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A
Thesis on

The Role of Indigenous Knowledge Systems in
Dairy Production in Alamata Wereda in South
Tigray

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Title

**The Role of Indigenous Knowledge Systems in Dairy
Production In Alamata Wereda in South Tigray.**

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Abstract

This ethnographic study was conducted to explore the role of Indigenous knowledge systems in dairy production in Gargale and Selenwuha kebeles of Alamata wereda . To this end, 40 dairy producers were purposefully selected .And they were studied through direct observation, key informants, focus group discussion and in-depth interviews for almost three consecutive months. In both villages, it was identified that traditional mixed livestock-crop production was practiced. This study reveals that dairy producers employ such local knowledge as color of the skin, breast, tail and stature, breed type, health, feed intake, productivity of milk, age, price, and agro ecology to select desirable breeds. Natural mating is predominantly practiced along with insignificant artificial insemination. Based on such diagnostic skills as knowledge on symptoms of diseases, causes of diseases, seasons of diseases and species affected, dairy producers employ ethno veterinary practices to fight against diseases that attack their animals. Dairy producers provide their dairy cattle with conventional and non-conventional feeds. The major sources of water include: rivers, pipe water, dams and wells Rangeland and Natural Resources are administered by a body known as Abohagay or Shimagle Adi. Milking in the study area is predominantly handled by men. Milk, dung, hide, and horn are locally processed in to economically important products. Butter, Ergo, and Whole milk as the major primary dairy products for income generation are sold in the informal market directly to consumers. Price and demand have been dictated by such factors as season, access to the market, fasting, festivals etc. Costs and Returns are not recorded and analyzed. The traditional dairy production process is being constrained by such challenges as animal feed shortages, land fragmentation, discouraging marketing systems, inadequate veterinary services, lack of training, poor extension services, etc. As a result, the system is characterized by low productivity. For the productivity of the production system, therefore, Indigenous Knowledge Systems should further be studied and integrated with modern dairy production system in general

Chapter one

Introduction

1.1 Background of the Study

In the emerging global knowledge economy, a country's ability to build and mobilize knowledge capital is equally essential for sustainable development as the availability of physical and financial capital. The basic component of any country's knowledge system is its indigenous knowledge. It encompasses the skills, experiences and insights of people, applied to maintain or improve their livelihood (World Bank, 1997).

According to the Bank, Indigenous knowledge, particularly in the African context, has long been ignored and maligned by outsiders. Today, many indigenous knowledge systems are at risk of becoming extinct because of rapidly changing natural environments and fast pacing economic, political, and cultural changes on a global scale. Many practices disappear only because of the intrusion of foreign technologies or development concepts that promise short-term gains or solutions to problems without being capable of sustaining them. The tragedy of the impending disappearance of indigenous knowledge is most obvious to those who have developed it and make a living through it. But the implication for others can be detrimental as well, when skills, technologies, artifacts, problem solving strategies and expertise are lost.

On the other hand, Indigenous knowledge is not yet fully utilized in the development process. Conventional approaches imply that development processes always require technology transfers from locations that are perceived as more advanced. This has led often to overlooking the potential in local experiences and practices.(World Bank, 1997)

In this connection, the documentation unit and library of the Center for Indigenous Knowledge for Agriculture and Rural Development has so far collected, catalogued, and preserved documents pertaining to indigenous knowledge systems from all over the globe, but most of the documents are unpublished 'gray literature' and are not available in libraries. Similarly, a recent publication of the U.S. National Research Council in Warren

(1992) states that a vast heritage of indigenous knowledge about species, ecosystems, and their use exists, but it does not appear in the world literature.

In short, the uncertain status of the indigenous knowledge that reflects many generations of experience by thousands of ethnic groups across the globe is of great concern to many world citizens. Very little of this knowledge has been recorded, yet it represents an immensely valuable data base that provides humankind with insights on how numerous communities have interacted with their changing environment (Warren, 1992).

