk production in Ethiopia is cow but small quantities of milk are also obtained from goat and camel in some region particularly in pastoralist areas (Ketema and Tsehay, 1995).

The overall milk production system in Ethiopia could be broadly classified as pastoral and agro-pastoral, crop-livestock mixed and peri-urban and urban and intensive milk production systems (Kedija et al, 2008: cited in Adebabay, 2009, and Ketema and Tsehay, 1995).

#### **2.3.1. Pastoral and Agro-pastoral Dairy Production**

The pastoralist livestock production system which supports an estimated 10% of the human population covers 50-60% of the total area mostly lying at altitudes ranging from below sea level up to 1500 m.a.s.l. (Ketema and Tsehay, 1995). Pastoralist milk production system is a system mainly operating in the rangelands where the peoples involved follow animal-based life styles that requires them to move from place to place seasonally based on feed and water availability (Adebabay, 2009).

However, because of the rainfall pattern and related reasons, shortage of feed availability milk production is low and highly seasonally dependent (Ketema and Tsehay, 1995). Pastoralists typically rely on milk for food and use animals to save wealth. This system is not market oriented and most of the milk produced in this system is retained for home

consumption. The level of milk surplus is determined by the demand for milk by the household and its neighbors, the potential to produce milk in terms of herd size, production season, and access to a nearby market (Getachew, 2003: cited in Adebabay, 2009).

### **2.3.2. Highland mixed crop-livestock dairy production**

Livestock production system in the highlands is characterized by mixed crop-livestock production and transhumance production system (Azage, et al, 2008). The Ethiopian highlands possess a high potential for dairy development. These areas occupying the central part of Ethiopia, over about 40% of the country (approx. 490.000 km<sup>2</sup>) and are the largest of their kind in sub-Saharan Africa (Tedla et al, 1989 cited in Ketema and Tsehay, 1995). In the highland areas, agricultural production system is predominantly substance smallholder mixed farming, with crop and livestock husbandry typically practiced within the same management unit. In this farming system, the entire feed requirement is derived from native pasture and a balance comes from crop residues and stub grazing (Ketema and Tsehay, 1995).

In mixed crop–livestock agricultural production system, the outputs or products and/or by-products of crop and livestock are the resource input for one another (Sintayehu, 2008). It is non-market oriented and most of the milk produced in this system is retained for home consumption. The level of milk surplus is determined by the demand for milk by the household and its neighbors, the potential to produce milk in terms of herd size and production season, and access to a nearby market. The surplus is mainly processed using traditional technologies and the processed milk products such as butter, ghee, *ayib* and sour milk are usually marketed through the informal market after the households satisfy their needs (Tsehay, 2001).

### **2.3.3. Urban and peri-urban dairy production**

Urban and peri-urban milk farming system is concentrated in and around major cities, and towns characterized by a high demand for milk. This system has been developed in

response to the fast growing demand for milk and milk products around urban centers (Asaminew, 2007: cited in Adebabay, 2009).

Peri-urban milk production possesses animal types ranging from 50% crosses to high grade Friesian in small to medium-sized farms. The peri-urban milk system includes smallholder and commercial dairy farmers in the proximity of Addis Ababa and other regional towns. This sector owns most of the country's improved dairy stock (Tsehay, 2001). The system comprises small and medium size dairy farms located mainly in the highlands of Ethiopia. Farmers use all or part of their land for homegrown feeds. Generally, the primary of the production system is to sale milk as a means of additional cash income (Ketema and Tsehay, 1995).

The urban dairying, like most urban dairying of Ethiopia and other east African countries, is characterized by market orientation and by the types of inputs particularly feeds (Sintayehu 2008). The main feeds sources are agro-industrial by products (Oil Seed Cakes, Bran, etc) and purchased roughage (Sintayehu, 2008 and Ketema and Tsehay, 1995).

Urban dairy farming is a system involving highly specialized, state or businesspersons owned farms, which are mainly concentrated in major cities of the country. They have no access to grazing land. Currently, a number of smallholder and commercial dairy farms are emerging mainly in the urban and peri-urban areas of the capital (Felleke and Geda 2001; Azage 2003: cited in Sintayehu, 2008).

#### **2.3.4. Intensive dairy farming**

This is a more specialized dairy farming practiced by state sector and very few individuals on commercial basis. Most of the intensive dairy farms are concentrated in and around Addis Ababa and are based on exotic purebred stock. The urban, peri-urban and intensive dairy farmers are produce 2% of the total milk production of the country (Ketema and Tsehay, 1995).

## **2.4. Challenges of agricultural knowledge management**

One of the first challenges in understanding exactly what practical knowledge management involves is agreeing on a definition. There is also confusion on knowledge management which is caused by terminology borrowed from the academic community regarding the use of knowledge in artificial intelligence research, much of which doesn't apply to Knowledge Management (Bergeron B., 2003). Another important difficulty in KM is unable to determine what information within an organization qualifies as valuable. Bergeron (2003) stated that all information is not knowledge and all knowledge is not valuable.

The one and the most duty extension activities is providing relevant knowledge and information to the farming community about the improved agriculture technology and create conducive environment for the farmers that able to get relevant knowledge and information at the right time and place. However, some extension packages were not suitable to the farmers' real conditions rather in many parts of the country; extension agents promote technologies as 'blanket recommendations' (Belay and Abebaw, 2004).

There are also poor understandings and coordination among the farmers, market management committee, and input providers regarding to knowledge and information system. Effective performance of knowledge brokers is very essential to overcome this as they are catalysts for the participatory approach (Islam F., 2008) in agricultural production quality and quantity improvement. However, there is no as such organized private knowledge broker, even in the public sector we do not see as a professional science.

The development of Ethiopia's innovation and knowledge system faces several obvious challenges. The most critical challenges are the design and implementation of policies to create and strengthen the formal organizations engaged in the knowledge generating and transferring process (universities, private firms, and research organizations); the policies needed to facilitate innovation among smallholders (e.g., cooperatives and extension services); and the policies designed to mediate between/among these actors. These

challenges often boil down to the need for incentive mechanisms that promote greater cooperation and coordination between different public organizations at different levels (i.e., at the federal and regional levels) and between public organizations and newer players in the system (i.e., between public education, research, and extension) on the one hand, and private companies and civil society organizations on the other (J. Spielman D., et al, 2008).

The case of this study, identifying ways to increase milk production is therefore a major challenge (Devendra C., 2007). As the result, countries like Ethiopia improved agricultural technologies did not reach in to the farming community to improve the production and productivity of the sector. They mainly relay on traditional farming tools and methods (Islam F., 2008).

Farmers such as these possess valuable skills and knowledge, but traditional farming systems by themselves cannot generate all the skills, information and knowledge required for intensification of production, stewardship of the land and increased integration into markets (FAO, 2000). On the other hand in most of the cases they are not interested to share their experience to any farmers. As the result, new knowledge/ technology could not be self-disseminated in the certain area. For instance, according to FAO (1996) farmers never discussed their experiences with new tree species or management methods with others. Therefore, technology dissemination through pilot farmers may not be the most appropriate operation, since they appear to keep their new information mostly to themselves.

In too many countries, the productivity and incomes of the poorer farmers have stagnated or even decreased. One of the reason is the existing agricultural knowledge and information system institutions have not realized local farmers' full potential (FAO, 2000) and unable to consider farmers' knowledge and experience as an important component that determine the success of extension work (Belay and Abebaw, 2004). Rather, development and research institutions used to impose their own ideas and

technologies to the farming community. For example, for many years Ethiopia follows top-down and participatory nature of the extension service is pervasive throughout the county. Top-down approach is not only between DAs and farmer, but also between the woreda and the regional level office. The service is predominantly supply driven (Berhanu et al, 2006). Besides, extension agents tend to work very closely with middle-income farmers and pay little attention to the resource-poor farmers. This seems to suggest that poor farmers and their problems are given marginal attention (Belay and Abebaw, 2004).

As a result, farmers' needs and those of agri-business too often do not sufficiently drive the orientation of agricultural research and extension services, causing lack of relevance and impact. Even when relevant, know-how and technologies are too often not widely taken up by farmers, suggesting also the lack of effectiveness in the transfer of technologies (FARA, 2006).

To deliver right knowledge and technology to the farming community, the extension workers should be able to use various and appropriate communication methods. However, identifying and using appropriate communication methodology is not familiar activities by extension workers. This lack of appropriate extension materials is hampering the promotion and adoption of new agricultural technologies. This implies that proper guidelines and teaching aids had not been given to the extension agents to effectively work and communicate with the local farmers (Belay and Abebaw, 2004).

## **2.7. Conceptual framework**

The key framework for addressing agricultural problems is the Agricultural Knowledge Management System (AKMS), consisting of the farming system, sources of knowledge, methods of communication, and the nature of knowledge utilization in the agricultural production processes. Knowledge is not the same as information: knowledge includes information, understanding, insights, and other information that has been processed by individuals through learning and thought. As farmers make critical decisions throughout the year (e.g. credit applications, crop selection, tillage methods, pest control, harvesting,

post-processing, marketing), a typical household will rely on its own accumulated experience and the support of local organizations (e.g. producer associations, input suppliers, rural credit agencies, extension services, NGOs, schools and others). Thus, farmers are in need of a permanent solution to overcome these barriers to production. By applying a participatory approach called Knowledge Brokering (linking rural farmers with the national and international researchers) the farmers' community has developed a self driven system to manage all those crucial issues (Islam F., 2008).

This study is conceptualized on absorption-diffusion-generation-exploitation framework of knowledge management processes that is developed by Sprenger C. in 1995 (sited in Kerkhof C. et al, 2003). Therefore, the essence of the paper conceptualized in terms of agricultural knowledge absorption, diffusion, generation and exploitation for dairy production and productivity in the study area, Bure woreda, and west Gojjam zone. Knowledge management process and factors that affect knowledge absorption, diffusion, generation and exploitation conceptualized as follows.

**Absorption** is the process of obtaining new knowledge from others or external environment of the farming community. In this case, local community will receive improved agricultural technology, information and knowledge that can meet their farming problems. They can absorb/ acquire new knowledge and information from parents/relations, fellow farmers and cooperatives, personal cosmopolite sources (the extension agents and researchers), the mass media, books and exhibitions. 'School' and 'books' relate to adult literacy classes which some of the farmers attend (Okoye, 1998).

**Transferring** concerns the distribution of knowledge among the members of the farming community. Once the innovative farmers have these improved agricultural technologies, they can share knowingly or unknowingly to their relatives, neighboring and friends in different indigenous and scientific ways. **Generation** involves the development of new knowledge and the process of making explicit knowledge from the existing tacit knowledge. In this case, knowledge can be generated from research centers, development workers, and community organization and even by the farmers, i.e. indigenous knowledge, which can address their problems. **Exploitation** is considered to be the

commercialization or utilization of valuable knowledge (Kerkhof C. et. al, 2003). Farmers of certain community can use the knowledge which is received from external source either by partial modification or as it is or total modification.

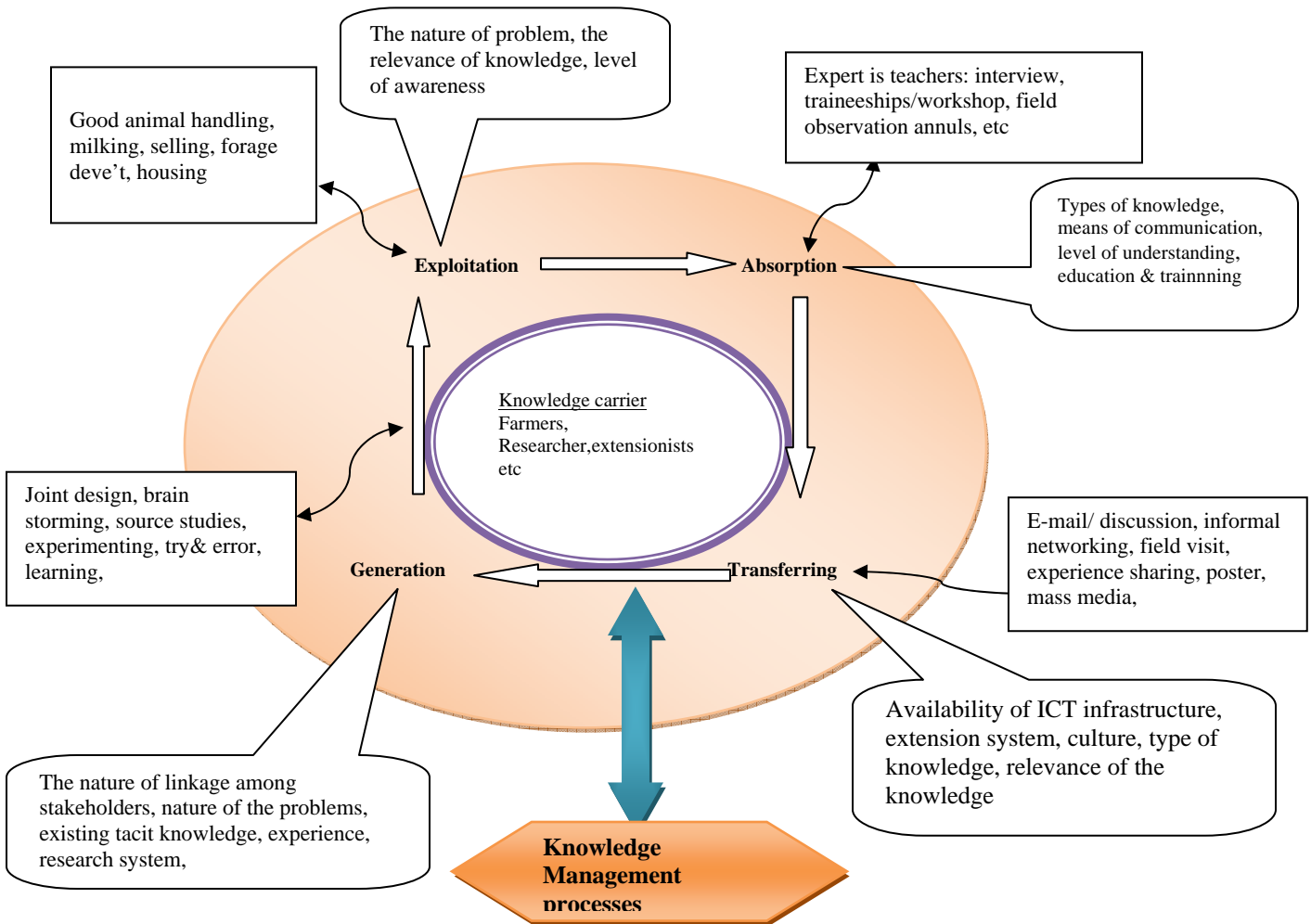
Knowledge management approaches must be participatory, dynamic and responsive to the needs of all users. More specifically, it should address the needs and problems of the farmers in order for them to be more productive and competitive (Malekmohammadi I., 2009). Therefore, in knowledge management process farmers should be active participant in identifying, developing, utilization and diffusion of relevant agriculture technologies, information and knowledge to address dairy production problems.

In knowledge management processes there could be different hindering factors. In the case of knowledge generation, the nature of linkage among stakeholders, nature of the problems, type technology, experiences of dairy producers, system of research etc are the possible factors. The nature of problem, the relevance of knowledge, level of awareness, the availability of the technology can influence knowledge exploitation. In knowledge absorption, the hindering factors could be types of knowledge, means of communication, level of understanding, education & training. In knowledge transferring, Availability of ICT infrastructure and mass Medias, extension system, culture, type of knowledge, relevance of the knowledge

There are also opportunities on KM processes in the study area. The Farmers Field School, for example, starts knowledge identification through technology needs assessment. Extension workers are able to provide appropriate technology. They capture and combine knowledge through field research requiring observation of animal behavior, farmers' meetings and consultations and able to write reports of their observations. Finally, they disseminate the knowledge through exhibits, field days, radio, TV programs and trainings. Which result in community awareness, re-use of knowledge and learning among farmers (internalization stage). Knowledge created through this way can be continuous interacted among the farmers, researchers and extension workers and result in improving their practices benefiting and practically empowering the stakeholders. This

experience proves that knowledge management can operate even outside of the information and communication technology platform (Malekmohammadi I., 2009).

**Figure1. Schematic presentation of agricultural knowledge management and factors that affect knowledge management**



Adopted and modified from Kerkhof C., et al., 2003

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY AND STUDY AREA DESCRIPTION**

This section is presented in to two main parts. The first section of this chapter describes general features of the study area (Bure Woreda). Section two is further classified in to four sections. In the first section sampling technique and in section two data collection technique and in the third section data sources are discussed. Methods of data analysis are discussed in section four.

#### **3.1. Location and Description of the Study Area**

Bure is one of the 15<sup>th</sup> woredas of West Gojjam Administrative Zone of Amhara National Regional State. It is one of the consistently surplus producer woredas of the Region. It is found 400 km northwest of Addis Ababa and 148km southwest of the Regional State capital, Bahir Dar. The woreda has 15 km asphalt road, 84km all weather gravel road and 103 km dry weather road. It is nearby and connected by all-weather road to East Wollega Zone of the Oromia Regional State and Metekel Zone of the Benishangul Gumez Regional State (Yigzaw and Kahsay, 2007). Therefore, Bure has good potential to sell its agricultural products in different regional states.

Population of the woreda is 169,609 of which 143,854 (85%) live in rural area. Its male population is relatively lower than female population. However, male-headed households are around 6 times higher than female-headed households. The number of agricultural households, 21,793, is about eight times higher than the households in the urban areas (Yigzaw and Kahsay, 2007). This indicates that the livelihood of most of the woreda population is dependent on agriculture.

The total area of the woreda is 72,739 ha of which 46.6% is cultivated and average household cultivated land holding is about 1.6 ha. At present, the woreda is divided into 22 rural peasant associations (PAs) and two town associations. Bure and Kuchie are the two major towns in the woreda.

Bure woreda has received 1386 to 1757 mm annual rainfall. Agro-ecologically, it is classified into moist and wet lowland (10%), wet Woina-Dega (82%) and wet Dega (8%). The altitude of the woreda ranges from 713 to 2604 meters above sea level. Long-term annual mean temperature of Bure ranges from 14 °C to 24 °C. Three soil types namely Humic Nitosols (63%), Eutric Cambisols (20%) and Eutric Vertisols (17%) (Yigzaw and Kahsay 2007).

The woreda is endowed with large number of rivers and springs. Farmers use this water resource for irrigated crop production both with traditional and modern river diversion schemes. At present, six modern river diversions are constructed and used to irrigate 614 ha of land. These river diversions are currently serving for about 3,665 households in rural areas (ibid).

