

Thesis Ref. No. \_\_\_\_\_

**DAIRY CATTLE FEED RESOURCES AND MILK HANDLING PRACTICES IN  
ADA'A DISTRICT, EAST SHOA ZONE,  
OROMIA REGIONAL STATE, ETHIOPIA**

**MSc. Thesis**



**By**

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**MSc Program in Tropical Animal Production and Health**

**September, 2014**

**Bishoftu, Ethiopia**

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ADA'A DISTRICT, EAST SHOA ZONE,  
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**A Thesis Submitted to the College of Veterinary Medicine and Agriculture of Addis  
Ababa University in Partial Fulfillment of the Requirements for the Degree of  
Master of Science in Tropical Animal Production and Health**

**By**

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**September, 2014  
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## **STATEMENT OF THE AUTHOR**

I hereby declare that this thesis is my work and that all sources of materials used for this thesis have been accordingly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for M.Sc. degree at Addis Ababa University College of Veterinary Medicine and Agriculture and was deposited at the University Library to be made available to borrowers under rules of the Library. I seriously declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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## **ACKNOWLEDGEMENTS**

Above all, thanks to my almighty God for his help in giving me courage to take up complicated situations I faced for pursuing my work.

I am very grateful to my advisor Dr. Ashenafi Mengistu for accepting me as his advisee, for his professional supports and due concerns from the very start of designing the research proposal up to thesis write up.

I have a loan from my deepest thanks to my co-advisor Prof. Berhan Tamir for his invaluable and unreserved assistance during the whole work of this study starting from research proposal up to thesis write up.

Grateful acknowledgement is extended to Ato Kassahun Melese for the help he accepted me for sponsoring the project, provided in commenting, correcting and supplying relevant information.

I would like to thank Debre-zeit Agricultural Research centre, EAAPP project for sponsoring the study without which the completion of this study would not have been possible in such a successful way.

My thanks also go to the enumerators for their co-operation and to the sample respondents who co-operated with me in supplying relevant information in addition to their kindness during the period of data collection.

Special appreciation is given to my husband, Mulusew Demlie and my sister Nitsuh Asres for their shouldering the whole responsibilities of family issues, particularly looking after our children, Tsion mulusew and Hana mulusew.

## **DEDICATION**

This thesis is dedicated to my husband's father, Demlie Abateneh who passed away in January 2<sup>nd</sup> 2013.

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## **LIST OF ABBREVIATIONS**

ADF	Acid Detergent Fiber
BW	Body Weight
CF	Crude Fiber
CP	Crude Protein
CSA	Central Statistically Agency
DM	Dry Matter
DMI	Dry Matter Intake
ESAP	Ethiopian Society of Animal Production
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
ILRI	International Livestock Research Institute
MOA	Ministry of Agriculture
MY	Milk Yield
NDDB	National Dairy Development Board
NDF	Neutral Detergent Fiber
SPSS	Statistical Package for Social Sciences

## ABSTRACT

This study was conducted in Ada'a district of Oromia region to assess the existing dairy cattle feed resources, to evaluate the feed quality of selected dairy cattle feed resources, to assess milk handling practices in the study areas and suggest possible solution for existing problems. Data were collected from 60 dairy producers having different types of feeds and living in seven different villages using single-visit-multiple-subject formal survey. Brewery by product, cotton seed cake, linseed cake, noug cake, lin seed cake + noug seed cake, elephant grass, hay, tef straw, wheat straw, poultry litter, maize grain, wheat bran, wheat middling and concentrate were as feed resources. Open air for roughage feeds and well aerated storing for compound feeds was the most practiced methods of feed storing. For feed quality test, a total of 184 feed samples were collected from seven villages in fourteen types of feeds. These samples were analyzed for six feed quality parameters i.e. dry matter (%), ash (%), crude protein (%), NDF (%), ADF (%) and lignin (%). All the samples had the average DM contents (91.28 - 94.67), ash (1.42 -11.89), CP (3.3-41.28), NDF (13.76 -77.5), ADF (2.8 – 51.97) and lignin (1.35 – 11.61). Based on this result the moisture content of feeds was reduced by means of different reasons. Almost all of the respondents were having the awareness of cleaning milking equipments before milking. But During milking all respondents were done inappropriate activities like touching nose and scratching of different parts of the body. About 33.3% of respondents were use common towel to clean udder before and after milking. Giving training to dairy producers concerning with feed management and milk handling practices (before, during and after milking) including the storing containers.

**Key words:** *Ada'a, dairy cattle, feed quality, feed resource, milk handling, Oromia region.*

## 1. INTRODUCTION

In many developing countries, livestock play an important role in most small-scale farming systems. They provide traction to cultivate fields, manure to maintain crop productivity, and nutritious food products for human consumption and income-generation (Sere et al, 2008). For instance, livestock production is an important component of the Ethiopian economy with an overall contribution of about 20% to the gross domestic product (GDP) and 40% to the gross value of annual agricultural output (Ahmed et al , 2010).

The Ethiopian highlands are inhabited by high human and livestock populations. High density of human and livestock population ranging between 37-120 people and 27-130 Tropical Livestock Unit (TLU) per square kilometer is one of the major reasons for severe degradation of the natural resource base (CSA, 2008) resulting in poor animal nutrition. Approximately 88% of the human, 75% of the cattle, 75% of the sheep and 34% of the goat population in Ethiopia are found in the highlands (CSA, 2008). However, the productivity of livestock in Ethiopia is extremely low in terms of milk, meat and draught output. The fact that Ethiopia is importing milk products while possessing the largest cattle population in Africa is a very good indicator of the complexity of the problem. The major problem to livestock productivity is scarcity of livestock feeds in both quantity and quality, especially in the dry season. Notwithstanding the continued reduction in the size of grazing lands and forest areas to crop production to feed the ever-increasing human population, ruminants will still continue to depend primarily on forages from natural pastures and crop residues. Poor grazing management (e.g. continuous overgrazing) has resulted in very low carrying capacities brought about by replacement of productive and nutritious flora by unpalatable species and reduction in vegetation cover. Livestock feed supply from natural pasture is characterized by seasonal fluctuation in total dry matter (DM) production and nutritional quality because of the distinct seasonal variation in plant growth, in relation to the annual rainfall pattern (Ahmed et al , 2010).

Agriculture dominates the economies of developing countries and in these countries the livestock sector is the fastest growing agricultural sector (3.77% for livestock vs. 2.71% for crops in last decade). By 2020, consumers in developing countries will eat 87% more meat and 75% more milk than they do today making livestock production the largest share of the value of global agricultural output (FAO, 2005). Animal feeding systems in these countries are mainly based on grazed native pastures, which are deteriorating in production and quality, which vary seasonally resulting in poor animal performance. Despite the importance of livestock, inadequate livestock nutrition is a common problem in the developing world, and a major factor affecting the development of viable livestock industries in poor countries (Sere et al, 2008).

Most of the research works on the assessment of feed resources in different parts of the country so far conducted only indicated the shortage of feeds without quantifying the amount of dry matter (DM) obtained in each feed resource type and whether this is adequate to the total number of livestock available to that particular area. This creates a great problem to recommend a possible solution to livestock producers particularly in the extreme drought seasons in Ethiopia. Therefore, it is very much important to assess the already existing feed resources in terms of quantity and quality in relation to the requirements of livestock annual basis so that it would be very easy to suggest either improving the existing feed resources, introduce another feed alternatives or suggest development and policy interventions for each agro-ecology (Yeshitila, 2008).

This is much worse for crop residues owing to their lower content of essential nutrients (protein, energy, minerals and vitamins) and lower digestibility and intake. Despite, these problems, however, ruminants will continue to depend primarily on forages from natural pastures and crop residues. Peri-urban dairy production systems have emerged around cities and towns, which heavily rely on purchased fodder (Vernooij, 2007). Commercialization of dairy production takes place around cities and towns where the demand for milk and milk products is high (medium and large towns) (Azage, 2004). However, the production system has been constrained by shortage of feed supply in dry season (quantity and quality) (Yoseph et al., 2003a). Few research works have been carried out with regard to feed availability in relation with dairy animals in urban and peri-urban dairy farms (Yitaye et al., 2009). Current and up-to-date baseline information is lacking in peri-urban areas on productive and reproductive performance of crossbred

dairy cows in association with feed availability and quality under the prevailing situations.

The study was important to smallholder farmers, dairy producers, milk consumers and processors to enable them preserve dairy feed in a well manner and milk handling practice. It also contributed to better understanding of the preservation of feed to keep the quality of cattle feed.

Hence, the research findings would inform the government to give training for farmers about improvement of storage, preservation and handling method of feeds and milk.

General objective

To assess dairy cattle feed resources and preservation methods and milk handling practices in Ada'a district.

Specific objectives of the study were:-

- To assess dairy cattle feed resources and feed preservation methods
- To evaluate the feed quality of selected dairy cattle feed resources.
- To assess milking and milk handling practices in the study areas.

## **2. LITRATURE REVIEW**

### **2.1. Livestock Feed Resources**

Feed resources are classified as natural pasture, crop residue, improved pasture and forage, agro industrial by products and other by-products like food and vegetable refusal, of which the first two contribute the largest feed types (Alemayehu, 2003).

In the mixed crop– livestock system of both cereal crop based and enset and coffee based systems, grazing is the major feed resource. The majority (53.7%) of the households use animal feeds from their own crop farm, while 23.7% use a combination of own farm and communal grazing, and 15.8% use own farm and purchased feed and about 7% use other sources. Contrary to this, 76% of dairy producers in the urban production system use purchased feeds from different sources. The rest 16 and 1.7% use road side grazing and own feed resources, respectively (sintayehu et al, 2008).