1.2 Statement of the Problem

During the summer of 2008 G.C, I was busily focused on selecting a research problem for my thesis work. To this end, I did two things. On the one hand, I went through miscellaneous reference materials. On the other hand, I consulted with my instructors and relevant professionals. In the course of searching for the research problem, I came to understand that the role of indigenous knowledge systems has been neglected by researchers and policy makers. This neglect has been witnessed in the Proceedings of the First National Workshop of the Ethiopia Chapter of OSSREA (Organization for Social Science Research in Eastern and Southern Africa) in October 2005 as, “Our own knowledge system is our treasure, our national heritage. Unfortunately, it has received little or no attention from researchers and policy makers.” (Dejene, 2005).

This traditional knowledge has also been disregarded by the international community. In this connection, Louise Grenier (1998) argued that in the past, outsiders such as social, physical and agricultural scientists, biologists, colonial powers ignored or maligned indigenous knowledge, depicting it as primitive, simple, static,” not knowledge,” or folklore. This historic neglect (regardless of its cause-racism ethnocentrism, or modernism, with its complete faith in the scientific method) has contributed to the decline of IK systems, through lack of use and application. This legacy is still in evidence. Many professionals are still skeptical. Also, in some countries, official propaganda depicts indigenous cultures and methodologies as backward or out of date and simultaneously promotes one national culture and one language at the expense of minority cultures.

Some local people and communities have lost confidence in their ability to help themselves and have become dependent on external solutions to their local problems.

As a result, much research studies have not been undertaken. In the already prevailing studies, however, development professionals have advanced arguments supporting the role of indigenous knowledge systems claiming that development efforts that ignore local circumstances, local technologies, and local system of knowledge have wasted enormous amounts of time and resources (Grenier, 1998). In addition, IFAD (1994) is also increasingly acknowledging the value of indigenous knowledge among rural men and women .Such knowledge often includes various aspects of livestock production such as animal management, hygiene, feeding, watering, and use of animal products.

As it is evident in the Proceedings of the First National Workshop of the Ethiopia Chapter of OSSREA (2005), only a relative handful of studies in Ethiopia have specifically examined the role of indigenous knowledge systems in: Medicine and Surgery (Pankhrust), Ethno veterinary Practice (Taffesse), Family Planning (Amare), Natural Resource Management (Woldesellasié), Soil and Water Conservation and Pest Control (Negash et' al), Craftwork (Alula Pankhrust) etc... However, whether indigenous knowledge has a role in dairy production in Alamata remains to be an open question.

The scarcity of information on the role of indigenous knowledge system in dairy production in Alamata is regrettable because it is the sort of evidence that researchers and policy makers require if they are to support dairy producing people in their development (livelihood) endeavors.

This study attempts to contribute to the knowledge base by exploring the role of indigenous knowledge systems in dairy production in Alamata woreda in South Tigray. This study also examines both the role of indigenous knowledge in dairy production and whether any effect of indigenous knowledge may be moderated by the extent to which scientific knowledge systems is used in the production.

1.3 Objective of the Study

The objective of this qualitative, ethnographic study was to explore the role of indigenous knowledge systems in dairy production in Alamata wereda in South Tigray. In this research, indigenous knowledge is generally defined as the unique, traditional, local knowledge existing within and developed around the specific conditions of women and men indigenous to a particular geographic area.

Specific Objectives

The specific objectives of this study were to:

- Identify traditional medicine and pharmaceutical practices used
- Examine participants detailed knowledge about the best kinds of feeding practices and feeds
- Describe how producers process animal products
- Seek to understand participants indigenous knowledge of managing range and natural resources
- Explore marketing practices of dairy producers
- Understand how changing conditions affect indigenous knowledge

1.4 Research Questions

- What role does indigenous knowledge systems have in selection of dairy cow breeds and breeding practices?
- What traditional medicine and pharmaceutical practices are used to deal with animal health problems?
- What detailed knowledge about the best kinds of feed for each season do participants have ?
- How do dairy producers process animal products?
- What indigenous knowledge on range and natural resource management do dairy producers have?
- What are the marketing practices of dairy producers?
- How does indigenous knowledge adapt and expand in response to changing conditions?