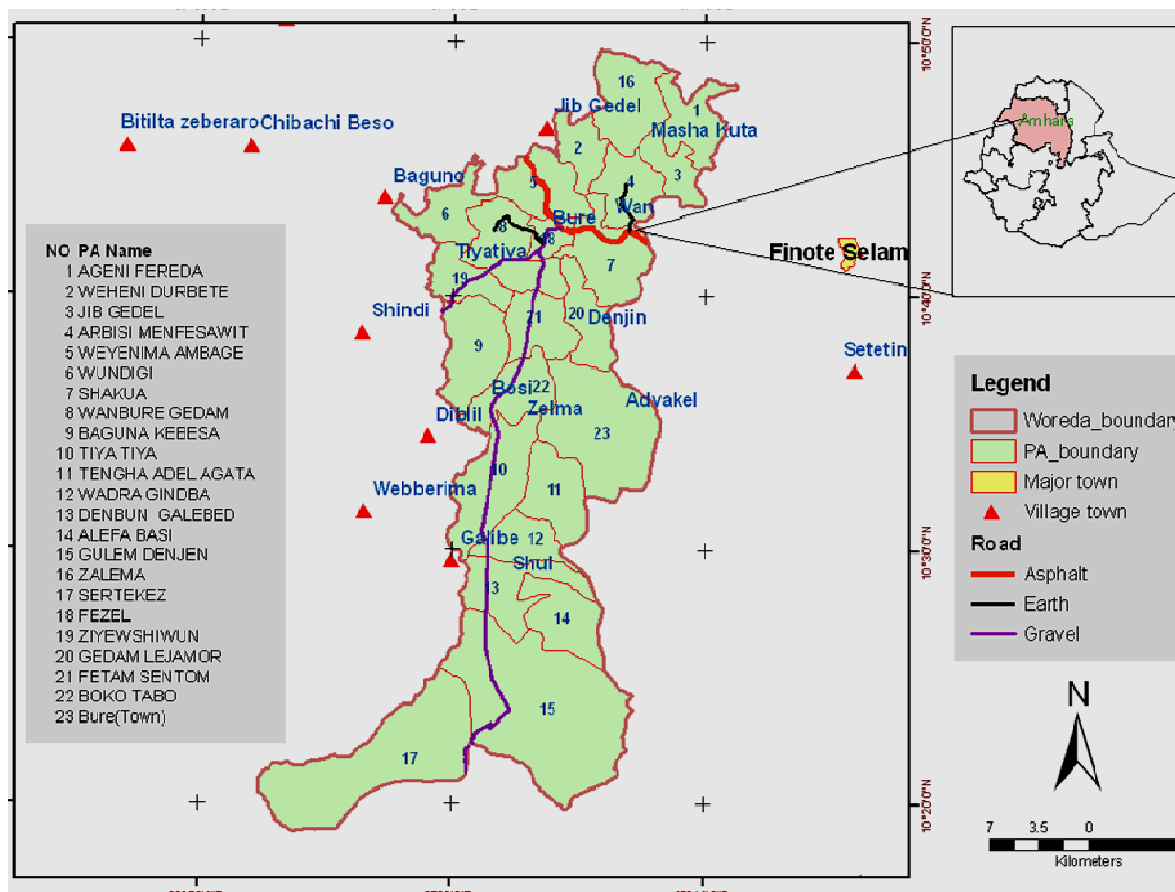


Figure 2, map of the study area (Bure Woreda)

## **3.2. Sampling procedures and methods of data collection**

### **3.2.1. Sampling technique**

Multistage sampling design was used to select representative respondents. According to Adebabay (2009), in Bure woreda there are three milk production systems. These include rural smallholder, peri-urban and urban milk production system. This study was conducted based on these three milk production systems. The list of milk producers of rural, peri-urban and urban milk production system were obtained from the district agricultural and rural development office.

Therefore, first the study area was classified into three dairy production systems based on Adebabay's finding i.e. urban (inside Bure town), peri-urban (around Bure town) and rural (the rural parts of the Bure woreda) dairy productions. Second, from each urban and per-urban milk production system 30 milk producers were selected purposively because of the accessibility and willingness of the respondents. Rural milk production system was further classified into three agro-climate zones. These are lowland, midland and highland. From each agro-climate zones, one kebele was selected purposively based on its dairy production potential and accessibility. Finally, because of the accessibility and willingness of the farmers, 10 farmers were selected purposively from each respective kebeles. Therefore, primary data were collected from 90 dairy producers who are in urban, peri-urban and rural areas; and also from various service providers in the Bure woreda.

### **3.2.2. Data collection technique**

The study was conducted using qualitative and quantitative research design. By doing so, both qualitative and quantitative data were collected. To collect both types of data both primary and secondary sources of data were used. **Qualitative data sources** were included participant observation (fieldwork), key informant discussion, focal group discussion, reviewing documents and texts. To gather information in the qualitative part, this research typically were relied on the analysis of documents and materials. Therefore, extensive related research and literature reasoning were reviewed. In **quantitative part**

**of the study** semi-structure questionnaire were implemented. To ensure the validity of the questionnaire pre-testing was conducted. Finally, well appropriate semi-structured questionnaire was developed and then conducted fieldwork interview.

### **3.2.3. Data sources**

As tried to mention above both primary and secondary data were collected. Primary data were collected using a multitude of data collection techniques from the dairy producers, extension workers, researchers and other which are working on dairy production development in the woreda. Secondary data were collected from of the woreda Agricultural and Rural Development office's annual and quarter reports, different research findings, MIPS's documents, documents of milk cooperative etc.

### **3.2.4. Data Analysis**

Once raw data were collected, quantitative and qualitative methods of data analysis were employed. Descriptive statistical tools such as frequency tables, percentages, graph, mean and standard deviation were used to describe the data. To test the difference among the subsystems on a certain variable, both t-test and chi-square statistical tools were used. Then based on the information obtained from data analysis, generalizations about the population were made. To analysis the data, SPSS (version 15) software was used. For the data gained through key informant interview and unstructured interviews qualitative analysis were applied.

## CHAPTER FOUR

### RESULT AND DISCUSSION

#### 4. 1. Background Information of Respondents

Knowledge on characteristics of agricultural producers and the production system play an important role in facilitating the design and implementation of appropriate development strategy for a certain locality in general and agricultural development in particular. Heterogeneity in terms of land holdings and source of livelihood, sex, education and other demographic factors influence the capacity of dairy producers to demand and pay for services(Anteneh, 2008).

As it was mentioned in research methodology section, respondents were selected systematically from the target population of the study who were engaged in dairy farming at Bure Woreda. Personal background information of the sampled respondents is illustrated in the following tables.

**Table 1,** Sex, age, marital status and religion of respondents in the study area

Variables	Frequency	Percent	Cumulative%
<b>Sex</b>			
Male	88	97.8	97.8
Female	2	2.2	100.0
<b>Age</b>			
20-45	47	52.2	52.2
46-60	32	35.6	87.8
above 60	11	12.2	100.0
<b>Marital Status</b>			
Single	1	1.1	1
Married	87	96.7	87
Widow or widower	2	2.2	2
<b>Religion</b>			
Orthodox	89	98.9	98.9
Muslim	1	1.1	100.0

*Source: own survey 2010*

As table 1 shows that the sampled respondents have different background information. As far as sex of the sample respondent is concerned, majorities of the respondents are male (97.8%) and the rest 2.2% are female. The overall mean age of the respondents is

45.93 with 11.5 year of standard deviation and range from 27 to 82 years (annex 1, table 3), and is almost equal to 45.08 years which was reported in the same district (Adebabay 2009). Out of the total sampled respondents (N=90), the majorities of the respondents (52.2%) are between 20 to 45 years of age group. The rest of the respondent with 46 to 60 years and above 60 years of age are 35.6% and 12.2%, respectively. This figure implies that the majority of the respondents who engaged in dairy production are the more productive group of the society.

As far as the marital status of the respondents is concerned, 96.7% of the respondents are married. This is followed by Widow or widower and singled respondents, 2.2% and 1.1%, respectively. Regarding religion of the respondents, 98.9% of sampled respondents are orthodox religion follower. The rest 1.1% of the respondent is Muslim religion follower and there is no any other religion follower in the study area.

**Table 2,** educational status of the respondents

Educational status		N	Dairy subsystems			Total	Test value ( $\chi^2$ )	Sig.
			Urban	Peri-urban	Rural			
Illiterate	N	1	6	2	9	56.74	***	
	%	1.1%	6.7%	2.2%	10.0%			
Able to read and write	N	2	16	16	34			
	%	2.2%	17.8%	17.8%	37.8%			
One to four grade	N	2	3	6	11			
	%	2.2%	3.3%	6.7%	12.2%			
Five to eight	N	3	4	4	11			
	%	3.3%	4.4%	4.4%	12.2%			
Nine to ten	N	2	1	0	3			
	%	2.2%	1.1%	.0%	3.3%			
Eleven to twelve grade	N	4	0	2	6			
	%	4.4%	.0%	2.2%	6.7%			
Diploma	N	13	0	0	13			
	%	14.4%	.0%	.0%	14.4%			
Degree	N	3	0	0	3			
	%	3.3%	.0%	.0%	3.3%			
Total	N	30	30	30	90			
	%	33.3%	33.3%	33.3%	100.0%			

*Source: own survey 2010*

The respondents in the study area had different educational status. As table 2 indicates that the three subsystems showed statistically significant difference in educational status at 1% probability level. Majorities of the respondents (37.8%) in the study area are able to read and write, and is comparable to other study with the 38.1% of the dairy producers in the Bure district (Adebabay 2009). On the other hand, there are also respondents who are Diploma and Degree holder, 14.4% and 3.3%, respectively. In the study area, the majority uneducated and less educated respondents (i.e. illiterate, able read and write and grade one to four) were found at rural and peri-urban dairy subsystem whereas the more educated respondents were at urban subsystem. For example, the proportion of respondents who are illiterate in the rural area is 22.2%, 66.7% in peri-urban and only 11.1% in urban subsystem. On the other hand, 100% of degree and 100% of diploma holder respondents were urban dairy producers.

In the urban subsystem, majority of respondents were diploma holders (14.4%). Those who are from grade 11 to grade 12 form 4.4%. About 1.1% of the respondents are illiterate. In both peri-urban and rural subsystem, the majority of the respondents are able only to read and write and there is no degree or diploma holder.

#### **4.1.1. Family Characteristics of the Respondent**

The family characteristics of respondents in the study area are summarized in the following tables. The average family size of the respondents is 6.4 persons/ HH. It is lower than 7.71 persons/HH in Bahir Dar Zuria and Mecha woredas study reports (Asaminew 2007). With in a family, the average size of male and female is 3.3 and 3.2 individuals.

**Table 3,** family size of the respondent

	Family size of the respondents	Male in the family	Female in the family
Mean	6.4	3.3	3.2
Std. Deviation	1.8	1.3	1.1
Minimum	3	1	1
Maximum	13	7	6

*Source: own survey 2010*

As the table 4 shows, majorities of the respondents have 15 to 40 years of age family members and its average size is 3.13 with 1.56 standard deviation.

**Table 4,** age composition of the respondents' family

Scale age	Mean	Minimum	Maximum	Std. Deviation
<u>N</u> of the family member below 14 years old	2.38	0	5	1.40
<u>N</u> of the family member b/n15 to 40 years old	3.13	1	8	1.56
<u>N</u> of the Family member b/n 41 to 60 years old	0.88	0	4	0.79
<u>N</u> of the family member above 60 years old	0.13	0	2	0.37

*Source: own survey 2010*

In the study area, with in the family of the respondents, the average size below 14 years old, between 41 to 60 years and above 60 years old age are 2.38, 0.88 and 0.13, respectively. This figure implies that the majority of sample respondents have energetic and productive family member and less dependent member.

**Table 5,** educational composition of the respondents' family

	Minimum	Maximum	Mean	Std. Deviation
Illiterate	0	5	1.5	1.3
Read and write	0	3	0.5	0.7
Between grade one to four	0	7	1.6	1.4
Between five to eight	0	9	1.3	1.6
Between grade nine to ten	0	5	0.6	0.9
Between grade 11 to 12	0	3	0.3	0.6
Diploma holder	0	5	0.4	1.0
Degree holder	0	2	0.2	0.5

*Source: own survey 2010*

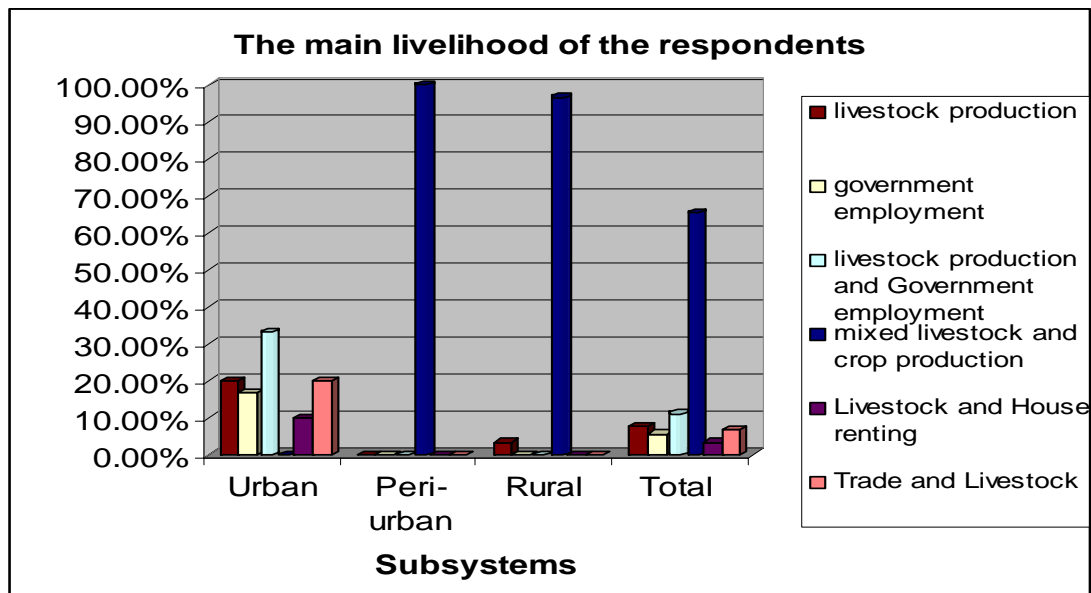
Education is an important entry point for empowerment of rural communities and an instrument to sustain development (Adebabay, 2009). In the study area, the nature of family composition regarding educational status was varying from family to family but we can get all level of educational status. Some of the families have members with

different educational level while others have members only with some level of education. As table 5 shows, majority family members of the respondents have attained grade levels between one and four and its average size is 1.6 members with 1.4 standard deviation which is comparable with other study to 1.53 with 0.68 standard deviation in Bahir Dar Zuria dairy producers' family (Asaminew 2007). The overall mean of illiterate and between grade five and eight are 1.5 and 1.3, with 1.3 and 1.6 standard deviation, respectively. There are also few higher educated family members in the study area.

#### 4.1.2. Socioeconomics characteristics of the respondents

##### 4.1.2.1. Livelihood of the respondents

As bar graph 1 shows, the major source of livelihood in study area for dairy producers is mixed crop-livestock production. In the same regard, cattle production with government employment is the second most important means of living of the respondents. Thirdly, there are respondents solely depending on livestock/dairy production as source of livelihood. This has a great implication on livestock production as on important source of livelihood in the study area. So exerting some efforts on cattle production improvement is very important in order to enhance the income of dairy producers in the study area.



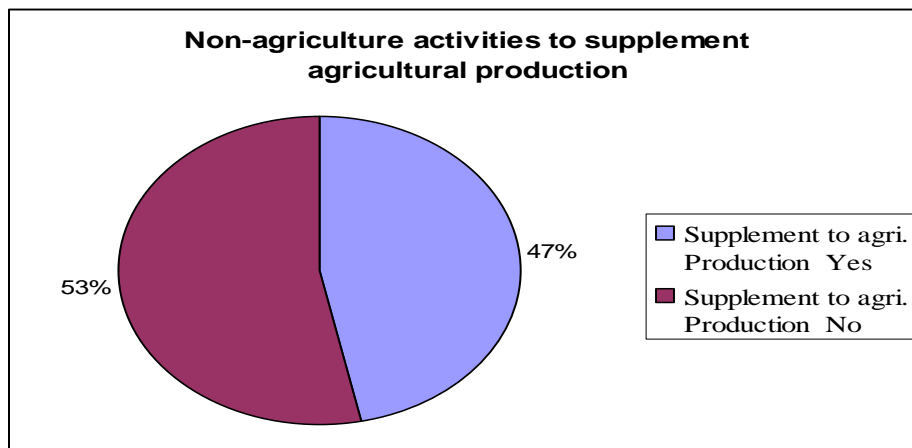
Graph 1, main livelihood of the respondents

Source: own survey 2010

The three dairy subsystems showed highly statistically significant differences in source of livelihood at 1% probability level. Within crop-livestock mixed livelihood, 50.8% and 49.2% respondents are peri-urban and rural dairy producers. No respondents used mixed crop-livestock production as means of livelihood in urban dairy production subsystem (annex 1, table 16). This result agreed with the result of Anteneh at Debrezeit milk shed of *Ada'a* district (Anteneh 2008). On the other hand, in urban subsystem, the major source of livelihood for the respondents is livestock production with government employment/monthly salary. Out of which, 100% of livestock production with government employment/monthly salary livelihood is used only for urban dairy producers.

In the crop-livestock mixed agriculture production system the average earns of money per year for the respondents is 458.3 ETB with 5871.1 ETB standard deviation (Annex 1, table 2). This maximum amount of money obtained from this sector could be due to extensive and intensive crop production system and there were individuals who were involved on ox fattening activities.

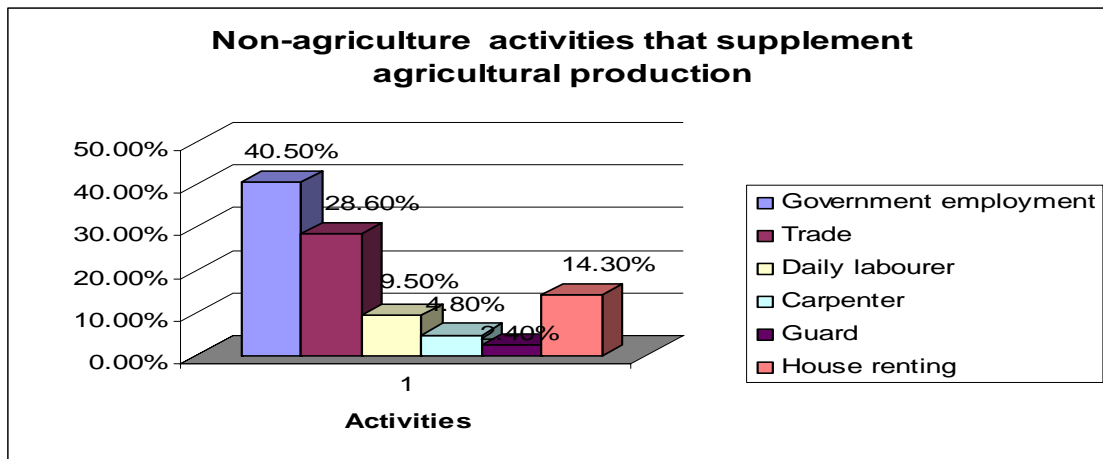
In the study area, the majority dairy producers do not supplement their agricultural production activities. About 47% of dairy producers supplement their agricultural activities with different non-agricultural activities (figure 2).



Graph 2, supplement to agricultural production

Source: own survey 2010

As figure 3 indicates, government employment (40.5 %) is major additional source of livelihood for the respondents in addition to their agriculture activities. There were also respondents that can supplement their agricultural activities with other means of livelihoods. Some of them were trade (28.6%), house renting (14.3%), daily laborer (9.5%), carpenter (4.8%), and Guard (2.4 %). The total average earning from these non-agricultural activities is 9808.04 ETB with standard deviation 24397.18 per year (Annex 1, table 2). The maximum amount of money is obtained from trading activities.



Graph 3, activities to supplement agricultural production

Source: own survey 2010

#### 4.1.2.2. Farming characteristics

##### 4.1.2.3.1. Land holding and land use pattern

Having land has its own meaning in agricultural production and technology adoption for the rural people. Those who have large size of farmland can produce large amount of agricultural production, can be risk aversion farmers, and in turn, their income can be improved. Beside, they can adopt improved agricultural technology to enhance their agricultural production. As table 6 shows, the average land holding per household in the study woreda was 0.95ha. This is smaller than the average land holding of 2.2ha per household in the highland of North Gonder woreda reported by Azage (2009). The variation across the subsystems in average land holding per household was statistically

significant at 1% probability level (Table 8). Some of dairy producers did not have any piece of land and there were dairy producers who have 3.37ha of land.