The major roughage feed resources for dairy animals across all the different production systems included natural pasture/grasslands, crop residues, non-conventional feed resources (e.g. leaf and stem of enset, banana and sugarcane; crop thinning) and crop aftermath (with the exception of urban dairy producers). Teff, wheat and barley straw, and maize stover are important feed resources in the rural highland system of Bure and Fogera. The contribution of these feed resources, however, depends up on the agro-ecology, the types of crop produced, accessibility and production system (Azage et al, 2013).

Agro-industrial by-products include cereals flour mill by-products, such as wheat, maize, rice bran, wheat short, and wheat middlings, which are commonly used as energy supplements, and oil seed cakes such as noug, cottonseed, peanut, sesame cakes, which are mainly used as protein supplements. Agro-industrial by-products are characterized by high protein, digestible energy, and low fibre fraction, and when supplemented to dairy cows improve the use of low quality basal diet and thereby improve milk production (Azage et al, 2013).

### *2.1.1. Crop Residues*

In the mixed cereal livestock farming systems of the Ethiopian highlands, crop residues provide on average about 50% of the total feed source for ruminant livestock. The contributions of crop residues reach up to 80% during the dry seasons of the year (Adugna, 2007). Further increased dependence on crop residues for livestock feed is expected, as more and more of the native grasslands are cultivated to satisfy the grain needs of the rapidly increasing human population. In spite of the rising dependence on fibrous crop residues as animal feeds, there are still certain constraints to their efficient utilization. Substantial efforts have been made so far to resolve the feed shortage problem in the Ethiopian highlands, aiming at improving feed availability and thereby improve livestock productivity. However, the impact was so little to cope with the problem that animals are still subjected to long periods of nutritional stress (LDMPS, 2006).

### *2.1.2. Natural Pasture*

Forages play varying role in different livestock production systems. In general, however, they are important as adjuncts to crop residues and natural pastures and may be used to fill the feed gaps during periods of inadequate crop residues and natural pasture supply. Even in the presence of abundant crop residues, which are often free fed to ruminants, forage crops especially legumes are needed to improve the utilization of crop residues, crop residues often provide energy while forage legumes provide proteins. Forages also provide benefits such as soil fertility through their nitrogen-fixing ability and are also useful in breaking insect, weed or disease cycles, which are likely to occur when they are not supplemented. In many situations, however, forages compete with other crops. In land scarce smallholder forages may compete with other crops for land, in land abundant pastoral systems, they may compete for the herders labour (Yeshitila, 2008).

## **2.2. Factors Affecting Animal Feed Quality**

Forage testing is necessary because forage quality varies considerably due to several factors, including differences in forage genotype, maturity, season, and management. An understanding of factors affecting forage quality will help producers anticipate and plan for changes in forage quality. When forage quality is low, forages alone may not support

desired rates of animal performance. In such cases, it is necessary to provide livestock with supplements for protein and energy (Adesogan et al, 2012).

Animal performance, whether growth or milk production, depends upon the animal's potential for production, as well as on how much dry matter (DM) the animal eats and the nutritive value of the DM the animal consumes. Therefore, the two forage-related factors that determine animal performance are forage intake and forage nutritive value. Collectively, these factors determine the quality of the forage. When forage is fed without restriction as the sole feed, forage quality can be an excellent predictor of animal performance (Adesogan et al, 2012).

### *2.2.1. Genotype*

Legumes generally have a higher quality than grasses. Legumes have higher CP concentrations and a higher intake by livestock due to a higher percentage of rapidly digestible leaves. Generalizations about quality of grasses are risky, but temperate or cool-season grasses, such as rye and ryegrass, often have higher quality than tropical or warm-season grasses, such as bermudagrass and bahiagrass. However, there is much variation in forage quality within and among grass genera (Adesogan et al, 2012).

### *2.2.2. Maturity*

The stage of forage re-growth at the time of utilization whether as hay or grazing has a major influence on forage quality. Forage re-growth stage is determined by the number of days between harvests for hay or haylage and by the rest period in rotational grazing. Forage quality begins to decline as soon as forages start to re-grow due to the accumulation of stems and deposition of poorly digested lignin in both leaves and stems. Therefore, forage quality generally declines with increasing length of the interval between harvests of stored forages or with longer rest periods in rotational grazing. Maturity of legumes and cool-season grasses can be assessed by determining the reproductive stage of growth. For warm-season grasses, however, weeks of re-growth are a better indicator of maturity because flowering may begin shortly after re-growth begins.

Table 1 shows a decline in digestibility and crude protein of Coastal bermudagrass after week five (35 days) of re-growth. The information in this table indicates that harvesting

Coastal bermudagrass at intervals greater than five weeks will reduce the quality of this forage. Each value represents several cuttings made from different cultivars in different years. These values are a general reference point. These data suggest that digitgrass and limpograss tend to have higher quality than bahiagrass, bermudagrass, and stargrass, especially at later stages of maturity. These differences often affect voluntary intake as well. With respect to maturity effects on perennial grasses, the most dramatic difference is the decrease in voluntary intake between six and eight weeks. These data and others show that after eight weeks re-growth, forage quality will generally be less than needed for livestock maintenance. Exceptions are digit grass and limpograss, which maintain a somewhat higher TDN when mature than do the other grasses. Consequently, limpograss and digitgrass are excellent forages for fall stockpiling. However, mature limpograss and digitgrass often are low in CP and require protein supplementation for maximum utilization (Adesogan et al, 2012).

### *2.2.3. Season*

Seasonal effects on forage quality have been noted in grazing trials in Florida, where forage regrowth intervals were kept constant. A “summer slump” was observed in that gains of grazing cattle were less during the summer than in spring and fall. That this slump in cattle weight gain during the summer is an effect of environment on forages and not due to the effect of the environment on animals was suggested by a direct comparison of bahia grass with dwarf elephant grass. The summer slump was dramatic with bahia grass, but not apparent with elephant grass even though similar cattle grazed adjacent paddocks of the two grasses. Summer slump in quality of warm-season grasses have been observed with hay harvested after similar re growth intervals on different dates throughout the growing season summer may have lower quality because high temperature increases lignin deposition, and high rainfall increases growth rates and maturation of the forage.

In the case of hay made in Florida, the negative effects of season and maturity on forage quality may be additive. Spring harvests are made generally after short re growth periods, while summer harvests are made after long re growth periods because of heavy summer rainfall that delays harvests. Therefore, the quality of Bermuda grass hay is highest when harvested in the spring or early summer (Adesogan et al, 2012).

## **2.3. Feed Management**

### *2.3.1. Pre-Harvest Management*

Pre-harvest management for maximum quality of hay or silage involves weed control and frequent cutting. Some producers harvest every four or five weeks throughout the season, making either hay or silage, depending on rainfall (Adesogan et al, 2012).

### *2.3.2. Post-Harvest Management*

The quality of hay or silage will never increase during harvesting and storage, but post-harvest decreases in quality can be minimized by careful management. Postharvest management requires avoiding rain damage, as well as proper curing of hay to less than 15% moisture or wilting of silage to 60%–70% moisture, promptly sealing silos and wrapping haylages, and minimizing losses during storage. Leaching of nutrients from weathering decreases forage nutritive value. Therefore, hay bales should be stored under a barn or a tarp whenever possible (Adesogan et al, 2012).

Growth of molds may also decrease palatability and, therefore, reduce livestock intake of forage. Additionally, molds may lead to production of mycotoxins, which can impair animal health and also affect human health negatively. To avoid mold growth, stored forages should be harvested and conserved at the recommended moisture concentrations. In addition, silage or hay lages plastic should be maintained properly; any holes should be promptly sealed with silage tape (Adesogan et al, 2012).

### *2.3.3. Management of Grazed Pastures*

For maximum quality, pastures should be managed to maintain a leafy canopy that is free of weeds and dead herbage and is grazed uniformly without many ungrazed patches. There is much controversy about how to achieve such a target. Some grazing experts contend that frequent rotation is desirable. Others feel that if stocking rate is matched carefully to forage availability, then frequent rotation offers little advantage. The management requirements of particular forage and the objectives of the livestock operation often are the most important factors influencing choice of rotation frequency. In addition, over-grazing should be avoided because lack of available forage will have a

major negative impact on animal performance regardless of forage nutritive value and potential quality. Generally, fertilizer application has little effect on forage quality except that CP will be increased for a period of time following N fertilization. If forage CP is low in unfertilized grass, then N fertilizer application will often increase forage CP and contribute to improved forage intake and animal performance (Adesogan et al, 2012).

Table1. Nutrient composition of Coastal Bermuda grass as affected by maturity (Adesogan et al, 2012)

<b>Age of Grass (Weeks)</b>	<b>Digestibility</b>	<b>Crude Protein</b>	<b>ADF</b>	<b>Lignin</b>
4	60	18	29	4
5	59	18	30	4
6	56	16	31	5
7	53	13	33	6

Table 2: Nutrient composition of some feeds (Pandey G. and Voskuil G., 2011)

<b>Feed ingredients (%)</b>	<b>DM</b>	<b>Moisture</b>	<b>Crude protein</b>	<b>Crude fiber</b>	<b>Ash</b>
wheat straw	93	7	2	38	5
hay	92	8	2	34	6
Maiz stover	92	8	2.5	32	5
Cotton seed cake	94	6	41	12	-

#### **2.4. Feed Conservation Method**

Feed conservation is one of the components of feed management to ensure year-round feed availability. Conservation of crop residues for animal feed is a common practice across all the study areas, but the methods of conservation vary among agro-ecologies and production systems, and types of crops grown (Azage et al, 2013).