1.5 Delimitation and Limitations

Delimitation

This qualitative study was confined to the role of indigenous knowledge used by dairy producers in dairy production in Gargale and Selenwuha kebeles of Alamata wereda in South Tigray.

Limitation

In this qualitative study, the findings could be subject to other interpretations. On the other hand, such constraints as time, finance, electricity, facilities, have practically influenced the nature of the thesis.

1.6 Significance of the study

An understanding of the role of indigenous knowledge in dairy production can be useful for two reasons. First, it can become the basis for upgrading knowledge and practices in the existing situation. Second, it can suggest technology that can be transferred to other areas.

Chapter Two

Literature Review

In this Part, an attempt has been made to talk about three issues. The first section tries to introduce Indigenous knowledge systems along with some cases. The second section attempts to discuss dairy production systems. The last section finalizes the discussion by establishing the links between Indigenous knowledge systems and Dairy production in a more generalized manner.

2.1 Indigenous Knowledge Systems

As defined by Louise Grenier (1998), Indigenous knowledge systems (IKs) refer to the unique, traditional, local knowledge existing within and developed around the specific conditions of women and men indigenous to a particular geographic area. The development of IK systems, covering all aspects of life has been a matter of survival to the peoples who generated these systems. Such knowledge systems are cumulative, representing generations of experiences, careful observations, and trial-and-error experiments. IK systems are also dynamic: new knowledge is continuously added. Such systems do innovate from within and also will internalize, use, and adapt external knowledge to suit the local situation.

IK is stored in peoples' memories and activities and is expressed in stories, songs, folklore, proverbs, dances, myths, cultural values, beliefs, rituals, community laws, local language and taxonomy, agricultural practices, equipment, materials, plant species, and animal breeds. IK is shared and communicated orally, by specific example, and through culture. Indigenous forms of communication and organization are vital to local-level decision-making processes and to the preservation, development, and spread of IK (Grenier , 1998)

While western science and education tend to emphasize compartmentalized knowledge which is often de-contextualized and taught in the detached setting of a classroom or laboratory, indigenous people have traditionally acquired their knowledge through direct experience in the natural world. For them, the particulars come to be understood in

relation to the whole, and the “laws” are continually tested in the context of everyday survival. Western thought also differs from indigenous thought in its notion of competency. In western terms, competency is often assessed based on predetermined ideas of what a person should know, which is then measured indirectly through various forms of “objective” tests. Such an approach does not address whether that person is actually capable of putting that knowledge into practice. In the traditional Native sense, competency has an unequivocal relationship to survival or extinction—if you fail as a caribou hunter, your whole family may be in jeopardy. You either have it, or you don't, and it is tested in a real-world context (Barnhart and Kawagley, 2005)

John Herbert In his article, “A Mail-order Catalog of Indigenous Knowledge” in Puffer (1995) argued that Local knowledge has been ignored because of the ideas passed on from Nineteenth century colonialism and social science that indigenous knowledge is primitive, simple and static., What little is recorded in black and white about it [indigenous knowledge] is often only found in anthropologists' anecdotes or mere mentions-in-passing in scientific dissertations.

Studies by Warren, Pawluk et al., Gradwohl, Rajasekaran et al., Mathias-Mundy, McCorkle, and others, help to disprove the Nineteenth century idea of indigenous knowledge being primitive, simple, and static. These articles also disprove Herbert's idea that these are just anecdotes in passing. The authors of these articles represent academic disciplines such as horticulture, anthropology, literary studies, wildlife management, agronomy, forestry, and economics (Puffer, 1995).

On the other hand, Puffer (1995) confirmed the disregard of Indigenous knowledge by saying that Local knowledge is not always understood because it is an ingrained part of a culture's life ways. Indigenous knowledge is part experience, part custom, religion, community laws, and the attitudes of a society that concerns their lives and the lives of other living things. Development professionals began recognizing the value of this knowledge within the last ten years.