The main land use patterns, in order of area coverage, are crop production, tree and grazing land (table 6). The overall mean land use pattern per household is 0.84 ha for crop production, 0.05 ha for tree plantation and 0.03 ha for grazing land with other minor land use pattern. This finding reveals that the majority of dairy producer use their land for crop production, tree plantation and grazing land. They gave less attention for improved forage development and fruit production because the land covered with these productions is very small (table 6). So efforts should be made to create awareness on the dairy producers to give piece of land to improve forage development since they are dairy producers.

**Table 6,** Land holding and use pattern

Land use patterns	Minimum	Maximum	Mean	SD
Crop land in ha	0.00	3.00	0.84	0.86
Tree plant in ha	0.00	0.75	0.05	0.11
Vegetable in ha	0.00	0.25	0.01	0.05
Fruit in ha	0.00	0.25	0.01	0.05
Forage in ha	0.00	0.25	0.01	0.03
Grazing land in ha	0.00	0.50	0.03	0.09
Total farm	0.00	3.37	0.95	0.96

SD – standard deviation

*Source: own survey 2010*

#### **4.1.2.3.2. Livestock holding and herd structure**

Livestock rearing is an integral part of crop-livestock mixed production system of the high land part of Ethiopia. As discussed above Bure district is also highly dominated with mixed agricultural production system. As the result dairy producers in the study area have all types of animal that can use for different purposes. Cattle rearing are the predominant one. As the table 7 shows, the respondents have different types of animals with both crossbreed and local breed types. From large animals, the major species in the household

livestock herd structure is large ruminant (i.e. cow, ox, heifer and the likes). From larger ruminant, cow is the major one in the household cattle herd structure in both local and crossbreed. The overall average number of local cows in the district is 1.89 head/hh, which is less than 2.4 heads/hh in North Gonder Woredas in Ethiopia reported by Azage (2009). The overall average number local ox in the woreda is 1.53 heads/hh and local heifer 1.04 heads/hh. The average number of local bulls and calf is 0.72 heads/hh and 1.32 heads/hh, respectively.

**Table 7,** Livestock holding and their composition

Animal type	Local				Cross			
	Min	Max	Mean	SD	Min	Max	Mean	SD
Ox	0	6	1.53	1.5	0	2	0.1	0.2
Cow	0	10	1.89	1.6	0	6	0.6	1.2
Heifer	0	5	1.04	1.2	0	3	0.2	0.6
Bull	0	4	.72	0.9	0	2	0.2	0.5
Calf	0	4	1.32	1.2	0	5	0.5	1
Chicken	0	34	2.67	5.2	0	27	0.5	3.
Sheep	0	11	1.40	2.3				
Goat	0	12	.31	1.5				
Hors	0	1	.01	0.1				
Mule	0	1	.01	0.1				
Donkey	0	3	.43	0.8				
Honey bee colony	0	30	.74	3.4				

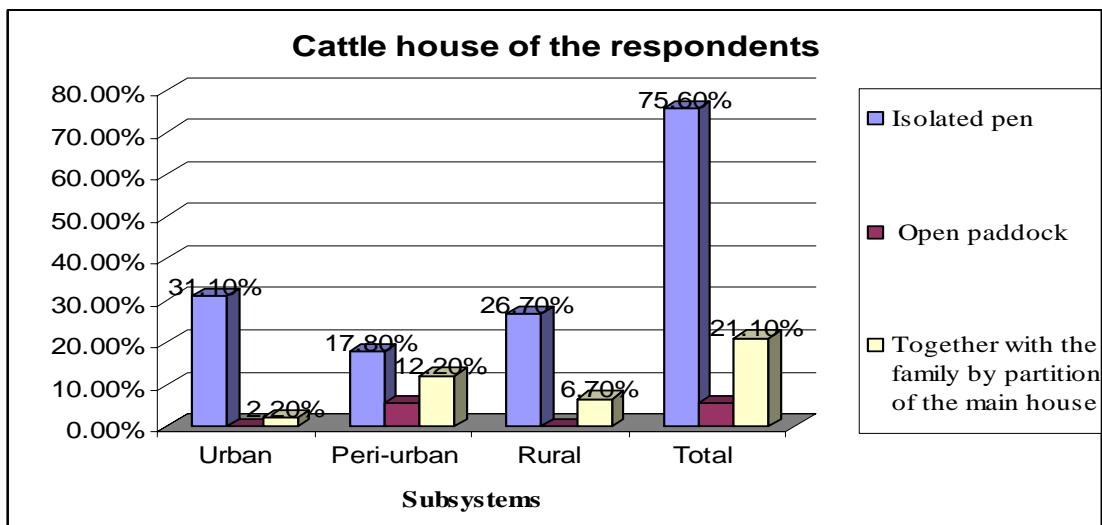
*SD= standard deviation*

In addition, the respondents use crossbreed cattle to enhance milk production. The overall average number of cross breed cow in the study area is 0.6 heads/hh. As the result the average number crossbreed calf (0.5 heads) was higher than other types of crossbreed cattle (table 8). Dairy producers are not interested to have crossbred bull in their herd due to shortage of feed and house. They also indicated that crossbred bull do not give any agricultural benefit except computing for the scarce animal feed. Therefore, they sold such types of animal at their calf stage.

In the study area, dairy producers also reared small types of animal, such as sheep, goat and chickens. They have large non-ruminant animal for transport and drought power.

#### 4.1.2.3.3. Cattle housing

The purposes of cattle housing in Bure district are to protect cattle from theft and from extreme weather conditions (Adebabay, 2009). In the study area, there are three types of animal housing situations. The majority dairy producers (75.9 %) use isolated pen house for their animal, which was lower than Adebabay's (2009) finding (57.3%) in the same district, and followed by together with family by partitioning of the main house (21.1%) and few respondents use open paddock as cattle house. Similarly in all subsystems, isolated pen housing system is highly used by dairy producers and followed by together with family house (figure 4).



Graph 4, types of cattle housing

Source: own survey 2010

#### 4.2. Dairy production system

According to the survey results, in Bure district broadly there are two milk production systems. Namely: crop–livestock mixed dairy production system and urban dairy production system. The mixed crop-livestock milk production system is found in the rural part of the district and around Bure town and the urban milk production system is found in Bure town.

In the district the mixed crop-livestock milk production systems is farther classified in to two subsystems such as peri-urban and rural dairy production systems. As a result, in the

district there are three specific dairy subsystems. Namely: urban, peri-urban and rural dairy production system. This study agreed with Adebaby's (2009) finding in the study woreda. To classify these dairy subsystems different criteria were under used. Some of the criteria were total farm size per individual household, number of local and crossbred ox, crossbred cow ownership, and number of local and crossbred cow, type of animal housing; and daily milk production, consumption and selling (table 8).

As discussed above the average size of land holding in the study area is 0.95 ha and it is statistically significant difference across the subsystems at 1% probability level. In the urban dairy subsystem, no respondents have farmland. In peri-urban and rural dairy subsystems, the overall average land holding per individual dairy producers is 1.06 and 1.8 ha of farmland, respectively. There is high statistically difference in the number local ox, local cow and crossbred cow across the three dairy subsystems at 1% of probability level. The number of crossbreed ox among subsystems does not show difference.

**Table 8**, Dairy production system characteristics

Variables		Subsystem			Test value ( $\chi^2$ or t-test)	Sig.
		Urban	Peri-urban	Rural		
Total farm side	Mean	00	1.06	1.80	156.41	***
No of local ox	Mean	0	2	3	95.09	***
No of cross ox	Mean	0	0	0	4.02	NS
Crossbred cow ownership					43.59	***
Yes	%	73.3	10	3.3		
No	%	26.7	90	96.7		
No of local cow		2	2	3	42.38	***
No crossbred cow		2	0	0	51.85	***
Cattle housing						
Isolated pen					13.48	***
Yes	%	93.3	53.3	80		
No	%	6.7	46.7	20		
Open paddock					10.59	***
Yes	%	0	16.7	0		
No	%	100	83.3	100		
Partition the main house						
Yes	%	6.7	36.7	20	8.14	**
No	%	93.3	63.3	80		
Milk production/ day	Mean	9.35	1.22	1.96	63.58	**
Milk consumption/ day	Mean	1.6	1.15	1.95	17.34	NS
Milk sold/ day	Mean	7.72	00	00	69.23	***

Note: \*\*\*, \*\* and \* indicates that statistically significant difference at 1%, 5% and 10% probability level.

NS=not statistically significant different

The average number of local ox, local cow and crossbred cow per individual household in urban subsystem was 0, 2 and 2, respectively, while in peri-urban subsystem was 2, 2 and 0, respectively. In rural subsystem, the average number of local ox, local cow and crossbred cow per household was 3, 3 and 0, respectively (table 8). This finding implies that there is a shortage of crossbred cow in peri-urban and rural subsystem rather local breed cows are the major one for milk production. As the result, the amount of their milk production is below the expected amount.

The average amount of milk production per household in the study area is 1.57 liters per day. The variation across the three subsystems in amount of milk production and sold is statistically significant at 5% and 1% probability level, respectively, while in milk consumption is not statistically different. In the urban subsystem, the average amount of milk produced per individual household level is 9.35 liters and out of which 7.72 liters is sold. In peri-urban and rural dairy subsystems, 1.22 liter and 1.96 liters are produced per day per individual household, respectively (table 8). In these two subsystems there is no a habit of milk selling to the market rather they totally use the milk for household consumption and calf feeding.

Regarding ownership of crossbred cow, there is statistically significant difference among the three dairy subsystems at 1% probably level. From the total crossbred cow ownership, 73.3% of the respondents are found in urban dairy subsystem, 10% in the peri-urban and 3.3% in the rural subsystem (table 8). This implies that the amount of milk production in the urban subsystem is higher because the proportion of more productive milking cows (crossbred cow) in the urban subsystem is higher than peri-urban and rural dairy subsystem.

On cattle housing character in the study area, there is statistically significant difference among the three subsystems. Namely: isolated pen, open paddock and partition from the main house types show statistically significant difference at 1%, 1% and 5% probability level, respectively. From the total urban dairy producers, 93.3 % of the respondents' animal house is isolated pen. In peri-urban subsystem, 53.3 % of them have isolated pen

and 80% in the rural. In urban and rural subsystems, no respondents have open paddock animal housing, while 16.7% of the peri-urban dairy producers keep their animal in open paddock housing condition. There are also dairy producers who are sharing their main living house with their cattle. According the survey result, 36.7% of peri-urban dairy producers and 20% of rural dairy producers share their main house with their animal by partitioning their main house. Only 6.7% of urban dairy producer respondents are living with their animal in one house (table 8).

#### **4.2.1. Purpose of cattle rearing**

In Ethiopia cattle rearing is carried out for different purposes. It varies place to place based on socioeconomics status, agro-ecology, cultures of the society and the likes. Farmers have their own reasons why they raise cattle. In some parts of Ethiopia, cattle rearing is carried out for social value (like gift for marriage ceremony, it use as wealth measurement etc.), and it used as coping mechanism during crop failures, draught power and as source of in come. In the study area, the survey tried to explore the purpose of cattle rearing based on the respondents' priority.

The major objectives of cattle rearing in the study area are draught power (ranked 1<sup>st</sup>), milk and milk products (ranked 2<sup>nd</sup>) and source of income (ranked 3<sup>rd</sup>) (annex one, table 11). This result is similar to study in North Gonder Woredas (Azage et al 2009) and partially agreed with study in Bahir Dar Zuria and Mecha Woredas (Asaminew 2007). *Bure* district is one of the highly potential areas on crop production in the country. Therefore, farmers in the district need more draught power for crop production. That is why respondents in this study give high priority cattle rearing for to obtain draught power.



*Figure 3, Animal for power draught*



*figure 4, milking cow*

The major objectives of cattle rearing in urban dairy production system are for milk production (ranked 1<sup>st</sup>), source of income by selling live animal or their products or both (ranked 2<sup>nd</sup>) and household consumption (ranked 3<sup>rd</sup>). In the urban area, types of cattle that majorities of the respondents sold as source of income are male animal especially male calf and bull. 33.3% of urban dairy producer respondents sold male calf and 16.7% of the respondents sold both male calf and bull. Beside, there were also other types of animal and animal products that can be sold to generate income. Some of them are ox; old animal, unproductive cows, milk, butter etc (annex one, table 5).

In both rural and peri-urban dairy production system, respondents have the same priority in the purpose of cattle rearing. Their first priority of cattle rearing is draught power and followed by milk production and used as source of income (annex 1, table 11). Both rural (6.7%) and peri-urban (46.7%) dairy producers sold old animal as source of income. Other types of animal can also be sold as source of income. Some of them were cow, old ox, any type of calves etc (annex 1, table 5). In both peri-urban and rural subsystems, no dairy producers sell milk as source of income because there is no a habit of selling milk.

In the study area, the overall average amount of money that respondents obtained from selling their animal in one year is 1,650.1 ETB with 1,336.9 standard deviation. The amount of money that obtained from animal selling per year in the urban subsystem is higher (1,909 ETB) than rural (1,674 ETB) and peri-urban (1,454 ETB). It is due to dairy farming system practices in the urban subsystem are relatively business oriented than the

rural and peri-urban subsystems. This difference is not statistical significant among the three subsystems (Annex 1, table 6).

#### 4.2.2. Labor division in cattle production management

Cattle rearing by its nature, it is labor-intensive farming activities. It needs adequate and large labor to run a certain dairy farming from its homestead to outside the homestead management activities. Women undertake most of dairy management activities, which are carried out in side and around homestead, while male member of the family undertake those activities, which are carried out outside the homestead. However, according group discussion all members of the family can participate in all types of activities but their level of participation varies across the types of activity. As table 9 shows, animal house cleaning (18.7%), milk processing (17.8%) and selling milk and milk products (16%) are mainly performed by homemaker. Beside, homemaker of the respondents carries out other dairy management activities. Such as cattle feeding in the home (18.1%), milking (12.3%) and calves caring (6.6%) with other miner activities. From this finding, it implies that housewife has great role in dairy management activities in the study area. Therefore, we need to exert efforts to build their capacity in order to make them active participant in dairy developmental activities.

**Table 9,** Labor division on cattle rearing in the household

	Husband	Wife	Youth female	Youth male	Children	Relative	Daily laborer
	%	%	%	%	%	%	%
Cattle keeping	11.4	4.5	11.0	19.4	6.6	15.8	27.0
Cattle feeding	19.1	18.1	18.5	24.5	5.3	20.8	21.3
Calves caring	5.1	6.6	18.9	18.6	64.5	17.8	14.6
Milking	17.9	12.3	6.6	12.3	3.9	13.9	13.5
Milk processing	0.7	17.8	15.9	4.0	2.6	6.9	2.2
Animal house cleaning	8.5	18.7	21.1	13.4	11.8	17.8	15.7
Selling milk product	2.2	16.0	7.5	4.3	2.6	4.0	5.6
Cattle selling	16.9	2.4	.4	1.2	1.3	3.0	0
Breeding decision	18.2	3.6	.0	2.4	1.3	.0	0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100</b>	<b>100.0</b>	<b>100.0</b>	<b>15.8</b>	<b>100</b>

*Source: own survey 2010*

Female youths are also actively involving in dairy management activities. Regarding this, the major tasks of female youths in the family are animal house cleaning (21.1%), calves caring (18.9%), cattle feeding in the home (18.5%), milk processing (15.9%) and cattle keeping (11%). On the other hand, the husband mainly carried out cattle breeding decision (18.2%) and cattle selling (16.9%) activities. Beside these, husband also perform cattle feeding (19.1%), cattle keeping (11.4%) and milking (17.9%) and with other activities.

This finding implies that female and male are equally important in dairy management activities in the household. Therefore, equal recognition and respects should be given to both female and male members of the household regarding to their roles in dairy management. Therefore, governments should consider the roles of females in dairy management during planning and implementing in dairy production development.

### **4.3. Knowledge management on dairy production**

In many cases, farmers try to find a solution for their agricultural production problems by themselves. Different development and research organizations and NGOs are also working to solve agricultural production problems. As the result they are able to, relatively, enhance agricultural production and productivity and in turn improve the economic status of the nations.

In the study area, farmers who are engaged in dairy production try to find solution for their dairy production problems by themselves. As discussed above in Bure district there are three dairy production subsystems. The overall average years that the respondents engaged in dairy production system is 14.79 years with 11.42 years of standard deviation. Statistically there is no significant difference across subsystems in the average number of years that dairy producers engaged in dairy production. In both urban and peri-urban subsystems, dairy producers have equal experience in dairy production i.e. 14 years experience. In the rural dairy subsystem, the average years of the respondents engaged in dairy production is 17 years with 13 years of standard deviation (see annex 1, table 8). Within these years, they acquired adequate experience/knowledge on dairy production

management. They acquired this experience/knowledge from different sources, through different means, utilize in different forms, shared to other dairy producers. The details of these KM process in the study area are illustrated in the following subchapters of this paper.

**Table 10**, Reasons of the respondents for engaging in dairy farming

Variables		N	%	Cumulative %
Valid	Milk consumption	12	13.3	13.3
	Milk consumption & animal selling	2	2.2	15.6
	Milk consumption & obtain ox	22	24.4	40.0
	Milk consumption & Selling animal	2	2.2	42.2
	Milk consumption & selling animal	4	4.4	46.7
	Milk consumption, selling animal & obtain ox	20	22.2	68.9
	Milk selling	3	3.3	72.2
	Milk selling & animal selling	1	1.1	73.3
	Milk selling & consumption, animal selling	9	10.0	83.3
	Milk selling & consumption, animal selling, obtain ox	2	2.2	85.6
	Milk selling and consumption	8	8.9	94.4
Obtain ox	5	5.6	100.0	
Total		90	100.0	

N-number of respondents

*Source: own survey 2010*

Dairy producers in the study area have different reasons why they engaged in dairy farming activities. They are involving in dairy farming for milk consumption and selling, obtaining ox used for draught power, as source of income by selling animals and their products etc. As table10 shows, the major objective of the majority respondents engaged in dairy farming is for milk consumption and obtaining ox (24.4%). 22.2 % of respondents involved in dairy farming for milk consumption, animal selling and obtaining ox and 13.3 % of respondents for only milk consumption purpose. From the total respondents, only (N=1) 1.1% of respondent is engaging in dairy farming for milk and animal selling. This figure implies that dairy farming in the study area is not

commercialized and market oriented farming rather it is using for household consumption. Therefore, government should exert efforts to create awareness to encourage market oriented and commercialized dairy farming system.

#### **4.3.1. Breed types for dairy farm**

In Bure district both local and cross breed cows are used for dairy production. As table 11 shows, majorities of the respondents (78.9%) are using local breed cow for milk production, while the rest 21.1 % of the respondents use cross breed. The three subsystems show statistical highly significant difference in breed types, which are used for milk production at 1% probability level. Majorities of the respondents in the urban subsystem use crossbreed cow. Out of the total crossbreed cow users, 94.7% of respondents are urban dairy producers and the rest 5.3% are peri-urban dairy producers. No respondents use crossbreed cow in the rural subsystem for dairy production purpose. All the respondent in the rural part of the district are totally depending on local breed dairy cows that have less potential in milk production.

Across all the subsystems, a local breed cow is used for milk production in the district but its proportion varies among subsystems. As table 11 shows, out of 78.9% of local breed cow users, majorities of the respondents (33.3%) are rural dairy producers and 32.2% and 13.3% of the respondents are peri-urban and urban dairy producers.