The most commonly used ways of feed preservation techniques in Ethiopia is hay making which is expected to mitigate problems of livestock feeding during the dry period and therefore their experience is a good indicator that feeds are being efficiently utilized. However; as both grasses and legume decline in quality as the dry season progresses ways of preserving nutritive quality through hay making during the rainy season may be worthwhile (Yeshitila, 2008).



Figure 1: feed conservation practices in a form of kussa in Mieso (left), stack in Fogera (middle) and standing hay in Metema (right).

#### *2.4.1. Silage Making*

Silage-making is a management tool that allows producers to match feed resources (forages, crop residues, agro-industrial by products, etc.) with feed demand for a dairy herd. The basic function of silage-making is to store and preserve feed for later use with minimal loss of nutritional qualities. In modern animal agriculture, hay-making of excess pasture preceded silage-making as the primary method of preservation on the farm; however, silage-making has progressively replaced hay making as the technique of choice in some parts of the world. Silage making is less dependent than hay-making on good weather conditions and can be extended to a great variety of forage crops (corn, sorghum, immature cereal grains, etc.) and locally available agro-industrial by products (sugar beet pulp, brewers' grain, etc.). Actually, the practice of silage making evolved in parallel with the success of corn as a high yielding crop that is preserved extremely easily in a silo. Difficulties arose when silage making was extended to other forage crops that are less easily preserved as silage, in particular legumes. Silage making has become an important tool for producers to manage crop production and dairy herd feeding programs

in many production systems around the world. However, silage making requires considerable capital and labor investments on the farm; it also demands a fairly high level of technical expertise. This knowledge is key to making the best management decisions for minimizing the inevitable losses that occur when fresh feed resources are ensiled and preserved for long periods of time in a silo (Broderick, 2000).

Silage making gives producers a feed inventory that can be used to plan a detailed feeding program for the herd. If feed analyses are performed, diets can be formulated specifically to meet cow requirements and improve nutritional status at all stages of lactation. Thus, despite the fact that silage making represents high costs and/or capital investments, benefits accrue from higher cow productivity (Broderick, 2000).

Optimum fermentation is dependent upon decisions and management practices implemented before and during the en-siling process. Good quality silage is achieved when lactic acid is the predominant acid produced. The faster the fermentation is completed, the more nutrients will be retained in the silage. Keep in mind that good silage depends on the stage of maturity of the forage at time of harvest, the type of fermentation that occurs during the ensiling process, and the type of storage used for the fermentation process. Attention to details such as moisture content, length of chop, silage distribution and compaction can greatly impact the fermentation process and storage losses (Rocky, 2010).

#### *2.4.2. Hay making*

Hay is grass, legumes or other herbaceous plants that have been cut, dried, and stored for use as animal fodder, particularly for grazing livestock such as cattle, horses, goats, and sheep. Hay is fed when or where there is not enough pasture or rangeland on which to graze an animal, when grazing is unavailable due to weather (such as during the winter) or when lush pasture by itself is too rich for the health of the animal. It is also fed during times when an animal is unable to access pasture, such as when animals are kept in a stable or barn (Broderick, 2000).

The primary objective of any hay-feeding program is to provide plenty of high-quality hay to meet the animals' nutritional needs. Many factors affect the quality of hay: soil fertility, the stage of forage maturity when harvested, the moisture available during the growing season, harvesting conditions, and storage. Because of those factors, most

operations produce hay of varying qualities in different cuttings. To determine the quality of each cutting, have the hay analyzed by a laboratory. If you know the quality of each cutting, you not only can feed the highest quality hay to animals with the highest requirements, but you also can estimate the amount of supplement needed to meet animal requirements with each quality of hay (Broderick, 2000).

## **2.5. Nutrition and Productivity of Dairy Cattle**

The critical problem in optimizing milk production and milk quality is the difficulty in controlling feeding and environmental management. Feed, environment and the animal itself are the most credible factors affecting feed intake, milk yield (MY) and milk quality in lactating dairy cows. For example, the dry matter intake (DMI) of lactating dairy cows largely depends on the types of feed offered, level of feeding, ration formulation and quality of feed, as well as body condition, stage of lactation, reproduction and climatic factors, such as environmental temperature and relative humidity. Prediction of DMI is a prerequisite for accurate balancing of dairy rations. Various equations have been developed in an attempt to predict the DMI of lactating dairy cows based on their age, parity, bodyweight (BW), stage of lactation, milk production and milk composition (National Research Council, 2001). Moreover, studies have been conducted to determine DMI from feed quality and animal (Fuentes-Pila et al., 2003).

## **2.6. Overview of Dairy Production Systems in Ethiopia**

Dairying is practiced almost all over Ethiopia involving a vast number of small or medium or large-sized, subsistence or market-oriented farms. Based on climate, land holdings and integration with crop production as criterion, dairy production systems are recognized in Ethiopia; namely the rural dairy system which is part of the subsistence farming system and includes pastoralists, agro-pastoralists, and mixed crop–livestock producers; the peri-urban; and urban dairy systems; (Yoseph et al., 2003 and Dereje et al., 2005). The first system (pastoralism, agropastoralism and highland mixed smallholder production system) contributes to 98%, while the peri-urban and urban dairy farms produce only 2% of the total milk production of the country (Ketema, 2000).

### *2.6.1. Rural Milk Production*

This dairy system is part of the subsistence farming system; it is the predominant production system accounting for over 97% of national milk production. This system includes pastoralists, agro-pastoralists, and crop-livestock producers. Largely, the system is based on low producing indigenous breeds of zebu cattle. The livestock are kept under traditional management conditions and generally obtain most of their feed from native vegetation, aftermath grazing and crop residues (Tsehay, 2002). Pastoralism is the major system of milk production in lowlands. However, because of the low rainfall, shortage of feed and water availability, milk production is low and highly influenced by season (IPS, 2000). The system is not market oriented and most of the milk produced in it is retained for home consumption (Ahmed et al., 2003) or household processing. Processing is usually done using traditional technology in to products such as butter, ghee, ayib and sour milk. Milk and milk products are usually marketed through the informal market after the households satisfy their needs (Tsehay, 2002).

Cows are the main source of milk, and it is cows' milk that is the focus of processing in Ethiopia. Dairy processing in Ethiopia is generally based on ergo (fermented milk in Ethiopia), without any defined starter culture, with natural starter culture. Raw milk is either kept at ambient temperature or kept in a warm place to ferment prior to processing (Mogessie, 2002). Dairy processing in the country is basically limited to smallholder level and hygienic qualities of products are generally poor. About 52% of smallholder producers and 58% of large-scale producers used common towel to clean the udder or they did not at all. Above all they do not use clean water to clean the udder and other milk utensils. Of the interviewed small-scale producers, 45% did not treat milk before consumption (Zelalem and Faye, 2006).

### *2.6.2. Peri-urban milk production*

This system includes smallholder and commercial dairy farmers near Addis Ababa and other regional towns (Ahmed et al., 2003). Most of the improved dairy stock is used for this type of dairy production. Currently small holder farmers' milk marketing units, the

Dairy Development Enterprise, Mama agro-industry, and private dairy farmers in and around Addis Ababa are supplying dairy products to the city market (Tsehay, 2002).

### *2.6.3. Urban Milk Production*

Urban dairy systems in general are located in cities and/or towns and focuses on production and sale of fluid milk, with little or no land resources, using the available human and capital resources mostly for specialized dairy production under stall feeding conditions. As compared to other systems they have relatively better access to inputs (e.g. feeds) and services (e.g. artificial insemination) provided by the public and private sectors, and use intensive management. Marketing of fluid milk in these towns is arranged through direct contact between producers and consumers, and/or involves wholesalers/processors, cooperatives, and retailers (Tsehay, 2002).

## **2.7. Traditional Milk Handling and Processing Practices in Ethiopia**

Ethiopia has a huge untapped potential for market-oriented development of smallholder dairy production. The population of milking cows in the country is estimated at 9.9 million heads (CSA, 2008) although the majority of these fulfill multiple functions besides dairy production (Ahmed et al., 2004). Livestock currently support and sustain livelihoods for 80% of all rural poor. Female cattle constitute about 55.48% of the national herd. Of the total female cattle population, dairy and milking cows total 16,941,361, 14.24% dairy cows (cow of any breed kept primarily for milking purposes) (CSA, 2008). Ethiopia produces approximately 3.2 billion liters per year from 10 million milking cows. The farm-level value of the milk is an estimated 16 billion Ethiopian Birr per year (Kitaw et al, 2012).