Although there prevail literary works that witness the neglect of Indigenous knowledge, miscellaneous existing literature on the other hand indicate its importance for various reasons. First, local knowledge can help find the best solution to a development solution. Second, familiarity can help extensionists and researchers understand and communicate better with local people. Third, indigenous knowledge represents the successful ways in which people have dealt with their environments. Possibly the most basic answer to the question of why indigenous knowledge is important is that it shows that the extensionist has a clear understanding of the present situation and allows for better communication between the scientist and local people. With familiarity of cultural customs, a rapport can be built between the scientist and people that include respect. This mutual respect fosters a relationship as partners who are looking for a solution together and encourages participation on a local level (Puffer, 1994)

Development cases for indigenous knowledge

According to Nicolas (2000), the World Bank launched the Indigenous Knowledge for Development Program in 1998 to facilitate the integration of indigenous knowledge into operations. He reflects on the Program's experiences over the last three years as follows.

Mozambique

The potential development impact of indigenous knowledge systems can be gauged by a few examples of what IK has already achieved. After fifteen years of civil war, community leaders in Mozambique reportedly managed about 500,000 informal "land transactions" and helped in the settlement of about 5 million refugees and displaced persons in two years. Most significantly, they achieved this without direct external help from donors or central government. How did this happen? Traditional, local authorities relied on indigenous, customary laws to resolve potential conflicts arising from competing claims to land by returning refugees and those who had settled the lands during the civil war. As a result, small holders were able to quickly resettle and resume farming and contribute to the growth of agricultural production.

Nepal

In a Food for Work Program in Nepal, indigenous knowledge has been a more effective agent of development than modern technology. A donor-assisted food distribution program was incurring major losses of food along the distribution line. The project managers turned to the local community for solutions. It was jointly determined that using local equipment (e.g., bullock carts), distributors, and community-based supervision would be the most appropriate way to distribute the food in the local context. Hiring local bullock carts in place of the covered trucks operated by city-based companies provided additional income for rural communities and improved transparency of the distribution process.

Senegal

In Senegal, external partners had for years engaged the country authorities to abolish female genital mutilation (FGM), though with little success. Indigenous knowledge and empowerment of community groups eventually made a national impact. After attending an adult literacy course conducted by a local NGO, a group of women from a village called Malicounda decided to address the issue in their communities. They convinced the traditional spiritual leaders to join their campaign against the practice. Within two years these empowered women had convinced sixteen neighboring communities to abolish the practice. As a result of the growing impact of the Malicounda initiative, by the end of 1999 the practice was declared illegal in Senegal. The Malicounda initiative has spread to other groups in the neighboring countries where already more than 200 communities have abolished FGM.

Uganda

Indigenous institutions, indigenous appropriate technology, and low-cost approaches can increase the efficiency of development programs because IK is a locally owned and managed resource. Building on IK can be particularly effective in helping to reach the poor since IK is often the only asset they control, and certainly one with which they are very familiar. Utilizing IK helps to increase the sustainability of development efforts because the IK integration process provides for mutual learning and adaptation, which in

turn contributes to the empowerment of local communities. Since efficiency, effectiveness, and sustainability are key determinants of the quality of development work, harnessing indigenous knowledge has a clear development business case. Early indications point to significant improvements in development project quality if IK is leveraged with modern technologies. The example from an UNFPA-supported program in Uganda supports this proposition.

In the Iganga district of Uganda, leveraging traditional knowledge systems with simple and appropriate modern communications helped to dramatically reduce high maternal mortality rates. In the past, traditional care could not assist in complicated cases and the modern health service delivery system reached less than half the population of the district. To address the high mortality rates, local communities and officials built on the local traditional institutions to improve the reach and impact of modern prenatal and maternal healthcare services. The local initiative used and leveraged the system known and trusted by Ugandan women, the traditional birth attendant (TBA). The project provided the TBAs with walkie-talkies to communicate with public health service workers from their outposts. This enabled the TBAs in remote areas to become the referral system to modern healthcare. In cases of complications or emergencies, the TBA could now call in the modern mobile unit or refer the patient to the rural health center. As a result, maternal mortality in the Iganga district reportedly declined by 50 percent in three years.