*Figure 5, crossbreed cow*



*Figure 6, local breed*

According to group discussion, the higher proportion of crossbreed cows in the urban subsystem is due to relatively good supply of crossbreed cow/ heifer, AI and information in the town than rural part of the district. As the result, peri-urban and rural dairy producers are not able to get expected amount of milk production. So efforts should be mad to alleviate this shortage by GO and NGOs in the study area.

**Table 11,** Main breed type used for dairy production

Main breed type			Dairy subsystems			Total	Test value	Sig.
			Urban	Peri-urban	Rural			
Local breed	N		12	29	30	71	40.96	***
	% within breed		16.9%	40.8%	42.3%	100.0%		
	% of Total		13.3%	32.2%	33.3%	78.9%		
	N		18	1	0	19		
	% within breed		94.7%	5.3%	.0%	100.0%		
	% of Total		20.0%	1.1%	.0%	21.1%		
Total	N		30	30	30	90		
	%		33.3%	33.3%	33.3%	100.0%		

*Source: own survey 2010*

In the study district, respondents mentioned different reasons for preference of breed type for milk production purpose. Some of the respondents (20%) prefer local breed cow due to their drought and disease resistance nature and other (20%) use local breed due to shortage of crossbreed cow/heifer in the district. On the other hand, in the district, there are respondents who use crossbreed cow for their dairy farm. From the total respondents, 17.8% of the respondents prefer crossbreed cow due to their high potential in milk production and other 6.7% due to both their high potential in milk production and easily manageable in house (annex 1, table 9).

### 4.3.2. Sources of dairy cattle

The sources of the first local or crossbreed cow/heifer of the respondents in order to start up their dairy farm are summarized in table 12. In *Bure* district, the respondents can get the first milking cow from different sources. Majorities of the respondents have got their local breed milking cow to start up their dairy farm from traders (44.7%) in the market and followed by neighbor (27.6%) and their fathers (15.8%). From the total crossbreed cow users (N=27), 55.6% of the respondents have got the first crossbreed cow from traders and 29.6% from their neighbors.

**Table 12**, Frequency distribution of respondents on sources of local and crossbreeds

Variables		N	Percentage
Source of local breed dairy cattle	Father	12	15.8%
	Relative	9	11.8%
	Neighbor	21	27.6%
	Trader	34	44.7%
	Cooperative	0	0.0%
Total		76	100%
Source of Crossbreed dairy cattle	Father	0	0.0%
	Relative	0	0.0%
	Neighbor	8	29.6%
	Trader	15	55.6%
	Cooperative	1	3.7%
	BWARDO	2	7.4%
	Friend	1	3.7%
Total		27	100%

N= number of respondents, *Source: own survey 2010*

Dairy producer respondents in the study area could get local milking cow through purchasing (72.4%), as gift from their father or relatives (24.1%) and breeding (using bull) (3.4%). The major means of getting crossbreed cow in the study area is purchasing (75%) from the traders, neighbors, BWARDO and *Bure Damot* milk cooperative. About 25% of the respondent have got crossbreed milking cow through breeding (using AI) (Table 13), which is higher than the 24.1% of reported around Debrezeit milk shad, *Ada* district, in Ethiopia (Anteneh 2008).

**Table 13**, Frequency distribution of respondents on means of getting local and crossbreed milking cow

		Responses	
		N	Percent
Means of getting local breed milking cow	Purchasing	63	72.4%
	Gift	21	24.1%
	Breeding	3	3.4%
Total		87	100.0%
		Responses	
		N	Percent
Means of getting crossbreed milking cows	Purchasing	24	75.0%
	Breeding/ AI	8	25.0%
Total		32	100.0%

*Source: own survey 2010*

#### **4.3.3. Farmers' mechanism to improve milk production**

As discussed above dairy producers have 14-year experience in dairy production. With these years of milk producing experience, farmers in the study area use different mechanisms to improve their cattle milk production. Majority respondents (89.9%) believe in keeping the health condition of their animal is the most important mechanism to improve milk production and 79.8% of the respondents feed green pasture to their milking cows, 66.3% of the respondents exercise animal selection, and 46.1% of the respondents use crossbreed cow to improve milk production (table 14) in their dairy farm.

In the study area, few respondents also used concentrate animal feed (43.8%), give special treatment to milking cow from its calving stage (21.3%) and increase number of milking cow (15.7%) as mechanisms to improve milk production in their dairy farm. In the contrary, only two respondents (one from peri-urban and rural subsystems) do not use any mechanisms to improve their milk production in their dairy farm.

**Table 14,** Frequency distribution of the respondents on milk improvement mechanisms

Mechanisms to improved milk production		Sub system			Total	Test value (x <sup>2</sup> )	Sig.
		Urban	Peri-urban	Rural			
Improved crossbred cow	N	23	9	9	41	17.56	***
	%	25.8%	10.1%	10.1%	46.1%		
Concentrate animal feed	N	18	8	13	39	6.79	**
	%	20.2%	9.0%	14.6%	43.8%		
Green pasture	N	29	27	15	71	22.95	***
	%	32.6%	30.3%	16.9%	79.8%		
Keep animal health	N	30	28	22	80	11.7	***
	%	33.7%	31.5%	24.7%	89.9%		
Animal selection	N	23	19	17	59	2.76	NS
	%	25.8%	21.3%	19.1%	66.3%		
Increase number of milking animal	N	6	4	4	14	0.68	NS
	%	6.7%	4.5%	4.5%	15.7%		
Give special treatment for cow from its calf stage	N	14	2	3	19	17.75	NS
	%	15.7%	2.2%	3.4%	21.3%		
Nothing to do	N	0	0	1	1	1.1	NS
	%	.0%	.0%	1.1%	1.1%		
Total	N	30	30	29	89		
	%	33.7%	33.7%	32.6%	100.0%		

Source: own survey 2010

Remark: \*\*\*, \*\*, and \* statistically significant at 1 %, 5 %, and 10 % probability level, respectively

NS= statistically not significance

As table 14 shows, some of mechanisms have statistically significant different across subsystems in improving milk production in the district. Some mechanisms such as using improved crossbred cow, feeding green pasture and keeping animal health mechanism show statistically significant difference at 1% probability level and feeding concentrate animal feeds to milking cow is also statistical significant difference at 5% probability level across the sub systems. In the contrary, mechanisms of animal selection, increasing number of milking cows and giving special treatment to milking cow from its calf stage are not statistical significant difference across the subsystems.

**Table 15**, frequency distribution of traits use for milking cow selection

Traits used for milking cow selection by the respondents	Responses	
	N	%
High potential in milk production	71	26.6
Behavior of the animal	41	15.4
Color of the animal	5	1.9
Better physical appearance of the animal	42	15.7
Short age of first calving	34	12.7
Longer lactation period	9	3.4
Shorter calving interval	36	13.5
Low number of service per conception	22	8.2
Resistance for disease	4	1.5
Drought resistance	3	1.1
<b>Total</b>	<b>267</b>	<b>100.0</b>

*Source: own survey 2010*

The one whose mechanism is animal selection to improve milk production selects milking cows based on different criteria. As table 15 shows, some of the criteria are high potential in milk production (26.6%), better physical appearance of the animal (15.7%), and good animal behavior (15.4%). The respondents give less attention to disease and drought resistance nature of the animals in milking cow selection

#### **4.3.3.1 Farmers' sources of knowledge for dairy production improvement**

In Bure district, dairy producers have different sources of knowledge on dairy production improvement. However, these sources of knowledge vary from subsystem to subsystem. As table 16 indicates, the major sources of knowledge on dairy production in the study area are *Bure* woreda Agricultural and Rural Development office (BWARDO) (54.7%), their own experience (46.5%), neighbors (33.7%), family (32.6%), radio (27.9%) and friends (26.7%). There are also respondents whose sources of knowledge on dairy production from TV (18.6%); reading materials (10.5%), NGO/IPMS (5.8%), formal agricultural education (3.5%) and research centers (2.3%).

Radio (20.9%), TV (18.6%), farmers' experience (17.4%) are the major sources of knowledge for dairy producers in urban subsystems, while BWARDO, farmers' experience and neighbors are the major sources of knowledge for both peri-urban and rural dairy producers. No respondents in the rural dairy production systems use research centers, TV, reading material and formal education as source of knowledge on dairy production improvement (table 16).

Some of the sources of knowledge such as TV, radio, and reading materials show statistical difference across the subsystems at 1% probably level and college of agriculture as source of knowledge statistically different across the subsystem at 5% probability level. The other sources of knowledge are not statistical difference across the subsystems

**Table 16,** Source of knowledge on dairy production improvement

Farmers' source of knowledge	Subsystems						Total		Test value ( $X^2$ )	Sig.
	Urban		Peri-urban		Rural					
	N	%	N	%	N	%	N	%		
Her/ his own experience	15	17.4	11	12.8	14	16.3	40	46.5	1.17	NS
Family	8	9.3	9	10.5	11	12.8	28	32.6	0.73	NS
Neighbor	10	11.6	10	11.6	9	10.5	29	33.7	0.10	NS
Friends	8	9.3	8	9.3	7	8.1	23	26.7	0.12	NS
Community Elders	2	2.3	0	0.0	4	4.7	6	7.0	4.29	NS
Research Centers	1	1.2	1	1.2	0	.0	2	2.3	1.02	NS
BWARDO	13	15.1	17	19.8	17	19.8	47	54.7	1.43	NS
TV	16	18.6	0	0.0	0	0.0	16	18.6	38.9	***
Radio	18	20.9	3	3.5	3	3.5	24	27.9	25.57	***
NGOs/IPMS	2	2.3	2	2.3	1	1.2	5	5.8	0.42	NS
Reading material	9	10.5	0	0.0	0	0.0	9	10.5	20	***
College of agriculture	3	3.5	0	0.0	0	0.0	3	3.5	6.21	**
Total	29	33.7	30	34.9	27	31.4	86	100.0		

Source: own survey 2010

As far as gender issue is concerned, the main sources of knowledge are presented at annex 1 in table 17. As the survey result indicates, women and men dairy producers do not have equal alternatives of sources of knowledge about dairy production improvement. In the study area, the major sources of knowledge for women dairy producers are their family and their own experiences. Beside, Neighbors, friends and Woreda Agriculture and Rural Development office are the other knowledge sources for women dairy producers. No women dairy producers can access knowledge from other than these knowledge sources. In the contrary, male dairy producers can access knowledge from different sources. Out the total male dairy producers, majorities of dairy producers can access to knowledge from BWARDO. Moreover, male dairy producers can access to knowledge from many sources such as their own experience, neighbor, family, radio, TV, friends and reading material with other minor sources (annex one, table 17).

#### **4.3.3.2. Means of access to knowledge on dairy production**

As sources of knowledge on dairy production vary from place to place and individuals to individuals, means of access to knowledge are also varying place to place and individuals to individuals. In the study area majorities of the respondents can access to knowledge on dairy production through observing the farmer's farm (61.7%) and followed by listening to radio (29.6%), experience sharing sessions (24.7%), on-farm demonstrations which were arranged by BWARDO or IPMS or both (21 %), watching TV (19.8%) and training 14.5% (table 17). There were also other means through which dairy producers can access to knowledge on dairy production improvement. Some of them are visiting research center (6.2%), technology exhibition (3.7%), and attending formal agricultural education (2.5%).

In the urban dairy production system, majorities of the respondents accessed to knowledge on dairy improvement through listening to radio (22.2%), TV (19.8%) and observing the farmers' dairy farm (18.5%), whereas majorities of dairy producers in peri-urban dairy subsystem access to knowledge through observing farmers' farm (24.7 %) and experience sharing sessions (7.4 %). In rural subsystem, the majority dairy producers

access to knowledge through observing the farmers' farm (18.1 %), listening to radio (7.2%) and experience sharing sessions (6.0%)(table 17).

In both peri-urban and rural dairy production systems the respondents do not use reading, formal agricultural education and watching TV as means of knowledge accessing because in these areas, there is no a habit of reading books and any other reading materials. Beside, majorities of dairy producers did not take part in any formal agricultural education system and there is no good TV broad casting.

**Table 17**, Means through which dairy producers can access to knowledge on dairy production improvement

		Subsystems			
		Urban	Peri-urban	Rural	Total
Means of knowledge getting	Observing the farmer's farm	N 15	20	15	50
		% 18.5%	24.7%	18.5%	61.7%
	On-farm demonstration	N 9	3	5	17
		% 11.1%	3.7%	6.2%	21.0%
	Visiting research center	N 0	2	3	5
		% .0%	2.5%	3.7%	6.2%
	Technology exhibition	N 1	0	2	3
		% 1.2%	.0%	2.5%	3.7%
	Experience sharing sessions	N 9	6	5	20
		% 11.1%	7.4%	6.2%	24.7%
	Watching TV	N 16	0	0	16
		% 19.8%	.0%	.0%	19.8%
	Listening to radio	N 18	3	3	24
		% 22.2%	3.7%	3.7%	29.6%
	Training	N 5	4	3	12
		% 6.2%	4.9%	3.7%	14.8%
	Formal agricultural education	N 2	0	0	2
		% 2.5%	.0%	.0%	2.5%
	Reading	N 9	0	0	9
		% 11.1%	.0%	.0%	11.1%
Total		N 29	29	28	86
		% 33.7%	33.7%	32.6%	100%

*Source: own survey 2010*

#### 4.3.3.3. Knowledge utilization on dairy production improvement

In rural parts of the country, farmers can get different kinds of agricultural knowledge from different sources to improve their agricultural production and productivity. However, not all the available knowledge may be relevant to solve agricultural production problems. Therefore, they are forced to modify the new knowledge in accordance with their own farming system. The modification of the new knowledge could be partially or totally based on the individuals' knowledge capacity, experience, the nature of farming system, type of the technology and the likes.

Dairy producers in *Bure* district are not special in modifying new knowledge on dairy production improvement. As table 18 shows, majority dairy producers (50.6 %) use the new knowledge by partially modifying, 40.2 % of dairy producer use the new knowledge as it is and only 11.5 % of the respondents use the new knowledge by totally modifying based on their own farming system. In the study area, the overall nature of knowledge utilization in all dairy production systems is the same but its proportion is varying among dairy production subsystems.

**Table 18,** Frequency distribution of the respondents on knowledge utilization

			Knowledge utilization			Total
			Knowledge utilization as it is	Partial modification	Totally modification	
Dairy production systems	Urban	N	10	16	4	29
		%	11.5%	18.4%	4.6%	33.3%
	Peri-urban	N	13	14	3	30
		%	14.9%	16.1%	3.4%	34.5%
	Rural	N	12	14	3	28
		%	13.8%	16.1%	3.4%	32.2%
Total		N	35	44	10	87
		%	40.2%	50.6%	11.5%	100.0%
<b>Sex of the respondent</b>						
Male	N		34	43	10	85
	%		40.0%	50.6%	11.8%	
Female	N		1	1	0	2
	%		50.0%	50.0%	.0%	
Total	N		35	44	10	87

Source: own survey 2010

Regarding gender in agricultural knowledge utilization, it shown that there is some between the two sexes. As table 18 indicates, from the total women dairy producer respondents half of them use the new knowledge, which are sourced from other bodies, by doing partial modification and the other half respondents use the new knowledge as it is. However, there are no women respondents who use the new knowledge by totally modifying. On the other hand, the majorities of male dairy producers use the new agricultural knowledge as it is (50.6%) and followed by partial modification (40%) and total modification (11.8%).

#### **4.3.3.4. Knowledge transfer**

As discussed above, dairy producers can get different kinds of milk production improving knowledge from various sources to solve their dairy production problems. Just either before or after utilizing the new knowledge in solving their dairy production problems, they transfer their knowledge to other dairy producers. As table 19 shows, majorities of dairy producers (88.9%) transfer their new dairy production improving knowledge to other dairy producers. There is no statistically significant difference among the subsystems in knowledge transferring. 28.9%, 31.1% and 28.9% of the respondents of the urban, peri-urban and rural dairy producers, respectively, transfer their knowledge to other dairy producers.

Majorities of the respondents transfer their knowledge to their neighbors (94.9%) and followed by friends (74.7%), relative (69.6%) and children (40.5%). Transferring knowledge to a person is the same across all subsystems. As table 19 shows, there is no statistically significant difference in the persons to whom knowledge is transferred among subsystems, except transferring to children.

**Table 19,** Frequency of distribution of individuals to whom the respondents transfer their knowledge

		Sub system					Test value (X <sup>2</sup> )	Sig.
		Urban	Peri-urban	Rural	Total			
Knowledge transferring	Yes	N	26	28	26	80	0.9	NS
		%	28.9%	31.1%	28.9%	88.9%		
	No	N	4	2	4	10		
		%	4.4%	2.2%	4.4%	11.1%		
Dairy producers transfer knowledge to	Friends	N	18	21	20	59	0.69	NS
		%	22.8%	26.6%	25.3%	74.7%		
	Children	N	8	9	15	32	4.17	**
		%	10.1%	11.4%	19.0%	40.5%		
	Relative	N	14	20	21	55	4.02	NS
		%	17.7%	25.3%	26.6%	69.6%		
	Neighbor	N	24	27	24	75	1.44	NS
		%	30.4%	34.2%	30.4%	94.9%		
Total	N	25	28	26	79			
	%	31.6%	35.4%	32.9%	100.0%			

NS= no statistically significant

Source: own survey 2010,

#### 4.3.3.5. Farmers' means of knowledge transferring

Dairy producers can transfer their knowledge to other dairy producers through different means. There is no statistical significant difference in all farmers' means of knowledge transferring across the subsystems in the study area (table, 20). Majorities of the respondents (80.2%) transfer their knowledge to other dairy producers through informal discussion and followed by experience sharing (29.6%) and allowing farmers to visit their own dairy farm (25.9%). Only few respondents (2.5%) transferred their knowledge through written materials, 100% of them were used in the urban subsystem.

**Table 20, farmers' means of knowledge transferring**

		Subsystems					Test value (X <sup>2</sup> )	Sig.
		Urban	Peri-urban	Rural	Total			
Respondents' means of knowledge transferring	Allow the farmers to visit my own dairy farm	N	6	8	7	21	0.37	NS
		%	7.4%	9.9%	8.6%	25.9%		
	Informal discussion	N	22	23	20	65	0.78	NS
		%	27.2%	28.4%	24.7%	80.2%		
	Experience sharing	N	9	7	8	24	0.34	NS
		%	11.1%	8.6%	9.9%	29.6%		
	Through written material	N	2	0	0	2	4.09	NS
		%	2.5%	.0%	.0%	2.5%		
Total		N	26	28	27	81		
		%	32.1%	34.6%	33.3%	100.0%		

Source: own survey 2010

Informal discussion is used as a major means of knowledge transfer among dairy producers across all the subsystems. As table 20 shows, 27.2 % urban, 28.4% peri-urban and 24.7 % rural dairy producers use informal discussion as a major means to transfer their knowledge to other dairy producers. Experience sharing among the dairy producers in both urban (11.1%) and rural (9.9%) dairy subsystems is the second most important means of dairy producers to transfer knowledge. Using the mechanism of allowing farmers to visit their dairy farm is used as a means of knowledge transferring in peri-urban subsystem. Transferring through written materials was not totally used in both peri-urban and rural subsystems.

#### 4.3.4. Cattle feed sources

There are different cattle feed sources in any dairy production systems in the country. Dairy producers in *Bure* district have different cattle feed sources for their milking cows/heifers. As table 21 shows, crop residue (92.2%) is the major cattle feed source in the study area, while in Bahir Dar Zuria woreda the major cattle feed source is common grazing (24.45%) (Asaminew 2007). In the district *attela* (91.1%), natural pasture (65.6%), hay (62.2%) and *birnt* (30%) are also important sources of cattle feed. There are also respondents who used improved forage (18.9%) as source of feed for their milking cows.