On the other hand, the dairy sub-sector is currently facing a number of problems that have persisted for decades. Productivity of the dairy herd is low (1.3 l – 1.54 l per cow per day) with an average lactation period of 180 – 210 days (CSA, 2008). High mortality rates occur due to poor nutrition which makes cattle vulnerable to disease. Producers in the rural areas lack access to markets and extension services which reduces the ability of

smallholder producers to be competitive. Feed production and distribution is not coordinated. Only 0.15% of rural livestock holders are involved in an on-farm production of improved forages like alfalfa and Napier grass (Tefera, 2010); the use of industrial by-products like oil cake, bran, and brewery residue is negligible (0.8%) (Tefera, 2010). Moreover, market-orientation of the production systems and the possibility of exporting Ethiopian dairy products are limited by high transaction costs despite low costs of production (Ahmed et al, 2004). Development of a vertically integrated and coordinated milk value chain is thus an important option to reduce operational and transaction costs to meet consumers' demand and to encourage partnerships along the chain (Costales et al. 2006). There is a serious concern, however, that smallholder agricultural producers are often excluded from participation in value chain since they usually lack access to credit, make limited investment in their human capital (including skills and entrepreneurship training), and are isolated by physical distance from the market (Mendoza and Thelen, 2008).

## **2.8. Smallholder Dairy Production and Processing Method in Ethiopia**

Hand milking is the sole milking method practiced across all the rural part of Ethiopia. Frequency of milking across the dairy production in rural part of country is twice daily, with the exception of the rural lowland agro pastoral production sub-system where milking frequency is reduced to once a day during the dry season in order to cope up with feed shortage (Azage et al, 2013).

Hygienic milk production is important and should take into account the sanitation of the barn, personnel involved in milking and the utensils used to collect and store milk. Cleaning of the teats before milking contributes to hygienic milk production. However, it is not common practice to sanitize teats before milking in the rural dairy production systems, and the number of farmers sanitizing teats is few in urban dairy production system with the assumption that teats are cleaned when the calf suckles before milking. In fact calves are also allowed to suckle after milking to ensure complete milking. The dominant milk processing method across all rural dairy production systems is traditional

home processing method and it involves processing of fluid milk into fermented or sour milk, butter and local cheese (ayib). For example, in the rural highland system milk is fermented for 3 to 5 days before it is processed into butter and other milk products (Azage et al, 2013).



Figure 2: Hand milking (source: - Azage et al, 2013).

### **3. MATERIALS AND METHODS**

#### **3.1. Study Area**

This study was conducted at Ada'a district around Debre-Zeit town. Debre-Zeit is located 47kms south east of Addis Ababa. The area is located at 9°N latitude and 40°E at an altitude of 1850 meters above sea level in central high land of Ethiopia. It has an annual rainfall of 866 mm of which 84% is in the long rainy season (June to September). The dry season extends from October to February. The mean annual maximum and minimum temperatures are 26°C and 14°C respectively, with mean relative humidity of 61.3%. Farmers in the vicinity of Debre Zeit town use mixed crop and live stock farming system. Moreover, Debre-Zeit and its surrounding have variable representative agro-ecologies of the country. These agro-climatic zones are inhabited with different plant and animal species (Zelege et al, 2004).

According to (CSA, 2003) recorded the livestock population of Debre Zeit registered cattle 160,697, sheep 22,181, goat 37,510, horse 5660, donkey 38,726, mule 268 and poultry 191,380.

#### **3.2 Research Approach**

##### *3.2.1 Sampling Techniques and Sample Size*

The study was conducted in Ada'a district of the Oromia region. Prior to the actual survey, a structured questionnaire was developed and pre-tested for its consistency and applicability to the objectives of the study. Based on the representativeness from the seven villages with respect to dairy potential were selected using purposive sampling techniques. Total of 60 respondents from the seven villages (Godino jitu =13, Babogaya =8, kebele 09 =9, Ude =10, kebele 01 =5, kebele 02 =7 and Dembi=8) were purposively selected.

A total of 184 feed samples from seven purposively selected potential villages of Ada'a district were collected. feed samples was collected from the fourteen types of feeds (3 brewery by product, 1 cotton seed cake, 6 linseed cake, 13 noug cake, 3 lin seed cake +

noug seed cake, 3 elephant grass, 3 hay, 28 tef straw, 45 wheat straw, 18 poultry litter, 5 maize grain, 27 wheat bran, 11 wheat middling and 18 concentrate mixes.

### *3.2.2 Data Collected*

The study was including the following major data groups.

- Household socio-economic characteristics: sex, age, family size and education level.
- Feed resources: feed type and source, the present types of feed owned.
- Feed quality: nutritional values of samples were determined in laboratory for parameters like dry matter, ash, crude protein, NDF, ADF and lignin.

### *3.2.3 Data Sources and Methods of Collection*

Both primary and secondary sources of data were used in this study. Secondary data were obtained from reports of Debre -zeit Agricultural Research Centre Office and other published and unpublished materials. Primary data were collected using semi-structured questionnaire used.

The respondents were used to generate information during survey. Based on the information generated through respondents, the questionnaire and record sheets were developed for the main survey. The enumerators were recruited from the study area and made acquainted with the questions, trained on methods of data collection and interviewing techniques. The collection of information was made at household level.

### *3.2.4 Sampling procedures of the feeds*

To identify the quality of feed, feed samples were randomly collected from different villages considering the different feed types.

Nutritive values of feed samples were determined according to the Near Infrared Reflectance (NIR) spectroscopy system. Samples were analysed to their nutritive value in feed analysis laboratory at Holleta Agricultural Research Centre, Ethiopia.

The most important precondition when analyzing feedstuffs is the sampling procedure. The following sampling procedures were applied:

1. The samples taken were representative for the entire lot.
2. Samples were taken randomly from several different points of the lot. Subsequently the samples were then mixed to a single blend to produce a collective sample, which again is divided into several representative laboratory samples for analysis.
3. Sampling equipment was not being able to influence the sample taken, i. e. via contamination or sedimentation.
4. Feed samples were stored in a manner that ingredients would not be altered (temperature, oxygen, sun light etc.) before analysis.
5. A sampling report is prepared in order to assign the sample correctly after analysis.

### **3.3 Data Management and Statistical Analysis**

The collected data were coded and tabulated for analysis. The statistical analysis used in the study varied depending on the type of variable and information obtained. However, since the survey study was based on ‘single-visit-multiple-subject formal survey’ methodology, descriptive statistics using SPSS version 20 was mainly applied such as frequency. Feed quality parameters were also analyzed using SPSS version 20.

## 4. RESULTS

### 4.1 Socio- Economic Characteristics of Households

This section deals with the findings of descriptive analysis on dairy cattle feed resources and milk handling practices. It also discusses the analysis of preservation methods of feed and feed quality in Ada'a district.

#### 4.1.1 Household Characteristics

The demographic characteristics of farmers in terms of sex, educational level and age were described as follows. Respondents were 88.3% male and 11.7% females; about 38.3% and 36.7% of the respondents were primary school (1-8) education and secondary school education respectively. Other remaining 1.7%, 6.7%, 11.7% and 5% were illiterate, no formal education, diploma and degree and above respectively. The mean age of the respondents were 46.22 years (with standard deviation of 11.82 years) ranging from 28 to 80 years. Of the total households interviewed, 86.7 % are married while 5%, 3.3% and 5% are single, divorced and widows, respectively.

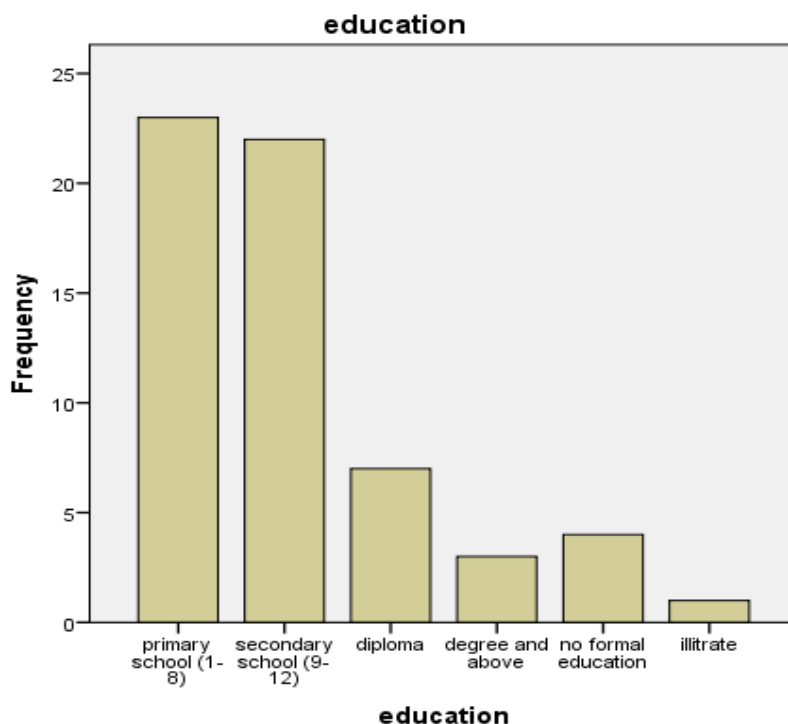


Figure 3: Educational status of the respondents

#### 4.1.2. Crop Land Holding and Farm Size

About 41.8% of the respondents had <1 hectare and 30% of the respondents had 2-5 hectares farm size. Farms are obtained by purchased (16.7%), inherited (28.3), rented (36.7) and given from government (5%). the larger areas of farm size (2-5 ha) were found in godino (15%) and ude (15%) kebeles. 46.7% of the respondents have crop land holdings from 1-5 hectares in addition to dairy cattle production.