India

Building on IK systems also empowers local communities. Empowerment, especially of the poor, is a core objective of most development efforts. The case from India shows how farming communities were able to leverage indigenous and global knowledge locally, and build a network of practitioners that engaged the agricultural administration and research in a dialogue of partners. The empowerment of these communities is demonstrated in the impact of their efforts, the application of their own knowledge to address a critical problem, and their effective engagement of assistance from authorities and donors

In India, the World Bank-supported Sodic Lands Reclamation Project is a farmer-driven effort to increase household incomes. The major constraints were sodic soils, a result of inappropriate irrigation management and brown plant hoppers, which often destroyed up to 50 percent of paddy and wheat crops. By combining local and modern knowledge, farmers applied gypsum, built contour bunds, leached the soil, started multicropping, green manuring, crop rotation and composting, and reclaimed over 68,000 hectares of land belonging to 247,000 families. They controlled brown plant hoppers with Neem tree extract, rice husk and green manure. After five years, paddy and wheat yields and incomes had reportedly risen by 60 percent. With World Bank support, farmers created a local farmers school to incorporate these practices into curriculum and outreach work. Today, farmers train and advise fellow farmers, reaching over 7,200 households in 65 villages. Recognizing and incorporating IK has not only produced technical and economic results, but has helped to create a farmer-owned training institution with tremendous credibility and outreach.

Building on such examples, several teams in the World Bank now seek to leverage global and local knowledge systems to adapt the design of Bank-supported projects and programs to local conditions. Eventually, more communities will shape their own agenda by actively participating in the development dialogue and enhancing good governance from below. Helping communities to value their own knowledge and, in turn, learning from it, enhances the Bank's own knowledge. The Indigenous Knowledge for Development Program operates within this context (Nicolas,2000).

2.2. Dairy production Systems

As defined by Sere and Stein field (1995), livestock production systems are considered a subset of the farming systems, including cases in which livestock contribute more than 10% to total farm output in value terms or where intermediate contributions such as animal traction or manure represent more than 10 % of the total value of the purchased inputs. There are different classification criteria for livestock production systems in general and dairy production systems in particular .For example, based on such criteria as Integration with crops, relation to land , agro ecological zones, intensity of production and type of product, the world livestock production systems are classified in 11

systems(Sere and Stein field, 1995).Of these livestock production systems ,mixed farm rain fed temperate and tropical highlands is by far the largest. Globally it represents 41% of the arable land, 21%of cattle population, and 37% of dairy cattle (Sere and Stein field 1995)

Dairying is practiced almost all over Ethiopia involving a vast number of small 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 producers; the peri-urban, and urban dairy systems (Azage and Alemu, 1998).The first system (pastoralism, agro pastoralism and highland mixed stallholder production systems) contributes to 98%while the peri-urban and urban dairy farms produce only 2% of the total milk production of the country (Ketema ,2000).

The rural 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 and production season, and access to the near by 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).Pastoralists raise about 30% of the indigenous livestock population which serve as the major milk production system for an estimated 10%of the country's human population living in the lowland areas .Milk production in this system is characterized by low yield and seasonal availability(Zegeye, 2003)

The highland smallholder milk production is found in the central part of Ethiopia where dairying is nearly always part of the subsistence, smallholder mixed crop and livestock farming. Local animals raised in this system generally low performance with average age

at first calving of 53 months, average calving intervals of 25 months and average lactation yield of 524 litres.(Zegeye,2003).

Peri-urban milk production is developed in areas where the population density is high and agricultural land is shrinking due to urbanization around big cities like Addis Ababa. It possesses animal types ranging from 50% of crosses to high grade Friesian in small to medium sized farms. The peri-urban milk 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 main source of feed is both home produced or purchased hay; and the primary objective is to get additional cash income from milk sale. This production system is now expanding in the highlands among mixed crop-livestock farmers such as those found in Selale and Holeta and serves as the major milk supplier to the urban market (Gebre wold et al 2000).