*Figure 7, crop residue for animal feed (Maize Stover conservation)*

This finding has a negative implication on improved forage development in the study area. Only few respondents developed improved forage to feed their milking cows. As the result, majorities of respondents were not able to get a benefit from improved forage. Therefore, some efforts should be taken by development agents and research institutes like awareness creation and adequate supply of improved forage seed and plant materials to dairy producers in order to increase the availability of quality animal feed in the study area.

The three dairy subsystems in *Bure* district show highly significant difference in some of their main animal feed sources at 1% and 5% probability level. Hay and crop residue showed highly significant difference at 1% probability level, while natural pasture as a source of cattle feed are statistically significant difference across subsystems at 5% probability level. The rest feed sources are not statistically different across the subsystems. In the study area, natural pasture, 15.6% in the urban, 25.6% in peri-urban and 24.4% in the rural subsystem are used as source of cattle feed (table 21).

The major cattle feed sources in the urban subsystem are *Attela* (30.0%), hay (27.8%) and crop residue (25.6%). Whereas in both peri-urban and rural subsystems, crop residual and *attela* are the major animal feed sources for their milking cows. Beside, natural pasture in both peri-urban and rural subsystems is also thirdly important cattle feed source.

**Table 21, the main animal feed sources**

			Subsystems				Test value (X <sup>2</sup> )	Sig.
			Urban	Peri-urban	Rural	Total		
The main animal feed sources	Natural pasture	N	14	23	22	59	7.18	**
		%	15.6%	25.6%	24.4%	65.6%		
	Improved forage	N	7	5	5	17	0.58	NS
		%	7.8%	5.6%	5.6%	18.9%		
	Hay	N	25	12	19	56	12.01	***
		%	27.8%	13.3%	21.1%	62.2%		
	Crop residue	N	23	30	30	83	15.18	***
		%	25.6%	33.3%	33.3%	92.2%		
	<i>Attela</i>	N	27	27	28	82	0.27	NS
		%	30.0%	30.0%	31.1%	91.1%		
	<i>Birnt</i>	N	7	7	13	27	3.8	NS
		%	7.8%	7.8%	14.4%	30.0%		
Total	N	30	30	30	90			
	%	33.3	33.3	33.3	100.0			

Source: own survey 2010

Note: \*\*\* and \*\* represents statistical significant at 1% and 5% probability level, respectively.

NS= not statistically significant

#### 4.3.4.1. Farmers' mechanism to improve cattle feed quality

Livestock feeds are the major inputs in any milk production activity (Sintayehu et al, 2008: cited in Adebabay 2008). As the result in different part of the country, farmers try to find different mechanisms to improve the quality of their cattle feed to improve their cattle milk production. As table 22 shows, in the study area the major mechanisms to improve the quality of cattle feed was supplementing non-conventional feeds (like *Attela and Brint*) after grazing (92.1%) and followed by green hay making (65.2%), concentrate supplement after grazing (41.6%) and developing improved forage(20.2%).

From the total concentrate animal feed providers(N=39) to their animals, 59 % of the dairy producer respondents give concentrate feed to local breed milking cows since majorities of the respondents relay on local breed cows for their dairy farm. Secondly, they give concentrate animal feed to crossbreed milking cows (56.4%). In the urban subsystem, the majorities of the respondents (53.8%) give concentrate animal feed to

crossbreed milking cows and followed by crossbreed heifer (25.6%) and local breed milking cow (25.6%). In both peri-urban and rural subsystems, the majorities of respondents give concentrate animal feed to local milking cow and oxen since they do not have any crossbreed cow (annex 1, table 12).

Regarding improved forage, majorities of the respondents (76%) give improved forage to local breed milking cow and crossbreed milking cows (24%). However, in the urban subsystem 24% of crossbreed milking cows, 16% local breed milking cow and 12% of crossbreed heifers are given improved forage. In the peri-urban and rural subsystems majorities of the respondents give improved forage to local breed milking cows, 32% and 28%, respectively (annex one, table 12).

In study the study area, supplementing concentrate animal feed to grazing and hay making mechanisms show statistical difference across the subsystems at 1% of probability level. In the contrary, there is no statistically significant difference in both non-conventional feed supplement and developing improved forage mechanisms to improve the quality of animal feed (table 22).

**Table 22, Farmers' mechanisms in cattle feed quality improvement**

		Sub systems			Total	Test value( X <sup>2</sup> )	Sig.
		Urban	Peri-urban	Rural			
Developing improved forage	N	3	7	8	18	2.9	NS
	%	3.4	7.9	9.0	20.2		
Concentrate supplement on grazing	N	25	7	5	37	33.4	***
	%	28.1	7.9	5.6	41.6		
Non-conventional feed(like Attela, brint)	N	28	27	27	82	0.27	NS
	%	31.5	30.3	30.3	92.1		
Green hay making	N	30	14	14	58	24.8	***
	%	33.7	15.7	15.7	65.2		
Nothing done	N	0	1	0	1	2.0	NS
	%	0.0	1.1	.0	1.1		
Total	N	30	29	30	89		
	%	33.7	32.6	33.7	100		

Source: own survey 2010

Note: \*\*\* and \*\* represents as statistically significant at 1% and 5% probability level, respectively. NS= not statistically significant

The major mechanisms that were used by urban dairy producers to improve quality of cattle feed is green hay making (33.7%). Majorities of both peri-urban (30.3%) and rural (30.3%) dairy producers used non-conventional feed to improve the quality of their animal feed (table 22).

This reveals that dairy producers in the study area use locally available materials to improve the quality of their cattle feeds (like supplementing non-conventional feed after grazing and green hay making). Concentrate animal feed and improved forage are not easily available in the study area. For instance, as a group discussion results indicate, in the study area there is no adequate agro-processing factories and concentrate animal feed makers. As the result the availability and supply of concentrate animal feed in the study area is very limited. In-group discussion dairy producers mentioned, as the main problems to develop improved forage for their animal are less awareness about improve forage, inadequate forage seed supply and shortage of cropland. Due to these and other reasons, dairy producers are not interested to provide piece of land for forage development.

#### **4.3.4.2. Farmers' sources of knowledge for cattle feed quality improvement**

Farmers can seek agricultural knowledge from different sources in order to tackle agricultural production problems. As table 23 shows, in the study area, BWARDO and farmers' own experiences are the major sources of knowledge for dairy producers in order to improve the quality cattle feed at 60.2% and 52.3%, respectively. These two sources show statistically significant difference across subsystems at 10% of probability level. Out of the total BWARDO users (N=53), 23.9% of the respondents are in rural, 21.6% in peri-urban and 14.8% in urban subsystems. There are also other knowledge sources for dairy producers on cattle feed quality improvement in the district, such as neighbors (31.8%), radio (25.0%), TV (18.2%), friends (18.2%) and relatives (15.9%). Variation in neighbors as source of knowledge on cattle feed quality improvement across the subsystems is not statistically significant. Almost in all subsystems, neighbors are equally important as source of knowledge on cattle feed quality improvement.

**Table 23, farmers' sources of knowledge for cattle feed quality improvement**

		Subsystems					Test value (X <sup>2</sup> )	Sig.	
		Urban	Peri-urban	Rural	Total				
Farmers' source of knowledge for animal feed quality improvement	Friends	N	4	4	8	16	2.43	NS	
		%	4.5%	4.5%	9.1%	18.2%			
		Relatives	N	3	2	9	14	7.27	**
			%	3.4%	2.3%	10.2%	15.9%		
		Neighbors	N	8	8	12	28	1.66	NS
			%	9.1%	9.1%	13.6%	31.8%		
		Community elders	N	3	1	7	11	5.80	*
			%	3.4%	1.1%	8.0%	12.5%		
		My own	N	20	12	14	46	4.62	*
			%	22.7%	13.6%	15.9%	52.3%		
		Research center	N	0	1	0	1	2.02	NS
			%	.0%	1.1%	.0%	1.1%		
		BWARDO	N	13	19	21	53	4.77	*
			%	14.8%	21.6%	23.9%	60.2%		
		NGOs	N	3	4	1	8	1.92	NS
			%	3.4%	4.5%	1.1%	9.1%		
		TV	N	16	0	0	16	38.92	***
		% within source		100.0%	.0%	.0%			
		%		18.2%	.0%	.0%	18.2%		
		Radio	N	15	2	5	22	16.72	***
	% within source		68.2%	9.1%	22.7%				
	%		17.0%	2.3%	5.7%	25.0%			
	Agricultural College	N	1	1	0	2	1.02	NS	
		%	1.1%	1.1%	.0%	2.3%			
	Reading Materials	N	5	0	0	5	10.59	***	
		%	5.7%	.0%	.0%	5.7%			
Total		N	30	30	28	88			
		%	34.1%	34.1%	31.8%	100.0%			

Source: own survey 2010

Note: \*\*\*, \*\* and \* represents as statistically significant at 1%, 5% and 10% probability level, respectively, NS= not statistically significant

In the study area, mass Medias has significant role in providing important knowledge/information on cattle feed quality improvement to dairy producers. The variation in mass Media usage as source of knowledge across the subsystems is highly statistically significant at 1% probability level. They are highly used at urban subsystem. TV is used totally by urban dairy producers, while 68.2% of radio in urban, 22.7% in rural and 9.1 % in peri-urban subsystems is used.

Dairy producers' own experience (22.7%), TV (18.2%), radio (17.0%) and BWARDO (14.8%) are the major sources of knowledge on cattle feed quality improvement in the urban subsystem. Whereas, in both peri-urban and rural dairy subsystem, the major sources of knowledge on animal feed improvements are BWARDO, dairy producers' own and neighbors. In both peri-urban and rural subsystems, reading materials and TV are not important sources of knowledge for those dairy producers (table 23).

#### **4.3.4.3. Farmers' means of access to knowledge on cattle feed quality improvement**

Dairy producers in the study area can access to knowledge through different means. As table 24 shows, informal discussion with other farmers (56.8%), on-walk observation of the farmers' farm (26.1%), experience sharing sessions (36.4%), demonstration session (18.2%) and listening to radio (19.3%) are major farmers' means of access to knowledge on animal feed quality improvements. In addition, few dairy producer respondents used other means, such as reading (5.7%), formal agricultural education (3.4%), watching TV (12.5%) and technology exhibition (1.1%).

Informal discussion and experience sharing do not show statistically significant different across subsystems. Therefore, these two are the major means of accessing knowledge on animal feed quality improvement in the Bure district. Other means, however, show statistically significant difference across the subsystems. These are on-walk observing farmers' farm, demonstration, listening radio, watching TV and reading at 1% probability level and formal agricultural education was significant difference at 5% probability level (table 24).

Majorities of dairy producers in the urban subsystem access to knowledge on cattle feed quality improvement through informal discussion with their friends (17.0%), listening radio (12.5%) and watching TV (12.5%). In both peri-urban and rural subsystems, informal discussion and experience sharing sessions are the major means of access to knowledge on animal feed quality improvement.

**Table 24, Farmers' means of access to knowledge on animal feed quality improvement**

			Subsystems			Total	Test value (x <sup>2</sup> )	Sig.
			Urban	Peri-urban	Rural			
Farmers' means access to knowledge	On-walk observation of the farmers' farm	N	2	9	12	23	9.23	***
		%	2.3%	10.2%	13.6%	26.1%		
	Informal discussion with other farmers	N	15	18	17	50	0.63	NS
		%	17.0%	20.5%	19.3%	56.8%		
	Experience sharing sessions	N	7	13	12	32	3.00	NS
		%	8.0%	14.8%	13.6%	36.4%		
	Demonstration session	N	1	4	11	16	12.01	***
		%	1.1%	4.5%	12.5%	18.2%		
	Technology exhibition	N	1	0	0	1	2.02	NS
		%	1.1%	.0%	.0%	1.1%		
	By try and error/ own experiences	N	8	9	7	24	0.34	NS
		%	9.1%	10.2%	8.0%	27.3%		
	Listening radio	N	11	3	3	17	9.29	***
		%	12.5%	3.4%	3.4%	19.3%		
	Watching TV	N	11	0	0	11	25.06	***
		%	12.5%	.0%	.0%	12.5%		
Reading	N	5	0	0	5	10.59	***	
	%	5.7%	.0%	.0%	5.7%			
Formal education	N	3	0	0	3	6.21	**	
	%	3.4%	.0%	.0%	3.4%			
Total	N	30	30	28	88			
	%	34.1%	34.1%	31.8%	100.0%			

Source: own survey 2010

Note: \*\*\* and \*\* statistically significant difference at 1% and 5% of probability level.  
NS= not statistically significant difference

#### 4.3.4.4. Cattle feed quality improving knowledge sharing among dairy producers

In the study area, dairy producers share their knowledge to other dairy producers. Almost all dairy producers (92.2%) transferred their cattle feed quality improving knowledge to other dairy producers.

As the table 25 indicates, majorities of the respondents share their knowledge to their neighbors (95.1%), friends (91.4%), relative (63.0%) and children (37.0%). In the study area, there is a high tendency of knowledge diffusing among the dairy producers. In all

subsystems, majorities of the respondents transferred their cattle feed quality improving knowledge mainly to neighbors and friends.

**Table 25**, frequency of distribution of individuals to whom the respondents transfer their cattle feed quality improving knowledge

			Subsystems			
			Urban	Peri-urban	Rural	Total
The respondent can share cattle feed quality improving knowledge to other farmers	Yes	N	26	30	27	83
		%	28.9%	33.3%	30.0%	92.2%
	No	N	4	0	3	7
		%	4.4%	0.0%	3.3%	7.8%
Respondents transfer their knowledge to	Children	N	7	9	14	30
		%	8.6%	11.1%	17.3%	37.0%
	Relative	N	12	17	22	51
		%	14.8%	21.0%	27.2%	63.0%
	Friends	N	22	28	24	74
		%	27.2%	34.6%	29.6%	91.4%
	Neighbors	N	25	28	24	77
		%	30.9%	34.6%	29.6%	95.1%
Total	N	26	30	25	81	
	%	32.1%	37.0%	30.9%	100.0%	

*Source: own survey 2010*

In order to transfer such kinds of knowledge, dairy producers use different means. In the study area, informal discussion (82.1%) and experience sharing (40.5%) are the major means of knowledge transferring to other dairy producers and followed by farm visit (29.8%). The three dairy subsystems in the study area do not show statistical difference in all means of knowledge transferring (annex 1, table 13). Therefore, we need to promote and strengthen the existing means of knowledge transferring (i.e. informal discussion and experience sharing among dairy producers) to enhance and accelerate improved animal feed technology adoption process in the study area.

#### 4.3.5. Cattle health condition

Cattle disease is one serious problem for dairy producers in the study area. As table 26 shows, 90% of the respondents have cattle disease problems. The variation among the three dairy subsystems is not statistical difference in cattle disease problems. It was a problem of all dairy subsystems in the district. It is more serious due to inadequate veterinary services provision in the district. Due to this, dairy producers can not able to get expected amount of milk and milk products from their cattle.

**Table 26,** frequency distribution of respondents on animal disease

		subsystems				Total	Test value (X <sup>2</sup> )	Sig.
		Urban	Peri-urban	Rural				
There is serious cattle health problem	Yes	N	25	29	27	81	2.96	NS
		%	27.8%	32.2%	30.0%	90.0%		
	No	N	5	1	3	9		
		%	5.6%	1.1%	3.3%	10.0%		
Total		N	30	30	30	90		
		%	33.3%	33.3%	33.3%	100.0%		

*Source: own survey 2010*

Note: NS- not statistical difference

According to the survey result, Lumpy skin (38.8%), Trypanosomosis (31.3%) and fasciola (13.8%) diseases are the major diseases in the study area. Lumpy skin is the major cattle disease in both urban and peri-urban subsystems, 10% and 24.4%, respectively. In the rural subsystem, Trypanosomosis disease (16.3%) is the major one. Mastait disease is not a problem in rural and peri-urban subsystems (table 27).

Generally, in the district cattle disease is more serious on local milking cows (65.9%), local calf (50%) and local ox/bull (26.8%). As discussed above majorities of the respondents rely on local dairy breed cattle. As the result, this high proportion of animal disease is skewed to local breed.

**Table 27, the major cattle disease**

	Disease mane			Dairy subsystems			Total	
	Local name	Scientific name		Urban	Peri-urban	Rural		
Cattle diseases	<i>Kurba</i>	Anthrax	N	2	0	5	7	
			%	2.5%	.0%	6.3%	8.8%	
	<i>Worech</i>	Blackleg	N	1	1	3	5	
			%	1.3%	1.3%	3.8%	6.3%	
	<i>Berer</i>	Fasciola	N	5	1	5	11	
			%	6.3%	1.3%	6.3%	13.8%	
	<i>Yelam geta/wetete</i>	Lumpy skin	N	8	22	1	31	
			%	10%	24.4%	1.3%	38.8%	
	<i>Yetut beshita</i>	Mastait	N	1	0	0	1	
			%	1.3%	.0%	.0%	1.3%	
	Gende	Trypanosomosis	N	6	6	13	25	
			%	7.5%	7.5%	16.3%	31.3%	
	Total			N	23	30	27	80
				%	28.8%	37.5%	33.8%	100.0%
Test value ( $X^2$ )				45.39				
Sig.				***				

*Source: own survey 2010*

When it comes to urban subsystem, crossbreed milking cows (17.1%), crossbreed calf (13.4%) and local breed milking cows (13.4%) are highly vulnerable to animal disease. In both peri-urban and rural dairy subsystem, cattle diseases are more serious on local bred milking cow, local calf, local bull and local heifer. Since dairy producers in two subsystems do not have crossbreed, no respondent mentioned cattle diseases as a problem of crossbreed cattle. This finding reveals that cattle disease more serious on any breed types (table 28).

**Table 28**, types of cattle on which cattle more serious

		Dairy subsystems			Total	
		Urban	Peri-urban	Rural		
Types of animal more attacked	Crossbreed milking	N	14	0	0	14
		%	17.1%	.0%	.0%	17.1%
	Crossbreed dry pregnant cow	N	8	0	0	8
		%	9.8%	.0%	.0%	9.8%
	Crossbreed heifers	N	4	1	0	5
		%	4.9%	1.2%	.0%	6.1%
	Crossbreed bull	N	2	0	0	2
		%	2.4%	.0%	.0%	2.4%
	Crossbred calf	N	11	3	0	14
		%	13.4%	3.7%	.0%	17.1%
	Local bred milking cow	N	11	19	24	54
		%	13.4%	23.2%	29.3%	65.9%
	Local dry pregnant cow	N	4	8	5	17
		%	4.9%	9.8%	6.1%	20.7%
	Local heifer	N	4	9	5	18
		%	4.9%	11.0%	6.1%	22.0%
	Local bull /ox	N	0	13	9	22
		%	.0%	15.9%	11.0%	26.8%
	Local calf	N	8	15	18	41
		%	9.8%	18.3%	22.0%	50.0%
Total		N	25	30	27	82
		%	30.5%	36.6%	32.9%	100.0%

Source: own survey 2010

#### 4.3.5.1. Farmers' mechanism to keep healthy cattle

As discussed above cattle disease is more serious problem for dairy producer in the study area. To alleviate such kinds of cattle diseases problem, dairy producers use different mechanism. As table 29 indicates the major dairy producers' solution for their cattle disease problems are taking the animals to veterinary clinic (96.4%) and treat the animals using traditional medicine by themselves (22.9%). These two mechanisms show statistical difference across the subsystems. Taking their animal to veterinary clinic at 5% of probability level and treating their animal using traditional medicine by themselves at 1% of probability level. The other mechanisms do not show statistical difference across the subsystems.