Table 3: The size of farm in different kebeles

kebeles	farm size		Total
	<1 ha (%)	2-5 ha (%)	
godino	6.7	15	21.7
babogaya	11.7	0	11.7
kebele 09	11.7	0	11.7
ude	1.7	15	16.7
kebele 01	3.3	0	3.3
kebele 02	1.7	0	1.7
dembi	5	0	5
Total	41.8	30	71.8

## 4.2. Description of Dairy Cattle Feed Resources

### 4.2.1. Sources of Compound Feeds and Preservation Methods

The following table (table 4) described that the sources of the compound feeds are self made, Neighboring farms, local miller, local supplier and large reputable miller. From those listed sources many respondents were purchased feeds from local suppliers (63.3%), self made (21.7%) and local miller (15%). This indicates that the main sources of compound feeds in Ada'a district were local supplier.

Compound feeds were preserved in different methods which were in open air, well aerated and poorly aerated methods. Many respondents (about 65%) were used well aerated preservation method and 23.3% respondents were used poorly aerated method.

Table 4: sources of compound feeds and preservation method

<b>source</b>	<b>%</b>	<b>preservation</b>	<b>%</b>
Self made	21.7	Open air	13.3
Neighboring farms	1.7	Well aerated store	65
Local miller	15	Poorly aerated store	23.3
Local supplier	63.3		
Large reputable miller	5		
imported	0		

#### 4.2.2 Types, Sources and preservation methods of bulk feeds

Different types of bulk feeds were found in the Ada district which were hay (16.7%), Tef straw (76.7%), Wheat straw (98.3%), Maiz straw (11.7%) and others like sugarcane top, oat and vegetable leftover (11.7%). This study shows that Wheat straw was the common type of bulk feed and Tef straw was the next bulk feed in Ada district.

Table 5: Types of Bulk Feeds

<b>roughage</b>	<b>%</b>
Hay	16.7
Tef straw	76.7
Wheat straw	98.3
Maiz straw	11.7
Others (sugarcane top, Oat and vegetable leftover)	11.7

Sources of bulk feeds were self made (41.7%), neighboring farms (1.7%) and local supplier (66.7). The most common source was local supplier and self made was the second source of bulk feed based on the respondents' utilization.

Bulk feeds were preserved in open air (63.3%), well aerated store (26.7%) and poorly aerated store (10%). This indicates that many respondents were put bulk feeds in open air place.

Table 6: Sources and Preservation Methods of Bulk Feeds.

<b>source</b>	<b>%</b>	<b>preservation</b>	<b>%</b>
Self made	41.7	Open air	63.3
Neighboring farms	1.7	Well aerated store	26.7
Local supplier	66.7	Poorly aerated store	10

### **4.3. Feed Quality in Ada’a District**

Samples of feed ingredients and concentrate mixes were collected from the smallholder dairy producers. The samples were packed into the paper bag and labeled. They were immediately put in the oven dry until the nutritional analysis undertaken. Samples were analyzed for their nutrient value using the Near Infrared System (NIRS). A total of 184 feed ingredients and concentrate mixes were collected and analyzed.

Table 7: Nutritional value of feed ingredients and concentrate mixes used for dairy cattle in Ada'a district

<b>Feed ingredient</b>	<b>N</b>	<b>DM</b>	<b>Ash</b>	<b>CP</b>	<b>NDF</b>	<b>ADF</b>	<b>Lignin</b>
Brewery byproduct	3	93.18	5.44	23.00	55.18	22.10	7.61
Cottonseed cake	1	92.04	7.90	41.28	38.17	22.77	6.91
Linseed cake	6	92.19	6.91	29.47	34.42	25.72	5.29
Noug cake	13	92.35	10.18	34.03	36.02	26.42	11.61
Lin seed cake + Noug seed cake	3	92.33	8.17	30.81	34.55	24.31	8.94
Elephant grass	3	91.48	8.72	6.44	71.15	49.20	8.66
Hay	3	93.38	8.68	5.43	59.62	41.79	10.24
Tef straw	28	91.77	8.15	5.47	77.50	47.91	7.41
Wheat straw	45	92.52	8.41	3.30	75.87	51.97	6.65
Poultry litter	18	94.67	11.89	18.86	28.38	14.85	3.81
Maize grain	5	91.28	1.42	8.59	13.76	2.80	1.35
Wheat bran	27	93.15	5.26	18.19	46.94	13.25	3.40
Wheat mid ling	11	92.09	5.31	16.95	45.95	14.63	3.83
Concentrate mixes	18	91.63	5.97	17.15	40.21	13.25	3.27

#### 4.3.1 Dry matter (DM)

Dry matter (DM) is the percentage of feed that is not water. In contrast, moisture is a measure of the amount of water in the feed and is important because moisture dilutes the concentration of all nutrients.

Convert nutrient values to a dry basis to formulate rations. Then convert feeds in the ration obtained from the dry basis to an "as fed" basis to obtain amounts to feed or mix in the ration.

The following figure (figure 4) described that almost all of the sample feeds have narrow range of dry matter content (91.28 - 94.67). Even all of the sample feeds have an average

dry matter content of above 90, poultry litter has the higher dry matter content which accounts about 94.67 and the least dry matter content is found in maiz grain (91.28). This shows that majority of feeds had low moisture content due to loss of moisture with sun light or over maturity of feeds before harvesting.

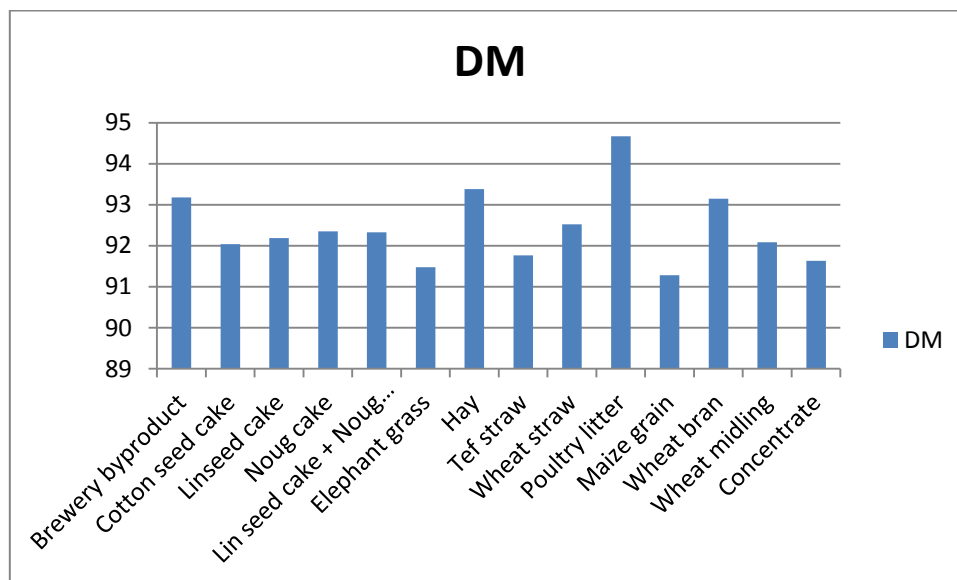


Figure 4: Dry matter content of sample feeds

#### 4.3.2. Ash

Ash is the inorganic residue remaining after the water and organic matter have been removed by heating in the presence of oxidizing agents, which provides a measure of the total amount of minerals within a food.

The ash contents of poultry litter is higher (11.89) than the other feed samples and the maiz grain ash content is the least (1.42). As a result poultry litter was used as a sources of minerals.

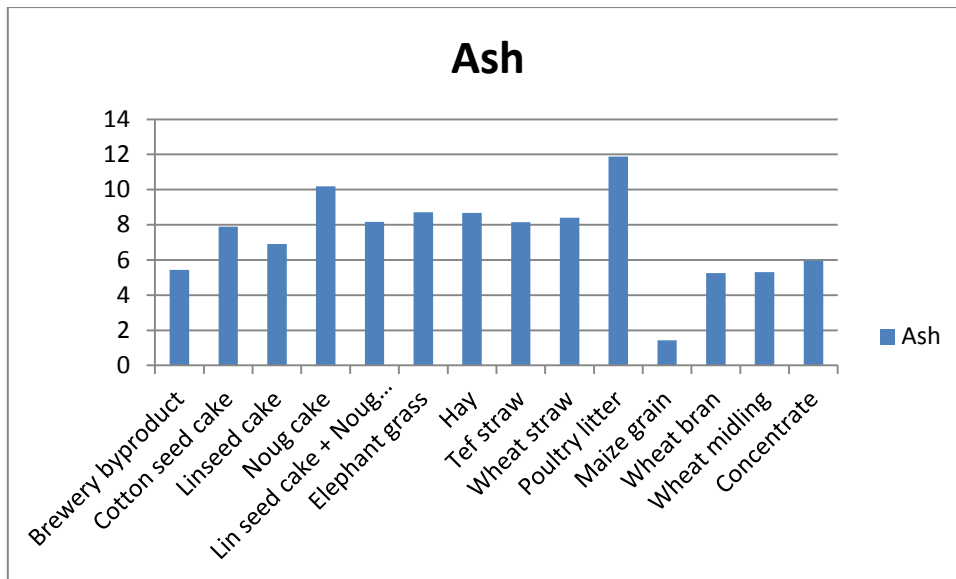


Figure 5: Ash contents of sample feeds

#### 4.3.3. Crude Protein (CP)

Crude protein (CP) measures both true protein and non-protein nitrogen. According to the result of feed analysis Cotton seed cake has the value of 41.28 CP which is the higher value and wheat straw has the least amount of CP (3.3).