In all subsystems, taking the animals is the major mechanism to keep healthy animal. In the urban subsystem, treating their animal using conventional drugs is the second important mechanism, while treating the animal using traditional medicine by themselves is in both peri-urban and rural subsystems.

**Table 29, Farmers’ mechanism keeping their cattle health condition**

		dairy subsystems					Test value (X <sup>2</sup> )	Sig.
		Urban	Peri-urban	Rural	Total			
Farmers' mechanism to cure their animal	Take the animal to veterinary clinic	N	26	30	24	80	6.3	**
		%	31.3%	36.1%	28.9%	96.3%		
	Treat the animal using traditional medicine by myself	N	2	9	8	19	5.74	*
		%	2.4%	10.8%	9.6%	22.9%		
	Treat the animal using conventional drugs by myself	N	4	2	7	13	3.42	NS
		%	4.8%	2.4%	8.4%	15.7%		
	Keep their barn clean	N	3	2	3	8	0.27	NS
		%	3.6%	2.4%	3.6%	9.6%		
Total		N	26	30	27	83		
		%	31.3%	36.1%	32.5%	100.0%		

Source: own survey 2010

Note: \*\* and \* statistically significant at 5% and 10% of probability level, respectively  
NS= not statistically significant

#### 4.3.5.1.1. Farmers’ sources of knowledge for keeping cattle health

Dairy producers in the study area have different knowledge sources on animal health keeping. The major sources of knowledge on keeping cattle health condition DAs (64.6%) of the respective kebeles and followed by neighbors (22.0%), radio (22.0%), friends (17.1%) ancestor family(19.5%) and own experience(17.1%). According to the few respondents, TV (15.9%), community elders (8.5%), reading material (4.9%), cooperatives (7.3%) and College of Agriculture (1.2%) are also important sources of knowledge on keeping cattle health condition (table 30).

The three dairy subsystems showed statistical significant difference in the main source of knowledge on keeping cattle health condition (i.e. DAs) at 1% of probability level and neighbors is not statistically significant difference. From the total respondents, 15.9% of

urban dairy producers, 26.8% of peri-urban dairy producers and 22.0% of rural dairy producers use DAs as the main source of knowledge on dairy health improvement, special in peri-urban and rural dairy production subsystems (table 30).

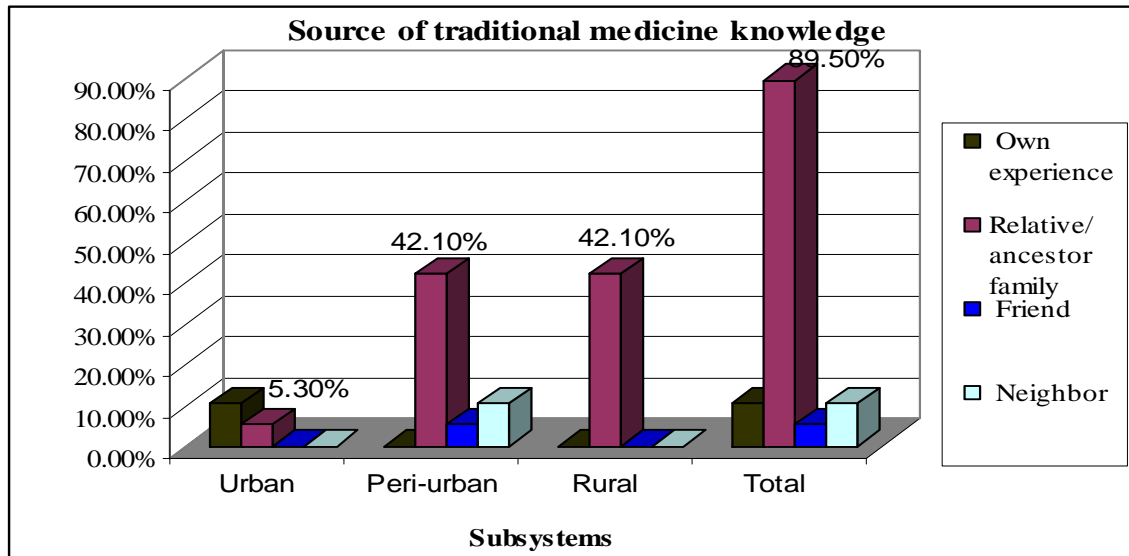
**Table 30**, frequency of distribution of the respondents on source of knowledge to keep cattle health

		dairy subsystems					Test value (X <sup>2</sup> )	Sig.
		Urban	Peri-urban	Rural	Total			
Sources of knowledge on keeping animal health condition	Friends	N	3	7	4	14	2.20	NS
		%	3.7%	8.5%	4.9%	17.1%		
	Relatives	N	1	2	5	8	3.57	NS
		%	1.2%	2.4%	6.1%	9.8%		
	Neighbors	N	6	7	5	18	0.42	NS
		%	7.3%	8.5%	6.1%	22.0%		
	Community elders	N	1	3	3	7	1.24	NS
		%	1.2%	3.7%	3.7%	8.5%		
	Ancestor family	N	5	1	10	16	9.28	***
		%	6.1%	1.2%	12.2%	19.5%		
	DAs	N	13	22	18	53	5.60	*
		%	15.9%	26.8%	22.0%	64.6%		
	Veterinary Service providers	N	5	1	5	11	3.31	NS
		%	6.1%	1.2%	6.1%	13.4%		
	Cooperatives	N	6	0	0	6	12.86	***
		%	7.3%	.0%	.0%	7.3%		
	Radio	N	14	0	4	18	21.67	***
		%	17.1%	.0%	4.9%	22.0%		
	TV	N	13	0	0	13	26.56	***
		%	15.9%	.0%	0.0%	15.9%		
College of Agriculture	N	1	0	0	1	2.02	NS	
	%	1.2%	.0%	.0%	1.2%			
Own experience	N	8	3	3	14	4.23	NS	
	%	9.8%	3.7%	3.7%	17.1%			
Reading material	N	4	0	0	4	8.37	**	
	%	4.9%	.0%	.0%	4.9%			
Total		N	26	30	26	82		
		%	31.7%	36.6%	31.7%	100.0%		

Source: own survey 2010

Note; \*\*\*, \*\* and \* indicate statistically significant difference at 1%, 5% and 10% of probability level, NS= not statistically significant

As discussed above considerable number of respondents used traditional medicine for their animal health keeping. As figure 6 indicates, the majority respondents obtained these tradition medicines from ancestor family (89.5%). Own experience and neighbors are also equally important sources. In the urban subsystem, majorities of the respondents obtained this traditional medicine knowledge from their own experience. In the contrary, no respondent in peri-urban and rural subsystems obtain traditional knowledge from their own their experience. Rather they obtain this traditional knowledge from their ancestor family (figure 6). According to the respondents, no respondents spent money for traditional medicine though they were highly dependent on it. For conventional medicine, they spent 23.01 ETB with 24.58 ETB of standard deviation per animal per year (annex one, table 14).



Graph 5, farmers’ sources of traditional medicine knowledge

Source: own survey 2010

#### 4.3.5.1.2. Farmers’ means of access to knowledge on cattle health keeping

In the study area majorities of respondents access to knowledge on animal health keeping through when woreda veterinarian supervise their dairy farm (67.1%), trial and error (29.4%) and farmer-to-farmer experience sharing session (16.5%). There are also other respondents who can access to knowledge on animal health keeping through TV

watching (12.9%), radio listening (12.9%), formal education (11.8%), training (10.6%) and informal discussion at church (10.6%)(table 31).

In the urban dairy subsystem the major means for access to knowledge on animal health keeping were trail and error (17.6%) and TV watching (12.9%). On the other hand, the majorities of peri-urban and rural dairy producers accessed to knowledge through during agricultural experts supervise their dairy farm. In these two subsystems, no respondents can also access to knowledge through formal agricultural education and TV watching (table 31).

**Table 31,** farmers’ means of access to knowledge cattle disease keeping

		Subsystems				
		Urban	Peri-urban	Rural	Total	
Farmers' means for access to knowledge on keeping animal health	Training	N	7	1	1	9
		%	8.2%	1.2%	1.2%	10.6%
	Formal education	N	10	0	0	10
		%	11.8%	.0%	.0%	11.8%
	Agricultural officer supervision	N	10	26	21	57
		%	11.8%	30.6%	24.7%	67.1%
	Farmer to farmer experience sharing session	N	6	4	4	14
		%	7.1%	4.7%	4.7%	16.5%
	Informal discussion at church	N	0	5	4	9
		%	.0%	5.9%	4.7%	10.6%
	Try and error	N	15	5	5	25
		%	17.6%	5.9%	5.9%	29.4%
	Radio listening	N	10	0	1	11
		%	11.8%	.0%	1.2%	12.9%
	TV watching	N	11	0	0	11
		%	12.9%	.0%	.0%	12.9%
Reading	N	5	0	1	6	
	%	5.9%	.0%	1.2%	7.1%	
<b>Total</b>		N	29	30	26	85
		%	34.1%	35.3%	30.6%	100.0%

Source: own survey 2010

### 4.3.6. Challenges and opportunities on knowledge management

#### 4.3.6.1. Challenges of knowledge management

Farmers in many parts of Ethiopia have a problem of accessing and transferring improved knowledge. Likewise, in Bure district dairy producer respondents have different problems of accessing milk production improving knowledge. As table 32 indicates, 74.2% of respondents mentioned inadequate technology as a problem. If there is inadequate technology in certain locality, it is difficult to improve the knowledge level of inhabitants and in turn, they are not able to tackle the agricultural problems. The most serious shortages for *Bure* district dairy producers are crossbreed dairy cow/heifer (39.1%), improved forage seed (27.0%), AI (19.0%) and improved dairy management manuals (12.1%)(Annex 1, table 10). There are also other respondents who mentioned poor delivery system (11.3%), complex nature of the technology (8.2%) and long distance of knowledge sources (5.2%) as a problem of accessing knowledge.

**Table 32,** Frequency distribution of respondents’ problems on access to knowledge regarding dairy production improving

		kebeles of the respondents				
			Urban	Peri-urban	Rural	Total
Respondents' problems on access to knowledge regarding dairy production improving	Inadequate technology	N	29	22	21	72
		%	29.9%	22.7%	21.6%	74.2%
	Complex nature of the technology	N	0	3	5	8
		%	0.0%	3.1%	5.2%	8.2%
	Preparing manuals with other language/ English	N	0	1	0	1
		%	0.0%	1.0%	.0%	1.0%
	Long distance of the source of the knowledge	N	2	1	2	5
		%	2.1%	1.0%	2.1%	5.2%
	Poor delivery system	N	3	4	4	11
		%	3.1%	4.1%	4.1%	11.3%
Total	N	34	31	32	97	
	%	35.1%	32.0%	33.0%	100.0%	

*Source: own survey 2010*

In urban dairy production system, problem of the majority respondents on access to knowledge is shortage of dairy technologies. Whereas, complex nature of the technology

is the main problems of rural and peri-urban dairy producer respondents on access to knowledge (table 32).

It is obvious that knowledge is not easily transferred and tackles the problems in certain locality, especially in the rural parts of the country. In the study area, farmers have faced different problems during transferring their knowledge to other farmers. Respondents mentioned different problems that can hinder them from transferring their knowledge to other dairy producers. The major problems in knowledge transferring are lack of adequate knowledge/improved dairy technology (46.2%), lack of awareness (26.9%) and dairy producers themselves are not interested to transfer their new technology (17.9%)(table 33).

**Table 33, Main problems on knowledge transferring**

		Subsystems				Total	Test value (X <sup>2</sup> )	Sig.
		Urban	Peri-urban	Rural				
Problems of knowledge transferring	Lack of awareness	N	4	8	9	21	2.6	NS
		%	5.1%	10.3%	11.5%	26.9%		
	Inadequate improved dairy technologies	N	13	12	11	36	0.28	NS
		%	16.7%	15.4%	14.1%	46.2%		
	Farmers are not interested to transfer the technology	N	3	7	4	14	2.20	NS
		%	3.8%	9.0%	5.1%	17.9%		
Complex nature of the technology	N	0	0	1	1	2.02	NS	
	%	.0%	.0%	1.3%	1.3%			
The respondent does not have time	N	5	0	1	6	7.5	**	
	%	6.4%	.0%	1.3%	7.7%			
Total		N	25	27	26	78		
		%	32.1%	34.6%	33.3%	100.0%		

Source: own survey 2010

Note: \*\* represent statistically significant at 5% probability level

NS= not statistically significant

In the study area as the table 33 shows, there is no statistically significant difference in major knowledge transfer problems across systems. However, there is proportional difference in the major problems across the subsystems. In urban subsystem inadequate knowledge/ improved dairy technology (16.7%), lack of time to transfer (6.4%) and lack

of awareness of technology receivers (5.1%) are mentioned as the main problems in knowledge transferring. Lack of awareness and inadequate knowledge/ improved dairy technologies are the major problems in both peri-urban and rural subsystems.

#### **4.3.6.2. Opportunities on knowledge management**

As there are different problems in knowledge management processes in the study area, there are also different opportunities on knowledge management processes in dairy production improvement processes. These opportunities vary from one process to another process of knowledge management. For instance, the opportunities on knowledge generation process may vary from knowledge transfer sub-processes since all these sub-processes were undertaken by different actors.

Regarding knowledge generation, majorities of the respondents (46.6%) believed that there is no any opportunity on knowledge generation. Out of which, this opinion is highly supported by the rural (41.5%) and peri-urban (39%) dairy producers. However, according to 35.2% of respondents, there are different organizations which can give capacity building on self-problem solving activities to agricultural producers in the study area. Out total individuals (N=88), this idea is supported by 14.8% of urban, 10.2% of peri-urban and 10.2% of rural dairy producers. It has its own implication on knowledge generation subsystem. Majorities of trainings on capacity building and other knowledge generation activities are given to and work with urban dairy producers and less to rural and peri-urban dairy producers. There are also NGO/IPMS (14.8%) which work on knowledge generate and transfer to dairy producers (Annex 1, table 15).

In accessing to knowledge, there is a habit of knowledge sharing among the dairy producers (76.7%) in the study area. As the result, majorities of dairy producers are accessing knowledge on dairy production improvement from other dairy producers. There is also clear radio broad casting in the study area (71.1%) (Annex one, table 15). Besides, agricultural extension agendas are developed based on farmers' need and problems. This helps both extension workers and agricultural producers. Extension

workers can come up with appropriate technologies or solutions for a particular agricultural problem and their works will also be effective in addressing agricultural problems and farmers can easily take up the technology. As the result, agricultural technology adoption processes will be accelerated and sustainable in tackling agricultural problems.

When it comes to knowledge sharing among dairy producers, majorities of the dairy producers (81.1%) in the study area volunteered to share their knowledge to other dairy producers. Like accessing knowledge opportunity, in knowledge sharing there is also a habit of informal discussion among dairy producers (62.2%) about their dairy production activities. Through this informal discussion, knowledge can be easily shared among dairy producers. In addition, there is different experience sharing programs (48.9%) which are arranged by different bodies to share knowledge from model farmers to other follower farmers. In some holidays, there is teaching and learning process on their agricultural production problems and solution with the collaboration of kebeles DAs and woreda experts at church (Annex 1, table 15).

In knowledge utilization, majorities of dairy produces (40.7%) do not see any opportunities in knowledge utilization. Nevertheless, according to 36% of dairy producer respondents there are intensive supervisions by agricultural experts on technology application. Different trainings are given (26.7%) by different concerned bodies, mostly BWARDO or IPMS or both (Annex 1, table 15).

## CHAPTER FIVE

### CONCLUSION AND RECOMMENDATION

#### 5.1. Summary and Conclusion

This study was conducted to assess knowledge management on dairy production in *Bure Woreda*. In the district, there are three dairy production systems. The study was conducted based on these subsystems differences.

Overall, dairy producers in Bure district have 14 years of experience in milk production. Within these years of experience, they acquire good experience in milk production improvements. The major objectives of the respondents engaging in dairy production are for milk consumption, obtaining ox and animal selling. In the district, local breed milking cow is the major breed type which is used for dairy farming. However, few dairy producers use crossbreed cow for their dairy farm. This crossbreed type is found only in the urban dairy producers' hand. As a result, there is high milk production in the urban subsystem than the other dairy production systems.

Dairy producers in the district use different mechanisms to improve milk production. Keeping the animal health condition, feeding green pasture to milking cow, animal selection and using crossbreed cow are the major mechanisms.

In the study area dairy producers can access to the above technologies/mechanisms/knowledge from different sources. The major sources are Agricultural and Rural Development office, their own experience, neighbor, family, radio and friends. In urban dairy production system, majorities of the respondents use radio, TV, farmers' experience as source of knowledge on dairy production. Whereas, in both peri-urban and rural dairy production subsystems, the major sources of knowledge are BWARDO, their own experience, neighbors, family and friends.

Dairy producers can access to dairy production improving knowledge through different means from aforementioned knowledge sources. In the study area majorities of the respondents accessing knowledge on dairy production through observing the farmer's farm, listening to radio, experience sharing sessions, on-farm demonstrations which were arranged by BWARDO or IPMS or both, watching TV, and training. In the urban subsystem, majority dairy producers are accessing knowledge through listening to radio, watching TV and observing the farmers' dairy farm. Whereas, in rural and peri-urban subsystems, observing the farmers' farm, listening to radio and experience sharing are the major means access to knowledge on dairy production improvement.

In *Bure* district, majority dairy producer use the new knowledge by partially modifying in accordance with their farming system. Some of dairy producers use the new knowledge as it is which comes from other sources. Only very few dairy responds use the new knowledge by totally modifying which can fit to their farming systems

Dairy producers in the study area can transfer their knowledge to other dairy producers. Majority of dairy producers transfer their knowledge to their neighbors, friends, relative and children. Transferring knowledge to those individuals are the same across all subsystems. They transfer different knowledge to the aforementioned individuals via informal discussion, experience sharing and allowing farmers to visit their own dairy farm. Only few respondents use written materials as means to transfer their knowledge to other farmers.

The major animal feed sources in the study area are crop residue, *attela*, natural pasture, hay and *birnt*. Types of animal feed sources are differing across the subsystems. The major animal feed sources in the urban subsystem are *Attela* and hay. Whereas in both peri-urban and rural subsystems, crop residual and *attela* are the major animal feeds sources for their milking cows. The major cattle feed quality improving mechanisms are supplementing non-conventional feed (like *Attela and Brint*) after grazing, green hay making, concentrate supplement on grazing and developing improved forage.

In the study area, there are cattle health problems. These animal diseases are more serious on local milking cows, local calf and local ox/bull. However, in the urban subsystem it is more serious on crossbreed milking cow and calf. Dairy producers use different mechanisms to improve the health condition of their animals. The majors are taking the animals to veterinary clinic and treat the animals using traditional medicine by themselves. In the urban subsystem, dairy producers take their animal to veterinary clinic, while in peri-urban and rural subsystems dairy producers heal their animal using traditional medicine by themselves.

Dairy producers in the study area face different problems in accessing as well as transferring knowledge. Inadequate technology, poor delivery system, complex nature of the technology and long distance of knowledge source are the major problems of the farmers for accessing knowledge on dairy production improvement. The most inadequate dairy technology which can hinder dairy producers from accessing improved knowledge in the district are crossbreed cow/ heifer, improved forage seed, AI and improved dairy management manuals. Alike the hindering factors in accessing knowledge, the major problems in transferring new knowledge to other dairy producers are also lack of adequate knowledge/ improved dairy technology, lack of awareness and even the dairy producers themselves are not interested to transfer their knowledge.