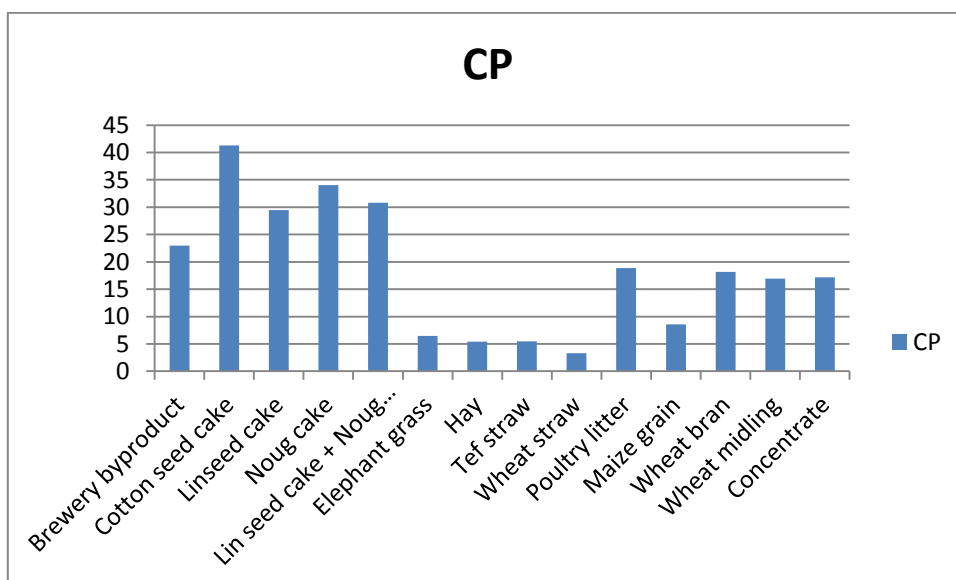


Figure 6: Crude protein content of sampled feeds

#### 4.3.4. Neutral detergent fiber (NDF)

Neutral detergent fiber (NDF) measures the structural part of the plant, the plant cell wall. NDF gives "bulk" or "fill" to the diet, and as a result limits intake. Because NDF can be used to predict intake, it is one of the most valuable analyses to have conducted on forages for dairy rations, and can be useful for beef rations that rely on forages primarily. Low NDF usually is desired. As maturity of the plant at harvest increases, cell wall content of the plant increases, and NDF increases.

Teff straw, wheat straw and elephant grass contains the higher NDF content (77.5, 75.87 and 71.15) respectively. But maize grain contains the lowest (13.76) NDF content. This indicates that Teff straw, wheat straw and elephant grass samples were collected at matured level when the cell wall part of feed were increased.

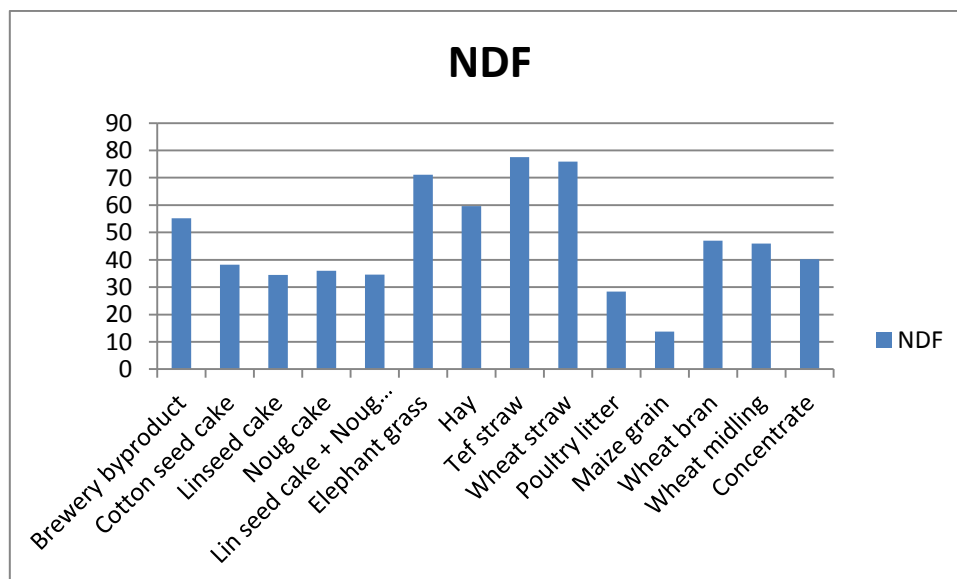


Figure 7: Neutral detergent fiber content of sample feeds

#### 4.3.5. Acid detergent fiber (ADF)

Acid detergent fiber (ADF) primarily consists of cellulose, lignin, silica, insoluble crude protein and ash, which are the least digestible parts of the plant. Because ADF percentage in forages negatively relates to digestibility, it is used to calculate energy values. ADF is

one of the most common analyses made, particularly on forages. Low ADF usually is preferred because it means higher net energy. As the plant matures, ADF increases.

The result of ADF analysis were similar to the result of NDF analysis which is Teff straw, wheat straw and elephant grass contains the higher ADF content and maiz strain has lower content of ADF when compared to the other feed samples. This shows that as maturity of feed increases, the content of cell wall, cellulose, lignin, silica, insoluble crude protein and ash increases then the energy value decreases.

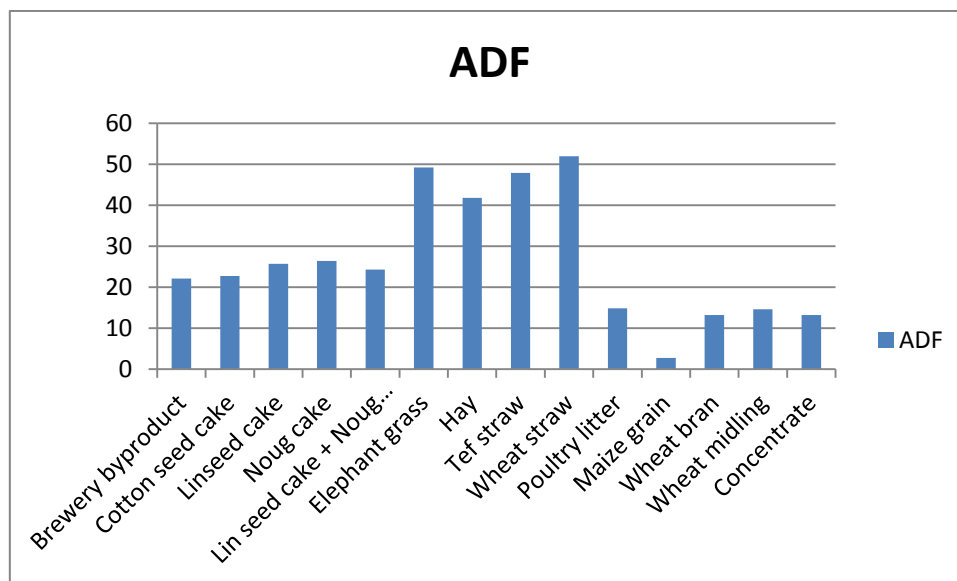


Figure 8: Acid detergent fiber content of sample feeds

#### 4.3.6. Ligin

This represents the highly indigestible portion and is associated with fiber. The greater the lignin content of a plant, expressed either on a dry-matter basis or as a percentage of the NDF, the lower the digestibility of the forage. Ligin content of a plant increases as the plant matures.

The lignin content of Noug cake is higher (11.61) followed by hay (10.24) and maiz grain contains the lower lignin content (1.35).

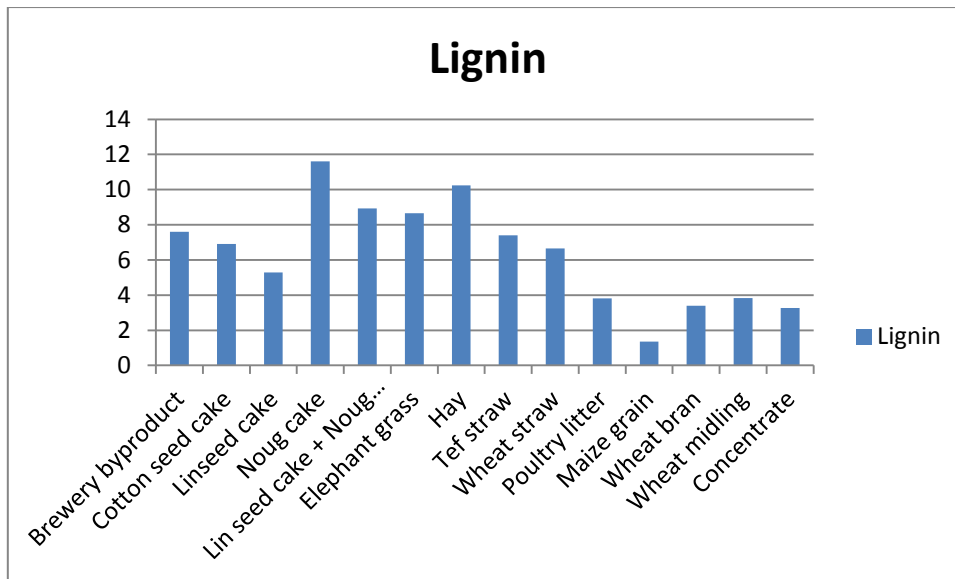


Figure 9: lignin contents of sample feeds

#### 4.4 Milk Handling Practices of Households

Different milk handling activities were practiced in different stages such as before milking, during milking and after milking.

##### 4.4.1. Before Milking

The following table (table 6) shows that before milking all of the respondents were properly clean and dry milking equipments and 60% of the respondents were covering their hair. 65%, 56.7% and 53.3% of the respondents were washing hands with clean water and disinfectant, washing udder and teats with boiled warm water and washing udder and teats with cold water respectively. About 43.3% were used individual towel and 33.3% were used collective towel to dry teats. 51% of the respondents were checking udder for mastitis and 46.7% were checking appearance and viscosity of foremilk. This shows that above half of the respondents had the awareness about before milking activities.

Table 8: Activities practiced before milking

<b>Before milking activity</b>	<b>%</b>
Properly clean and dry milking equipments	100
Covering your hair	60
Washing hands with clean water and disinfectant	65
Washing udder and teats with boiled warm water	56.7
Washing udder and teats with cold water	53.3
Dry the teats with individual towel	43.3
Dry teats with collective towel	33.3
Checking udder and foremilk for mastitis /udder inflammation	51.7
Check appearance and viscosity of fore milk	46.7

#### 4.4.2. During Milking

During milking respondents were done different inappropriate activities. All of the respondents (100%) were touching their nose and/or scratching different parts of the body and above 80% of the respondents were coughing without covering mouth/nose in to the palm. According to the respondents responses none of them can be produced good quality milk.

Table 9: inappropriate activities during milking

<b>During milking activity</b>	<b>%</b>
Touching your nose and/or scratching different parts of the body	100
Coughing into the palm	83.3
Coughing without covering mouth/nose	81.7

#### 4.4.3. After Milking

Many respondents were feed the animal immediately (81.7%) and filter the milk (93.3%) after milking. About 68.3% of respondents were measure the amount of milk but only 18.3% were record the milk yield. The percentage of dipping teats with teat dip, cooling

milk immediately, pasteurization and recording were very low (16.7%, 20%, 6.7% and 18.3%) respectively. This shows that the awareness and the availability of after milking materials were less in smallholder farmers.

Table 10: activities practiced after milking

<b>After milking activity</b>	<b>%</b>
Dipping teats with teat dip	16.7
Feed the animal immediately	81.7
Filter the milk	93.3
Measure the amount of milk	68.3
Cool the milk immediately	20
Pasteurize the milk	6.7
Store it in clean milk storage equipments	73.3
record the milk yield	18.3

#### 4.4. 4 Store after Milking

The following table (table 8) described that milk storing containers were plastic (98.3), stainless steel (8.3%), aluminum (3.3) and pot (5%). This shows that plastic containers were used widely to store milk.

Table 11: storing equipments after milking

<b>containers</b>	<b>%</b>
plastic containers	98.3
stainless steel containers	8.3
aluminum containers	3.3
Clay pot	5

## **5. DISCUSSION**

### **5.1 Dairy Cattle Feed Resources**

In this study the main sources of compound feeds and bulk feeds were local supplier (63.3%) and (66.7%) respectively. This result shows that the most feeds are obtained by purchasing. This report is similar with the report of (Vernooij, 2007) which revealed that Peri-urban dairy production systems have emerged around cities and towns, which heavily rely on purchased fodder. On the other hand this study is different from (Sintayehu et al, 2008) which reported that In the mixed crop– livestock system majority (53.7%) of the households use animal feeds from their own crop farm, while 23.7% use a combination of own farm and communal grazing, and 15.8% use own farm and purchased feed. This difference figure of the feed source is due to the different production systems of the dairy producers.

Major roughage feed resources for dairy animals in the study areas were Tef straw (76.7%), Wheat straw (98.3%) and Maiz straw (11.7%). This report is similar with the study of (Azage et al, 2013) teff, wheat and barley straw, and maize stover are important feed resources in the rural highland system of Bure and Fogera.

In the recent study there is about 16.7% of the households were used hay as a source of feed. This is very less than the report of (Azage et al, 2013) which reported that In the rural lowland system of Metema, although hay making was common (practised by 75% of the sampled households) and Hay stacking was practised by 35.8% of the urban dairy producers in Hawassa, Shashemene, Yirgalem and Dilla.

### **5.2. Feed Preservation Methods**

Preservation of feed for animal feed is a common practice across all the study areas. About 65% of compound feeds were store in well aerated store and 63.3% of bulk feeds were store in open space. Storing of bulk feeds were similar with the finding of (Azage et al, 2013) who noted that the crop residues and/or hay were preserved in an open space, but this might cause nutrient leaching due to excessive exposure to sunlight and rainfall.

### 5.3 Nutritional Compositions of Feeds

In this study small holder farmers used feeds were Brewery by product, Cotton seed cake, Linseed cake, Noug cake, Lin seed cake + Noug seed cake, Elephant grass, hay, tef straw, wheat straw, poultry litter, Maize grain, Wheat bran, Wheat middling and Concentrate. This report is almost similar with the study of (Azage et al, 2013) who reported that agro-industrial by-products include cereals flour mill by-products, such as wheat, maize, rice bran, wheat short, and wheat middlings, which are commonly used as energy supplements, and oil seed cakes such as noug, cottonseed, peanut, sesame cakes, which are mainly used as protein supplements. Agro-industrial by-products are characterized by high protein, digestible energy, and low fibre fraction, and when supplemented to dairy cows improve the use of low quality basal diet and thereby improve milk production.

The dry matter contents Cotton seed cake, hay, wheat straw and wheat middling were 92.04, 93.38, 92.52 and 93.15 respectively. This study shows that the DM content of cotton seed cake is less, DM content of hay is higher and DM content of wheat straw is almost the same to the study of (Pandey G. and Voskuil G., 2011) who stated that the DM content of Cotton seed cake, hay and wheat straw was 94, 92 and 93 respectively.

The crude protein content of Cotton seed cake, hay and wheat straw were 41.28, 5.43 and 3.30 respectively. The result cotton seed cake is the same to the finding of (Pandey G. and Voskuil G., 2011) who noted that the CP content of cotton seed cake was 41. But the result of recent study had higher CP contents of hay and wheat straw than to the finding of (Pandey and Voskui, 2011).

CP content of cotton seed cake was higher and used as better protein source rather than other feed which is similar with the study of (Azage et al, 2013) who revealed that oil-seed cakes such as noug, cottonseed, peanut, sesame cakes, which are mainly used as protein supplements.

Most of feeds were having higher contents of ADF, NDF and lignin. This result describes that feeds were harvested after matured which means that when the feeds are matured the leaf part became minimized and increase the stem content of the feed (reduce the protein content of feed) and increase the content of fibers (reduce the feed intake) then reduce the productivity of dairy cattle.

#### **5.4 Milk Handling Activities**

All of the respondents were cleaned milking equipments and (65%) of participants were wash hands with clean water and disinfect. 56.7% of the participants were wash udder with clean and boiled water before milking. This is different from the result of (Azage et al, 2013) who stated that it is not common practice to sanitize teats before milking in the rural dairy production systems, and the number of farmers sanitizing teats is few in urban dairy production system with the assumption that teats are cleaned when the calf suckles before milking.

In the recent study about 33.3% of respondents were used common towel to clean the udder. This percentage is less than the result which is reported by (Zelalem and Faye, 2006) who reported that about 52% of smallholder producers used common towel to clean the udder.

Almost all (98.3%) of participants were used plastic containers to store milk after milking. this is similar to the result reported by (Azage et al, 2013) who revealed that the majority (92%) of urban producers used plastic milk utensils.

## **6. CONCLUSION AND RECOMMENDATION**

Study on the assessment of dairy cattle feed resources and milk handling practices was conducted in Ada'a district with the objectives of assess the existing dairy cattle feed resources, to evaluate the feed quality and milk handling practices. Based on the results the following conclusions were forwarded.

Feed sources found in the district were Brewery by product, Cotton seed cake, Linseed cake, Noug cake, Lin seed cake + Noug seed cake, Elephant grass, hay, tef straw, wheat straw, poultry litter, Maize grain, Wheat bran, Wheat middling and Concentrate. But almost all of the respondents were mainly used wheat straw and teff straw for their dairy cattle by purchasing from local suppliers of feeds and the majority of smallholder farmers were preserved dairy cattle feeds in well aerated space (compound feeds) and in open air space (bulk feeds). Bulk feed preserving methods cause loses of nutrients due to rainfall and sun light. The dry matter contents of feeds were above 90 and this indicates that the most feeds had less moisture contents. The ADF, NDF and lignin content were high and reduce the productivity. This is the effect of maturity of feeds. All of the respondents were cleaned milking equipments and (65%) of participants were wash hands with clean water and disinfect before milking. Some of the respondents use common towel to clean teats before milking and almost all of the respondents were used plastic container to store milk after milking.