There are also opportunities that can be used to improve knowledge management processes on dairy production system. Nevertheless, these opportunities vary across subsystems and KM processes. Regarding knowledge generation, there are different organizations that give capacity building on self-problem solving activities. In accessing knowledge, there is a habit of knowledge sharing among the dairy producers, clear radio broad casting and Woreda agricultural extension agendas are developed based on farmers' need and problems. When it comes to knowledge sharing, majorities of the dairy producers in the study area are volunteered to share their knowledge to other dairy producers. Alike access to knowledge opportunity, in knowledge sharing there is also a habit of informal discussion among dairy producers about their dairy farming. In addition, there is different experience sharing programs that are arranged by different

bodies to share knowledge from model farmers to other followers. In some holidays, there is teaching and learning process on their agricultural production problems and solution with the collaboration of kebeles DAs and woreda experts at church. In knowledge utilization, there are intensive supervisions by agricultural experts on technology application. Different concerned bodies, mostly BWARDO or IPMS or both, give different trainings to dairy producers.

## **5.2. Recommendations**

Based of the findings of this research the following recommendations are pointed out which can be addressed by concerned bodies.

In the district, three dairy production systems are identified. Across these dairy subsystems, there is a distinct difference in many aspects of dairy production management systems and KM process. Therefore, any dairy production developmental planning and implementation programs should be carried out based on the nature and characteristics of these subsystems. Bo doing so, we can avoid blanket developmental recommendation across the district to meet the problems of dairy production systems. It also helps us to develop demand drive developments strategies rather than supply driven development activities in the district.

Generally, dairy producers in Bure district are not market oriented in milk production like other part of the country's dairy producers (i.e. AA and *Debrezeit* cities). As the result, milk production in the study area is below the expected amount and in turn, dairy producers are not motivated to use improved dairy technologies and able to improve milk production in the district. Therefore, it is recommended that government and non-government bodies should work together to create awareness about market oriented dairy farming system and its benefit. They should be linked to market to sell their products. By doing so the number of market oriented dairy producers can be increased in the district.

To achieve market oriented dairy farming, the shortage of improved dairy technologies, especially crossbred cow/heifer, should be alleviated by developing and multiplying improved dairy technologies and delivers them to dairy producers in appropriate ways. In addition, the existing AI service should be provided in large scale in the district in fair way. To alleviate lack of awareness problems, government and NGOs should provide needs and problems based trainings to dairy producers and then arrange outreach experience sharing programs in order to expand their knowledge horizons in milk production improvement.

In the study area, keeping the animal health condition is the major mechanism to improve milk production. It implies that there is high demand on veterinary service. Therefore, to meet this demand government should establish veterinary clinic in all dairy subsystem. Beside, government should encourage private sectors to involve in providing veterinary clinic and pharmacy. In the study area, few dairy producers use concentrated animal feed for their milking cows because there is no feed formulators and suppliers in Bure district. Due to this, dairy producers are imposed to purchase it from *Bahir Dar and Fnoteselam* towns. Since concentrated animal feed can increase milk production, they should be able to feed such kinds of animal feed to their milk cows. To alleviate this concentrate animal feed shortage, government should facilitate to make dairy producers able to get such animal feed from the sources at fair and reasonable price. For this *Bure Damot* milk cooperative can take the leading role in solving the problems. It can bring this animal feed and provide it to the member and non-member of cooperative at reasonable price. By doing so we can encourage dairy producers to feed their milking cow and able to increase their milk production in their dairy farm.

In the study area, dairy producers are accessing knowledge on dairy production improvement from different sources. These are endogenous and exogenous sources. In urban subsystem, source of knowledge for dairy producers are exogenous (Woreda's agricultural experts, radio, TV). Whereas, in both peri-urban and rural subsystem, the major sources of knowledge are endogenous sources (DA, neighbor, friends and relatives). Therefore, it is recommended that GOs and NGOs should identify the

appropriate sources of knowledge of the particular subsystem and deliver the new knowledge through it to the right dairy subsystems.

According to the survey result, in the study area the roles of College of Agriculture and Research Centre were not significant in knowledge generating and providing to dairy producers. However, in the other part of Ethiopia these institutions take the leading role in knowledge generation and providing to the local community and they can also bring visible impacts in the community farming improvement. Therefore, to test the benefit of these institutions' efforts, local planners or policy makers should make some efforts (like creating conducive research environment) on those institutions to generate and deliver important knowledge on dairy production improvement in the *Bure* district.

In the rural part of the study area, dairy producers are not familiar with the available dairy technologies. Therefore, our development agents and research institutions should be able to develop and introduce improved technologies that can easily be understood by the rural dairy producers. Otherwise, intensive and adequate training should be given to the farmers on the subject matter.

Majorities of the respondents transfer their knowledge to other dairy producers through different means. These are informal discussion, experience sharing and allowing farmers to visit their own dairy farm. Therefore, it is recommended that governments should promote and strengthen the existing informal knowledge transferring systems. To do so, development workers and research institutes should arrange frequent field days, farmers' days, experience sharing sessions and other means which can promote informal knowledge sharing systems among dairy producers. Organizing dairy producers in the form of farmers' research and extension groups (FREG) is also a very important approach to enhance farmers' capacity in identifying and giving appropriate solutions to their agricultural problems themselves. It can also be a means of diffusing improved agricultural knowledge and information to the farming community informally.

In the study area there is a problem of inadequate technologies in both directions (from knowledge accessing and transferring) and lack of awareness about improved dairy

technologies. To alleviate the shortage of technology, government should make research centers to be active in generating and providing appropriate technologies. This generated technology should be multiplied and distributed to dairy producers at the right time by extension workers. Beside, adequate and frequent trainings should be given to the dairy producers to create awareness, particularly both in peri-urban and rural subsystems, and to accelerating adoption process. To do so, the main actors in dairy production development (i.e. farmers, extension workers and researchers) should work together in all processes of developments.

There is an cattle health problem in the district. To solve this problem dairy producers take different measurements. The major one is taking the animal to veterinary clinic and treating their animal using non-conventional medicine. However, veterinary service distribution is not fair across the subsystems because it is more concentrated to Bure town. Therefore, is recommended that there should be fair and adequate veterinary service provision in all subsystems. Beside, government should create conducive environment and provide incentives to privet investors in order to attract and encourage involving in the sector.

In the study area there are different opportunities on KM regarding dairy production improvement. However, they are not highly recognized by local population and developmental workers in knowledge generation, acquisition, utilization and distribution in the district. Therefore, government and NGOs should first exploit the available opportunists in KM processes and transfer them into new social and economical values in the community. It helps to reduce the cost of knowledge generation, acquisition, utilization and distribution in terms of money, time and labor in the district.

To knowledge more about knowledge management, further research should be conducted in the study area on the concept of knowledge.

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**Annex one.**

**Table 1,** average farm size, number of local oxen, crossbred ox, local cow, crossbred cow, and milk production, consumed and sold

	N	Minimum	Maximum	Mean	Std. Deviation
Total farm size	90	.00	3.37	.9512	.96201
Number of crossbred cow	90	0	6	.58	1.208
Number of local cow	90	0	10	1.89	1.611
Number of local ox	90	0	6	1.53	1.515
Number of crossbred ox	90	0	2	.03	.235
Amount of milk obtained per day	90	.00	42.00	4.1750	6.82531
Amount of milk consume per day	90	.00	9.00	1.5694	1.67392
Amount of milk sold per day	90	.00	37.00	2.5722	6.27621
Valid N (listwise)	90				

**Table 2,** total amount of money obtained from agriculture and non agricultural activities/year

Source of income	N	Minimum	Maximum	Mean	Std. Deviation
agricultural product sold/year	88	.00	30600	4587.3295	5871.1
Valid N (listwise)	88				
non-farm activities	90	.00	180000.00	9808.04	24397.18

**Table 3,** mean age of the respondents

	N	Minimum	Maximum	Mean	Std. Deviation
age of the respondents	90	27	82	45.93	11.466
Valid N (listwise)	90				

**Table 4**, age, educational status of the respondents, family size, and educational status of family members of the respondents cross tabulated with sampled kebeles

	Age of the respondent		Educational status of the respondent		Family size of the respondent		Number of illiterate in the family		No of family member who are able to read and write		Number of family member who are between grade one to four		number of family member who are b/n 5 to 8		No of family member who are b/n grade 9 to 10		Number of family member who are b/n grade 11 to 12		No of family member who are diploma holder		Number of family member who are degree holder	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Dairy subsystems																						
Urban	51	12	6	2	6	2	1	1	0	1	1	1	2	2	1	1	1	1	1	1	0	1
Peri-urban	43	10	2	1	7	2	2	1	1	1	2	2	1	1	0	1	0	0	0	0	0	0
Rural	44	11	3	1	6	1	2	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0

**Table 5**, type of cattle sold for source income

Type of animal or animal product that could sold as source of income	kebele of the respondents					
	Urban		Peri-urban		Rural	
	N	%	N	%	N	%
	0	.0%	8	26.7%	7	23.3%
Any animal	0	.0%	1	3.3%	0	.0%
any calf	0	.0%	1	3.3%	0	.0%
Bull	3	10.0%	0	.0%	1	3.3%
Bull & heifer	0	.0%	0	.0%	1	3.3%
Bull & Ox	1	3.3%	0	.0%	0	.0%
Calf	0	.0%	0	.0%	1	3.3%
Calf & old animal	0	.0%	0	.0%	3	10.0%
Calf & Ox	0	.0%	0	.0%	2	6.7%
Cow	2	6.7%	0	.0%	0	.0%
Cow & Ox	0	.0%	1	3.3%	0	.0%
Cow unable to pregnant, milking	1	3.3%	0	.0%	0	.0%
Heifer & Bull	0	.0%	3	10.0%	0	.0%
Male calf	10	33.3%	0	.0%	0	.0%
Male calf, Bull	5	16.7%	0	.0%	0	.0%
Male calf, Bull, heifer	1	3.3%	0	.0%	0	.0%
Milk, male calf, heifer	2	6.7%	0	.0%	0	.0%
Milk, male calf, heifer, bull	1	3.3%	0	.0%	0	.0%
Not give birth cow	2	6.7%	0	.0%	0	.0%
Not give birth cow & old animal	0	.0%	1	3.3%	1	3.3%
old animal	0	.0%	14	46.7%	11	36.7%
old cow	2	6.7%	0	.0%	0	.0%
Ox	0	.0%	1	3.3%	3	10.0%

**Table 6**, Cattle selling time

Time of sale	kebele of the respondent					
	Urban		Peri-urban		Rural	
	N	%	N	%	N	%
	0	.0%	7	23.3%	7	23.3%
April up to June	1	3.3%	0	.0%	0	.0%
at any time	10	33.3%	4	13.3%	1	3.3%
December	0	.0%	4	13.3%	4	13.3%
December up to January	0	.0%	0	.0%	1	3.3%
December, March	0	.0%	1	3.3%	0	.0%



Pearson Chi-Square	47.364	38	.142
Likelihood Ratio	52.748	38	.056
Linear-by-Linear Association	0.173	1	.677
N of Valid Cases	72		

**Table 7**, the average amount of money that the respondents obtained from animal and animal product sold

	kebele of the respondents											
	Urban				Peri-urban				Rural			
	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD
Amount of money obtain from sale animal or animal product	500	5,600	1,909	1,248	0	4,500	1,454	1,436	0	4,000	1,674	1,313
								N	Min	Max	Mean	SD
Amount of money obtain from sale animal or animal product								72	0	5,600	1,650.14	1,336.851
Valid N (listwise)								72				

**Table 8**, the average experience of the respondents in dairy productions

	kebele of the respondent												
	Urban				Peri-urban				Rural				
	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	
Number of year age that the respondent engaged in dairy production	1	40	14	10	2	36	14	11	1	45	17	13	
				N	Min	Max	Mean	SD					
Number of year age that the respondent engaged in dairy production				90	1	45	14.79	11.423					
Valid N (listwise)				90									
				Number of year that the respondent engaged in dairy production				Test value (X <sup>2</sup> )	Sig.				
				Mean	SD								

Sub systems	Urban	14	10	55.692	NS
	Peri-urban	14	11		
	Rural	17	13		
Total number of years		14.79	11.42		

NS= not statistically significant

**Table 9**, Kebele of the respondents \* Reason for preference to use local breed for dairy production Cross tabulation

			Reason for preference to use local breed for dairy production						Total	
				Cross is not familiar in area	Disease resistance	Drought & disease resistance	Expensive of crossbred	Shortage of cross cow		shortage of crossbred cow
kebele of the respondents	Urban	N	18	0	0	4	1	0	7	30
		%	20.0%	.0%	.0%	4.4%	1.1%	.0%	7.8%	33.3%
	Peri-urban	N	1	4	5	12	3	3	2	30
		%	1.1%	4.4%	5.6%	13.3%	3.3%	3.3%	2.2%	33.3%
	Rural	N	0	8	0	2	5	15	0	30
		%	.0%	8.9%	.0%	2.2%	5.6%	16.7%	.0%	33.3%
Total		N	19	12	5	18	9	18	9	90
		%	21.1%	13.3%	5.6%	20.0%	10.0%	20.0%	10.0%	100.0%
			Reason for preference to use Crossbreed for dairy production			Total				
				High milk production	High milk production, can be easily handle at home					
kebele of the respondents	Urban	N	9	15	6	30				
		%	10.0%	16.7%	6.7%	33.3%				
	Peri-urban	N	29	1	0	30				
		%	32.2%	1.1%	.0%	33.3%				
	Rural	N	30	0	0	30				
		%	33.3%	.0%	.0%	33.3%				
Total		N	68	16	6	90				
		%	75.6%	17.8%	6.7%	100.0%				

**Table 10, inadequate dairy technologies \* kebele Cross tabulation**

			kebele of the respondents			Total
			Urban	Peri-urban	Rural	Urban
More inadequate technologies	crossbreed cow/ heifer	N	26	21	21	68
		%	14.9%	12.1%	12.1%	39.1%
	Improved forage seed	N	16	19	12	47
		%	9.2%	10.9%	6.9%	27.0%
	AI service	N	14	9	10	33
		%	8.0%	5.2%	5.7%	19.0%
	Improved dairy management manuals	N	16	1	4	21
		%	9.2%	.6%	2.3%	12.1%
	Milking and milk processing materials	N	3	2	0	5
		%	1.7%	1.1%	.0%	2.9%
Total	N	75	52	47	174	
	%	43.1%	29.9%	27.0%	100.0%	

Percentages and totals are based on responses.

**Table 11, the purposes of cattle rearing based on its importance**

Dairy production system		The first purpose cattle rearing			The second purpose of cattle rearing				The third purpose of cattle rearing					
		Milk prod.	Draught power	source of income	Milk prod.	Draught power	Source of income	Consumption	As a buffer in the case of crop failure	Milk prod.	Draught power	Source of income	Consumption	As a buffer in the case of crop failure
Urban	N	23	0	7	4	2	20	4	0	1	1	3	25	0
	%	76.7	0.0	23.3	13.3	6.7	66.7	13.3	.0	3.3	3.3	10.0	83.3	.0
Peri-urban	N	6	21	3	21	6	2	0	1	2	3	17	4	4
	%	20.0	70.0	10.0	70.0	20.0	6.7	.0	3.3	6.7	10.0	56.7	13.3	13.3
Rural	N	5	24	1	20	4	5	1	0	4	1	16	2	7
	%	16.7	80.0	3.3	66.7	13.3	16.7	3.3	.0	13.3	3.3	53.3	6.7	23.3
Total	N	34	45	11	45	12	27	5	1	7	5	36	31	11
	%	37.8	50.0	12.2	50.0	13.3	30.0	5.6	1.1	7.8	5.6	40.0	34.4	12.2

N= number of respondents

**Table 12**, types of animal to which concentrate and improved forage is given

			Improved forage			Total	Concentrate animal feed			Total
			Dairy subsystems				Dairy subsystem			
			Urban	Peri-urban	Rural		Urban	Peri-urban	Rural	
Types of cattle to which improved forage is given	Crossbred milking cow	N	6	0	0	6	21	1	0	22
		%	24.0%	.0%	.0%	24.0%	53.8%	2.6%	.0%	56.4%
	Crossbred dry pregnant cow	N	2	0	0	2	7	0	0	7
		%	8.0%	.0%	.0%	8.0%	17.9%	.0%	.0%	17.9%
	Crossbred heifer	N	3	2	0	5	10	2	0	12
		%	12.0%	8.0%	.0%	20.0%	25.6%	5.1%	.0%	30.8%
	Local breed milking cow	N	4	8	7	19	10	6	7	23
		%	16.0%	32.0%	28.0%	76.0%	25.6%	15.4%	17.9%	59.0%
	Local bred dry pregnant cow	N	1	1	1	3	4	0	1	5
		%	4.0%	4.0%	4.0%	12.0%	10.3%	.0%	2.6%	12.8%
	Local bred heifer	N	1	0	1	2	1	1	1	3
		%	4.0%	.0%	4.0%	8.0%	2.6%	2.6%	2.6%	7.7%
Ox	N					0	4	5	9	
	%					.0%	10.3%	12.8%	23.1%	
Total		N	9	8	8	25	25	7	7	39
		%	36.0%	32.0%	32.0%	100.0%	64.1%	17.9%	17.9%	100.0%

**Table 13**, farmers' means of knowledge transferring on animal feed quality improvement

			dairy subsystems			Total	Test value (x <sup>2</sup> )	Sig.
			Urban	Peri-urban	Rural			
Farmers' of knowledge transferring	Informal discussion	N	21	25	23	69	1.49	NS
		%	25.0%	29.8%	27.4%	82.1%		
	Allowing the farmers to visit the respondent farm	N	6	8	11	25	2.10	NS
		%	7.1%	9.5%	13.1%	29.8%		
	Experience sharing	N	10	13	11	34	0.66	NS
		%	11.9%	15.5%	13.1%	40.5%		
	Write materials	N	1	0	1	2	1.02	NS
		%	1.2%	.0%	1.2%	2.4%		
Total		N	26	30	28	84		
		%	31.0%	35.7%	33.3%	100.0%		
			dairy subsystems			Total		
			Urban	Peri-urban	Rural			

Farmers problem to transfer animal feed improving knowledge	The respondent lack interest transfer their knowledge	N	1	2	1	4
		%	1.5%	3.0%	1.5%	6.1%
	Inadequate technology	N	18	10	10	38
		%	27.3%	15.2%	15.2%	57.6%
	Farmers are not interested to use feed improving knowledge	N	1	12	6	19
		%	1.5%	18.2%	9.1%	28.8%
	The complex nature of the technology	N	1	0	5	6
		%	1.5%	.0%	7.6%	9.1%
	Respondent lack time to transfer their knowledge	N	5	1	3	9
		%	7.6%	1.5%	4.5%	13.6%
Total		N	21	24	21	66
		%	31.8%	36.4%	31.8%	100.0%

Percentages and totals are based on respondents.