According to the result of this study some of the suggested issues that require consideration by any development organizations are high lightened below:

- Preserving feeds in appropriate storage place to keep the nutritive value of feed.
- In order to increase milk production, create the awareness of dairy feed management to dairy producers and dairy feed suppliers.
- Feeds should be harvested when the plants are green (before matured).
- Giving training to dairy producers concerning with feed management and milk handling practices (before, during and after milking) including the storing containers

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## 8. APPENDIX

### 8.1 Questionnaire Used in the Study

#### Addis Ababa University School of Graduate Studies Dairy Cattle Feed Resources and Milk Handling Practices Questionnaire

Name of interviewer \_\_\_\_\_ Date \_\_\_\_\_

Name of supervisor ----- Signature \_\_\_\_\_

#### Part 1. General

1.1 Name of the respondent \_\_\_\_\_

1.2 Relation to the Household head (HH)

A. Owner    B. Spouse    C. Relative    D. Employee    E. Others

(specify) \_\_\_\_\_

1.3 Phone number of HH \_\_\_\_\_

1.4 HH gender                    A. Female                    B. Male

1.5 Educational status of HH

A. Primary School (1-8)                    B. Secondary School (9-12)                    C. Diploma

D. Degree and above                    E. No formal education                    F.

Read and write only

1.6 Employment status of HH

A. Informal/ self    B. Formal                    C. Casual labor    D. Other

(specify) \_\_\_\_\_

1.7 Family size                    A. 1-3                    B. 4-6                    C. >6

1.8 Age of the HH \_\_\_\_\_

1.9 Marital status of the HH

A. Single    B. Married    C. Separated/ divorced                    D. Widowed

1.10 District \_\_\_\_\_

1.11 Village \_\_\_\_\_

**Part 2. Technical information**

2.1. Main five farm enterprises (descending order) “see the codes”

A. \_\_\_\_\_ B \_\_\_\_\_ C. \_\_\_\_\_ D. \_\_\_\_\_ E.

Code	Enterprise	Code	Enterprise	Code	Enterprise
1	Dairy production	5	Beef production	9	Horticultural crops production
2	Poultry production	6	Food crops production	10	Aquaculture (fish farming)
3	Goat production	7	Cash crops production	11	Apiculture (honey production)
4	Sheep production				

2.2 Indicate farm size A. <1 ha B. 2-5 ha C. 6-10 ha D. >10 ha

2.3 Mode of acquisition

A. Purchased B. Inherited C. Rented D. Others

(specify) \_\_\_\_\_

2.4 What crops do you grow? \_\_\_\_\_

2.5 What is the area under crops? \_\_\_\_\_ ha

2.6 How could livestock be used on the plot

A. Grazing B. Growing fodder for livestock C. Other (specify)

\_\_\_\_\_

2.7 Who manages the farm?

A. Self B. Spouse C. Relative D. Hired labour E.

Others(specify) \_\_\_\_\_

2.8 Does the farmer keep farm records? A. Always B. Occasionally

C. Not at all

2.9 Major feeding system/Production system

A. Zero grazing B. Semi-zero grazing C. Extensive grazing E. Tethering F. Paddock

2.10 If yes for extensive and semi zero grazing, specify where you graze your animals

- A. Along road reserves    B. At dumping sites    C. Along sewer lines    D. Rural setting
- E. Other (specify) \_\_\_\_\_
- 2.11 Does the farmer use compounded feed?    A. Yes    B. No
- 2.12 Source of compounded feeds
- A. Self made    B. Neighbouring farms    C. Local miller    D. Local supplier
- E. Large reputable miller    F. Imported
- 2.13 Indicate how compounded feeds are kept at the farm
- A. Open air    B. Well aerated store    C. Poorly aerated store    D. Other (specify) \_\_\_\_\_
- 2.14 Major type of roughage
- A. Hay    B. Tef Straw    C. Wheat Straw    D. Maize stover
- D. Other (Specify) \_\_\_\_\_
- 2.15 Source of bulk feeds (roughage)
- A. Self grown    B. Neighboring farm    C. Local supplier    D. Other supplies (specify) \_\_\_\_\_
- 2.16 Indicate how bulk feeds are kept at the farm
- A. Open air    B. Well aerated store    C. Poorly aerated store    D. Other (specify) \_\_\_\_\_
- 2.17 Does the farmer use mineral supplements?    A. Yes    B. No
- 2.18 Indicate source of mineral supplements
- A. Local traders    B. Natural lick    C. Large suppliers    D. Others (specify) \_\_\_\_\_
- 2.19 Is quality of feed & supplements important to him?    A. Yes    B. No
- 2.20 How does he/she ensure good quality of these products (mineral supplements and compound feeds)?
- A. Laboratory test,    B. Use of skilled labour/staff,    C. Regular testing
- D. Physical characteristics,    E. Adherence to expiry date for ingredients
- F. Adherence to professional ethics in ration formulation    G. Other (specify) \_\_\_\_\_

- 2.21 Does the farmer use farm chemicals? A. Yes B. No
- 2.22 If yes, type of chemicals used  
 A. Herbicides B. Pesticides C. Acaricides D. Drenches  
 E. Antibiotics F. Organic solvents from paints/ chlorinated solvents (dry cleaners )  
 G. Others (specify) \_\_\_\_\_
- 2.23 Indicate sources of these chemicals  
 A. local traders B. Large reputable supplies C. Other (specify)\_\_\_\_\_
- 2.24 Does the farmer observe expiry date of procured products?  
 A. Always B. Occasionally C. Not at all
- 2.25 Is the farmer aware of chemical hazards? A. Yes B. No
- 2.26 If yes, how does he/she get the information on chemical hazards?  
 A. Label B. Extension officers C. Product promoters D. Open forums  
 E. Other (specify) \_\_\_\_\_
- 2.27 Where does he/she store farm chemicals?  
 A. Family house B. Drug store C. Feeds' store D. Other (specify)-----
- 2.28 Indicate methods of chemical application  
 A. Manually (Using small sprayers) B. Mechanized C. Others (specify) \_\_\_\_\_
- 2.29 Does the farmer wear protective gear/clothing? A. Yes B. No
- 2.30 If yes, which of these are worn?  
 A. Gloves B. Gumboots C. Breathing masks  
 D. Overall E. Hair cover F=Other (specify )\_\_\_\_\_
- 2.31 How do you dispose off expired chemicals?  
 A. Pit B. Burning C. Hiding under fence D. Discard E. Other (specify) \_\_\_\_\_
- 2.32 How do you dispose off spent packaging materials?  
 A. Pit B. Burning C. Hiding under fence D. Discard E. Other (specify) \_\_\_\_\_
- 2.33 What is the water source used for cleaning milk utensils?

A. Tap water    B. Surface water    C. Ground water    D. Rain    5. Others  
(specify) \_\_\_\_\_

2.34 Do you boil water before using for cleaning milk purposes?    A. Yes    B.  
No

2.35 When the water source is other than tap, what water treatment do you practice?  
A. Filtration    B. Boiling    C. No treatment    D.  
Others(specify) \_\_\_\_\_

2.36 What type of cleaning agents do you use for cleaning milk containers?  
A. Soap    B. Chemical detergents    C. None    D. Others(specify)  
\_\_\_\_\_

2.37 Do you have any knowledge on clean milk production and handling?    A. Yes  
B. No

2.38 If yes, how did acquire it?  
A. On the job experience    B. Extensionists    C. Training institution  
D. Research institutions    E. NGOs    F. Others (specify)  
\_\_\_\_\_

2.39 What do you do before milking?  
A. Properly clean and dry milking equipments  
B. Covering hair  
C. Washing hands with clean water and disinfectant  
D. Washing udder and teats with boiled warm water  
E. Washing udder and teats with cold water  
F. Dry the teats with individual towel  
G. Dry teats with collective towel  
H. Checking udder and foremilk for mastitis /udder inflammation  
I. Check appearance and viscosity of fore milk  
J. Others (specify) \_\_\_\_\_

2.40 Which practices do you find inappropriate during milking? (enumerator: please probe)  
A. Touching your nose and/or scratching different parts of the body  
B. Coughing into the palm  
C. Coughing without covering mouth/nose  
D. Using containers that have not been properly cleaned and dried  
E. Using one towel for more than one cow

F. Others(specify) \_\_\_\_\_

2.41 What do you use to lubricate the teats of animals during milking?

- A. Cooking oils      B. Milking salve      C. skin jelly/hair tonics      D. Dipping hand in the milk  
 E. Saliva      F. Others (specify) \_\_\_\_\_

2.42 What do you do after milking? Mark “✓”

A	Dipping teats with teat dip		E	Cool the milk immediately	
B	Feed the animal immediately		F	Pasteurize the milk	
C	Filter the milk		G	Store it in clean milk storage equipments	
D	Measure the amount of milk		H	record the milk yield	
I	others (specify) _____				

2.43 What type of equipment do you use to store milk after milking?

- A. Plastic container      B. Stainless steel containers  
 C. Aluminum containers      D. Others (specify) \_\_\_\_\_

2.44 How do you handle/use milk from animals under treatment?

- A. Let the calf suckle the milk      B. Check color/ consistency and use at home  
 C. Sell to costumers      D. Feed to pet animals  
 E. Boil and use      F. Discard /dispose as per drug manufacturer’s instructions  
 G. Others (specify) \_\_\_\_\_

2.45 Who takes over milking and milk handling activities when routine milkers and handlers are not on duty?

- A. Members of the family      B. Neighbours  
 C. Hired labor      D. Others (specify) \_\_\_\_\_

2.46 Are the substitute milkers experienced in clean milk production?      A. Yes

- B. No

2.47 Have your dairy animals been checked for diseases such as TB and Brucellosis?

- A. Yes                      B. No

2.48 If yes, specify the disease \_\_\_\_\_

2.49 If yes, how frequent

- A. Every six month      B. Annually    C. Every two years    D. Others (specify)

\_\_\_\_\_

2.50 Have the milkers ever been examined for diseases such as typhoid, TB and Brucellosis?

- A. Yes                      B. No

2.51 If yes, specify the disease \_\_\_\_\_

2.52 If yes, how frequent

- A. Every six month      B. Annually    C. Every two years    D. Others (specify)

\_\_\_\_\_