SN= not statistically significant

**Table 14**, the average amount of money spent for conventional medicine

	N	Minimum	Maximum	Mean	Std. Deviation
The amount of money spent for modern medicine per animal per year	84	.00	300.00	23.01	43.58
Valid N (listwise)	84				

**Table 15**, opportunities on knowledge generation, accessing, sharing and utilization on dairy production improvements

			Subsystems			Total
			Urban	Peri-urban	Rural	
Opportunities on knowledge generation	Strong linkage among farmers, extension and research center	N	4	3	0	7
		%	4.5%	3.4%	.0%	8.0%
	Research activities are farmers' need and interest base	N	6	3	0	9
		%	6.8%	3.4%	.0%	10.2%
	Self problem solving capacity building activities provided by different body	N	13	9	9	31
		%	14.8%	10.2%	10.2%	35.2%
	Research activities are carries out on farmers' animals	N	3	4	2	9
		%	3.4%	4.5%	2.3%	10.2%
	There are a number of NGOs	N	10	2	1	13
		%	11.4%	2.3%	1.1%	14.8%
	There are no good opportunities	N	8	16	17	41
		%	9.1%	18.2%	19.3%	46.6%
Total		N	29	30	29	88
		%	33.0%	34.1%	33.0%	100.0%

Opportunities on access to knowledge	There is strong linkage among farmers, extension and research centers	N	4	3	0	7
		%	4.4%	3.3%	.0%	7.8%
	There are FREGs (farmers research and extension groups)	N	1	4	0	5
		%	1.1%	4.4%	.0%	5.6%
	Agricultural extension agendas are farmers' problem and needs based	N	7	5	5	17
		%	7.8%	5.6%	5.6%	18.9%
	There is a habit of knowledge sharing among farmers	N	23	20	26	69
		%	25.6%	22.2%	28.9%	76.7%
	Extension activities are farmers' need base	N	6	5	3	14
	%	6.7%	5.6%	3.3%	15.6%	
There is NGOs that works technology diffusion	N	9	3	4	16	
	%	10.0%	3.3%	4.4%	17.8%	
Clear radio broadcasting	N	24	14	26	64	
	%	26.7%	15.6%	28.9%	71.1%	
There is clear TV broadcasting	N	15	0	0	15	
	%	16.7%	.0%	.0%	16.7%	
There is no any good opportunity	N	1	5	0	6	
	%	1.1%	5.6%	.0%	6.7%	
Total	N	30	30	30	90	
	%	33.3%	33.3%	33.3%	100.0%	
Opportunities on knowledge sharing	Strong linkage among farmers, extension and research center	N	4	4	0	8
		%	4.4%	4.4%	.0%	8.9%
	There is FREGs	N	0	1	0	1
		%	.0%	1.1%	.0%	1.1%
	There is different demonstration by different concerned body	N	12	7	18	37
		%	13.3%	7.8%	20.0%	41.1%
	there are different experience sharing programs which are arranged by different body	N	14	10	20	44
		%	15.6%	11.1%	22.2%	48.9%
	Farmers volunteer in sharing their knowledge among each other	N	22	24	27	73
	%	24.4%	26.7%	30.0%	81.1%	
There is NGOs which works on knowledge transferring	N	7	3	5	15	
	%	7.8%	3.3%	5.6%	16.7%	
Region fathers teach about improved agricultural technology	N	1	14	28	43	
	%	1.1%	15.6%	31.1%	47.8%	
There is a habit of discussion about their agricultural production condition	N	15	14	27	56	
	%	16.7%	15.6%	30.0%	62.2%	
There is no any good opportunity	N	1	1	1	3	
	%	1.1%	1.1%	1.1%	3.3%	

Total		N	30	30	30	90
		%	33.3%	33.3%	33.3%	100.0%
Opportunities on knowledge utilization	Providing different trainings about improved dairy management by different body	N	12	9	2	23
		%	14.0%	10.5%	2.3%	26.7%
	There is intensive supervision by agricultural officers in technology utilization	N	9	13	9	31
		%	10.5%	15.1%	10.5%	36.0%
	Research findings are problem and interest base	N	6	5	1	12
		%	7.0%	5.8%	1.2%	14.0%
	There is no any good opportunity	N	7	9	19	35
		%	8.1%	10.5%	22.1%	40.7%
Total		N	26	30	30	86
		%	30.2%	34.9%	34.9%	100.0%

Source: own survey 2010

**Table 16**, the main livelihood of the respondents

			Dairy subsystems			Total	Test value (X <sup>2</sup> )	Sig.
			Urban	Peri-urban	Rural			
The main source of livelihood	Cattle production	N	6	0	1	7	86.382	***
		%	6.7%	.0%	1.1%	7.8%		
	Mixed livestock-crop production	N	0	30	29	59		
		%	.0%	33.3%	32.2%	65.6%		
	Government employment	N	5	0	0	5		
		%	5.6%	.0%	.0%	5.6%		
	Livestock production and Government employment	N	10	0	0	10		
	%	11.1%	.0%	.0%	11.1%			
Livestock and House renting	N	3	0	0	3			
	%	3.3%	.0%	.0%	3.3%			
Trade and Livestock	N	6	0	0	6			
	%	6.7%	.0%	.0%	6.7%			
Total		N	30	30	30	90		
		% of Total	33.3%	33.3%	33.3%	100.0%		

Source: own survey 2010

**Table 17**, mechanisms to improve milk production cross tabulate with sex

Farmers mechanism	sex of the respondent				Total
	Male		Female		
	N	%	N	%	
using improved crossbred	40	46.0%	1	50.0%	41
Feeding improved animal feed to milking cow	39	44.8%	0	.0%	39
Feeding green pasture to milking cow	69	79.3%	2	100.0%	71

Keeping health of animal	78	89.7%	2	100.0%	80
Using animal selection	58	66.7%	1	50.0%	59
Increasing the number of milking cows	14	16.1%	0	.0%	14
Giving special treatment for the cow from its calf stage	19	21.8%	0	.0%	19
The respondent nothing do to improve milk production	1	1.1%	0	.0%	1
<b>Total</b>	<b>87</b>	<b>100%</b>	<b>2</b>	<b>89</b>	

Sources of knowledge	sex of the respondents				Total
	Male		Female		
	N	%	N	%	
My own experience	38	45.2%	2	100.0%	40
Family	26	31.0%	2	100.0%	28
Neighbor	28	33.3%	1	50.0%	29
Friends	22	26.2%	1	50.0%	23
Community Elders	6	7.1%	0	.0%	6
Research Centers	2	2.4%	0	.0%	2
Woreda Agriculture and Rural Development office	46	54.8%	1	50.0%	47
TV	16	19.0%	0	.0%	16
Radio	24	28.6%	0	.0%	24
NGOs	5	6.0%	0	.0%	5
Reading material	9	10.7%	0	.0%	9
Formal education	3	3.6%	0	.0%	3
<b>Total</b>		<b>84</b>	<b>2</b>		<b>86</b>

## Annex Two

### Personal Information of Respondent

1. Name of respondent -----
2. Sex
  1. Male
  2. Female
3. Age -----
4. Marital status
  1. Single            3. Divorced
  2. Married        4. Widow or widower
5. Education status
 

1. Illiterate	5. Nine to ten grades
2. Able to read and write/ Region base	6. Eleven to twelve grades
3. One to four grade	7. College
4. Five to Eight grade	8. University
6. Religion
  1. Orthodox    3. Protestant
  2. Muslim      4. Catholic    5. Others (specify) -----

### Family characteristics

#### 7. Family composition:

Family size: Male -----Female-----

Age composition			Educational status of the family			
	M	F		M	F	Total
Number of children below 14 years of age			Illiterate			
Number of youth 15-40 years age			Able to read and write			
Number of adults (41-60 years age )			One to Four grade			
Number of old persons (above 60 years)			Five up to Eight grade			
			Nine up to Ten grade			

			11 up to 12 grade			
			College			
			University			

## Socioeconomic Characteristics

### 8. Land hold characteristics

No	Farm land type	Size(ha)
1	Crop land	
2	Tree plantation	
3	Vegetables	
4	Fruits	
5	Forage land	
6	Grazing land	
7	Other(specify)-----	
Total		

### 9. Livestock Demography

No	Animal type	Number	
		Local	Crossbred
1	Ox		
2	Cow		
3	Heifer		
4	bull		
4	Calf		
5	Chicken		
6	Sheep		
7	Goat		
8	Hors		
9	Mule		
10	Donkey		
11	Honeybee colony		
12	Other (specify)		

### 9. What is the animal housing character?

1. Isolated pen
2. Open paddock
3. Together with family and partition of the main house
4. Other (specify) -----



- 3. Politician
- 6. Other (specify) -----

**Cattle Production Management System**

16. Do you keep cattle? 1. Yes 2. No

17. If your respond to Q. No. 16 is yes, what type of cattle you raise?

- 1. Local breed
- 2. Crossbred (specify) -----

18. If your answer to Q. no 16 is yes, for what purpose do you rear this cattle (put them in terms of their importance)?

- 1. For milk production
- 2. Power drought
- 3. Source of income
- 4. Consumption
- 5. As a buffer in the case of crop failure
- 6. Social and cultural function
- 7. Other (specify) -----

19. If your answer to Q. No. 18 is as source of income, what type/s animal product/s do you sale? -----

-----

when-----

----why?-----

-----

How much do earn from-----

20. If your answer to Q. No. 18 is milk production, how many milking cows do you have?

- 1. Local bred-----
- 2. Cross bred-----

21. How much milk do you use for ----per day?

- 1. House holed consumption /litter -----
- 2. for sale -----

**Knowledge Management on Dairy Production**

22. How long did you start dairy production? ----- Year

23. Why did you start dairy production? -----

-----

-----

24. On which breed type are you mainly relying on for milk production?

No	Bred type	Reason of preference
1	Local bred	
2	Cross bred	

25. Where did you get these dairy cattle?

No	Breed type	Source	Means of getting (put tike mark on the space)		
			Purchasing	Gifting	Breeding
1	Local bred				
2	Crossbred				

26. What do you do to improve milk production in your dairy farm?

1. Use improved cross bred animal
2. Using improved animal feed
3. Provide green pasture
4. Keep the health of the animals
5. Exercise animal selection (those give good milk production)
6. Increase the number of milking animal in the farm
7. Give special treatment for cows from their calf stage
8. I do nothing
9. Other (specify) -----

27. If your answer to Q. No 26 is through animal selection (alternative “5”), what is/ are trait/s that you use?

- |   |   |
|---|---|
| 1. High milk production                     | 7. Shorter calving interval                     |
| 2. Behavior of the animal                   | 8. Low number of service per conception         |
| 3. Color of the animal                      | 9. Resistance for disease                       |
| 4. Better physical appearance of the animal | 10. Drought resistance                          |
| 5. Short age of first calving               | 11. They can survive at poor management         |
|   | (Like <span style="float: right;">poor</span> ) |
| 6. Longer lactation period                  | 12. Others (specify) -----                      |

housing, feed)

28. If your answer to Q. No 27 is other than **I do nothing (8)**, where did you get this practice/ knowledge?

- |                      |  |
|----------------------|--|
| 1. My own experience | 7. Woreda agriculture and rural development office |
| 2. From my family    | 8. TV  |
| 3. Neighbor          | 9. Radio   |
| 4. Friends           | 10. NGOs (specify) -----                           |
| 5. Community elders  | 11. Reading material                               |
| 6. Research centers  | 12. Other (specify) -----                          |

32. How did you get this/ these practice/knowledge?

- |                                    |                        |                                 |
|------------------------------------|------------------------|---------------------------------|
| 1. Observing the farmer's farm     | 6. Through watching TV |                                 |
| 2. During on-farm demonstration    | 7. Listening Radio     |                                 |
| 3. Visit research centers' station | 8. Training            |                                 |
| 4. Technology exhibition           | 9. Formal education    |                                 |
| 5. Experience sharing sessions     | 10. Through reading    | 11. Others (specify) -<br>----- |

29. How did you utilize this knowledge?

1. I use the technology as it is
2. I partially modify the technology on my own farming system
3. I totally modify the technology
4. Other (specify) -----

30. What is/are the main problem/s did you face to get this/ these knowledge/ technology from the source/s?

1. Inadequate technology
2. Long process to get them
3. It is not easily understandable
4. They are written with other language/ English
5. The sources are too far to access the knowledge
6. There is no good delivery system
7. Others (specify) -----

31. If your answer to Q. No 30 is inadequate technology, on which technology the problem is more serious?

1. Getting crossbred heifer/ cow      2.Improved forage seed      3.Artificial  
insemination

4. Improved dairy management technique      5. Other (specify) -  
-----

32. Did you transfer this knowledge to other farmers?

1. Yes    2. No

33. If your answer to Q. No 32 is yes, to whom did you to transfer this knowledge?

1. Friends      3.Relatives  
2. Children      4. Neighbor    5. Others(specify)-----

34. How did you transfer this knowledge?

1. By allowing them to visit my farm      3.Experience sharing  
2. Informal discussion      4.Through written materials      5.Other  
(specify) -----

35. What are the main problems to transfer this knowledge to other farmers?

1. Farmers are not aware of about this knowledge  
2. Lack of adequate knowledge/ improved dairy technology  
3. The farmers are not interested to accept the technology/ knowledge  
4. The nature of the knowledge/ technology (complex to understand by the  
farmers)  
5. Others (specify)-----

## **Feeding Practice**

36. What is/ are the major feed source/s for your milking cows (put them in descending order in terms of their importance)?

1. Natural pasture      4. Crop-residues  
2. Improved forge      5. 'Attella'(brewery by-product from locally  
produced beer)  
3. Hay      6. 'Birint' (a by-product from locally produced  
*catikala*)  
7. Other (specify) -----

37. What measurement do you carry out to improve the feed quality and quantity for your milking cows?

1. Establishing improved forage
2. Supplementing concentrate after grazing
3. Supplement non-conventional feed like *Attela, Brint*
4. Through hay making
5. I don't use any mechanism
6. Other (specify) -----

38. If your respond to Q. No 37 is developing improved forage, for which animal do you give this improved forage?

- |                               |                                |
|-------------------------------|--------------------------------|
| 1. Crossbred milking cow      | 4. Local bred milking cow      |
| 2. Crossbred dry pregnant cow | 5. Local bred dry pregnant cow |
| 3. Crossbred heifer           | 6. Local bred heifer           |

39. For which animal do you give this concentrated feed?

- |                               |                                |
|-------------------------------|--------------------------------|
| 1. Crossbred milking cow      | 4. Local bred milking cow      |
| 2. Crossbred dry pregnant cow | 5. Local bred dry pregnant cow |
| 3. Crossbred heifer           | 6. Local bred heifer           |

40. What are your sources of knowledge regarding to improving the quality and quantity of animal feed?

- |                            |   |
|----------------------------|---|
| 1. Friends                 | 6. Research center                                  |
| 2. Relatives               | 7. Woreda agricultural and rural development office |
| 3. Neighbors               | 8. NGOs (specify) -----                             |
| 4. Elders in the community | 9. TV   |
| 5. My own                  | 10. Radio   |

41. How do you get such kind of knowledge?

- |  |                           |
|--|---------------------------|
| 1. On-walk observation of other farmer's farm    | 4. Demonstration session  |
| 2. During informal discussion with other farmers | 5. Technology exhibition  |
| 3. Experience sharing                            | 6. Others (specify) ----- |

-----  
42. Do you share this knowledge with other farmers?

- |        |       |
|--------|-------|
| 1. Yes | 2. No |
|--------|-------|

43. If your answer to Q. No 42 is yes, to whom do you transfer this knowledge?

- 1. My children                      3.Friends
- 2 Relatives                      4.Neighbors                      5.Others (specify) - -----

44. How do you transfer such kind of knowledge?

- 1. Informal discussion                      3. Experience sharing
- 2. By allowing the farmers to visit my farm                      4.Others (specify) -----

**Dairy Health Management**

45. Is there a serious health problem for dairy cattle?

- 1. Yes                      2. No

46. If your answer to Q. No 45 is yes, for which animal is the problem more serious?

- 1. Cross bred milking cow                      6. Local bred milking cow
- 2. Crossbred dry pregnant cow                      7. Local dry pregnant cow
- 3. Crossbred heifers                      8. Local heifers
- 4. Crossbred bull                      9. Local bull
- 5. Crossbred calf                      10.Local calf

47. What is/ are the disease that prevailed on your cattle?

No	Kind of animal (put the number that you chose from the above alternative)	Nam of the disease	Its septum

48. What measurements did you carry out to solve the problems?

- 1. Taking the animal to veterinary clinic(vaccination)
- 2. Take the animal to traditional healers
- 3. I treat them using traditional medicine
- 4. I treat them using conventional drugs (de-worming, spraying etc )
- 5. I keep the barn clean
- 6. I do nothing
- 7. .Others (specify) -----

49. If your answer to Q. No 48 is I treat the animal using traditional medicine, where did you get the knowledge?

- 1. By trail and error                      4.Neighbors
- 2. Relatives                      5.Traditional healer

3. Friends  
6. Other (specify) -----

50. If your answer to Q. No. 48 is other than alternative 3 and 6, what are your sources of knowledge?

1. Friends  
2. Relatives  
3. Neighbor  
4. Elders in the community  
5. Ansister family  
6. DAs  
7. Research center  
8. Veterinary service providers  
9. Cooperatives  
10. Radio  
11. TV  
12. Others (specify) -----

51. If your answer to Q. No. 49 is other than by try and error (1), how much do you pay for medicine per animal per year?

1. Traditional medicine-----Birr  
2. Modern medicine ----- Birr

52. How do you get such kind of knowledge / practice?

1. Training  
2. Through formal education  
3. During Agricultural Officer supervision  
4. Demonstration/field days  
5. Farmers' day  
6. Farmers to Farmer experience sharing session

### Labor Division

53. Is there labour division in the family regarding to dairy production?

1. Yes      2. No

54. If your answer for Q.53 is yes,

No	Family member	Responsibility (@)
1	Husband	
2	Wife	
3	Female youth	
4	Male youth	
5	Children	
6	Relative in the household	
5	Daily laborer	

Where= @= *1.keeping 2.Feeding 3.Caring of calves 4.Milking 5.Processing  
6.cleaning of animal house 7.Sale of milk products 8.Sale of livestock 9.Breeding  
decision 10. Other specify-----*

55. What is/are good opportunity/ies in dairy production knowledge management system?

A/ In knowledge generation

1. There is strong linkage among farmers, extension and Research center
2. Research activities are carried on based on farmers' problem and interest
3. Capacity building has been carried out to develop the capacity of the farmers to solve their problem by themselves
4. There are research that carried out on the farmers' animals
5. There are a number of NGOs
6. There is no good opportunities
7. Other (specify)\_\_\_\_\_

B/ In knowledge accessing to dairy producers

1. There is strong linkage among farmers, extension and Research center
2. There is farmers-extension-research groups(FREGs)
3. Agricultural extension agendas are carried out based on based on farmers' problem and interest
4. The local farmers are interested to transfer their knowledge to each other
5. The extension activities are carried on based on the farmers needs and interest
6. There are a number of NGOs that works on technology transferring
7. There is clear radio broadcasting
8. There is clear TV broadcasting
9. Other (specify)\_\_\_\_\_

C/ Knowledge sharing among farmers

1. There is strong linkage among farmers, extension and Research center
2. There is farmers-extension-research groups (FREGs)
3. Different demonstration are carried out by different concerned body
4. Different experience sharing programs are arranged by different concerned body

5. The local farmers are interested to transfer their knowledge to each other
6. There are a number of NGOs that works on technology transferring
7. Religion fathers teach about improved agricultural technology at religion place
8. There is a habit of discussion about their agricultural production condition
9. There is no any good opportunities
10. Other (specify)\_\_\_\_\_

D/ Knowledge utilization

1. Different trainings about improved dairy management are give by different body
2. There is intensive supervision by Agricultural officers in utilization of improved dairy technology
3. Research findings are based on the farmers' problems and needs
4. There is no any good opportunities
5. other (specify)\_\_\_\_\_

## **Declaration**

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

Name: Habtemariam Assefa

Signature: \_\_\_\_\_

Date: July, 2010

This thesis has been submitted for examination with my approval as a University advisor.

Advisor: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_