Urban dairying farming is a system involving highly specialized, state or businessmen owned farms, which are 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 in the urban and peri-urban areas of the capital (Azage ,2003) and most regional towns and districts(Nigussie 2006).

2.3 Indigenous Knowledge and Dairy Production

Nearly one billion head of livestock are kept by more than 600 million small farmers and herders in rural areas around the world Most of these livestock keepers – about 95 per cent – live in extreme poverty. Even though livestock keeping offers a promising opportunity to combat poverty in many developing countries, especially as the demand for animal products such as milk and meat continues to rise, most livestock policies and services tend to favor large-scale production. In order to take advantage of emerging market demands and reduce their poverty, small farmers and herders need access to basic services and technologies, such as veterinary care, good roads and grazing lands, as well as policies that take account of their needs(IFAD,199 4)

Poor people themselves need to be involved in the development and selection of livestock services. Yet their needs are often neglected. Living far from big cities and often illiterate, rural poor people are seldom asked to take part in the development of policies or the structure of services. To be effective, livestock services need to address the reality that most rural poor people lack access to vital resources such as land, water, markets, credit, health services and education.(IFAD ,1994)

Development efforts that ignore local circumstances, local technologies, and local systems of knowledge have wasted enormous amounts of time and resources. Compared with many modern technologies, traditional techniques have been tried and tested; are effective, inexpensive, locally available, and culturally appropriate; and in many cases are based on preserving and building on the patterns and processes of nature.(Grenier,1997)

Chapter Three

Methodology

3.1 The Ethnographic Research Design

This study did employ the ethnographic qualitative research design. The purpose of this ethnographic design was to gain a general picture of the subject of the study with emphasis on portraying the everyday experiences of individuals by observing and interviewing them and relevant others. This ethnographic design included focus group discussion, key informants and in-depth case interviewing, and continual and on going participant observation.

3.2 The Researcher's Role

Locke et al in Creswell (2003) argued that particularly in qualitative research, the role of the researcher as the primary data collection instrument necessitates the identification of personal values, assumptions and biases at the outset of the study. The investigator's contribution to the research setting can be useful and positive rather than detrimental.

My perceptions of indigenous knowledge and dairy production have been shaped by my personal experiences. First, I came from a peasant family. My childhood ages including high school ages to some extent were tied with the traditional rural life. During those ages, I was actively involved in the rural routines of my parents. Second, I, as a fresh graduate, taught English in a high school in northern Afar from September 2001 to July 2002 G.C. During my stay, I had chance to share experiences with Afar pastoralists. Both experiences have resulted in two things. One is that I have always given sincere regard to indigenous knowledge and dairy production. The other is the belief that my understanding of the context would enhance my knowledge about many of the issues related to indigenous knowledge and dairy production. This perception also helped me work with the participants in the study. My acquaintance with many of the gatekeepers and the permit letters I had from college of development studies and the district gatekeepers also helped me gain entry to the research field site. On the top of this, I also exploited my previous personal relationships with others. In this regard, I made

development workers with whom I had acquaintance introduce me to many of the participants in the research site during the early stage of the study.

On the other hand, the research site did not trigger (cause) any stress except that the participants were not available around their houses every time because they used to be away for natural resources conservation campaign for forty working days during this observation. During my stay, I felt comfortable with the weather at the research sites even though it appeared too hot for strangers especially from wet areas to stay in. This came apparent from the fact that I lived most of my ages in areas with hot weather conditions.

Although I strained every nerve and muscle to ensure objectivity, I might have brought some biases to this study because of my previous experiences. The way I viewed and understood the data I collected and the way I interpreted experiences might have been influenced (shaped) by these biases. Nevertheless, I began this study with the assumption that dairy production is a difficult and complex process, but what role does indigenous knowledge have in the process appeared to be the focal point.

3.3 Description of the study Area

3.3.1. Setting

This ethnographic study was conducted in two purposefully selected kebeles of Alamata Wereda in South Tigray :Gargale and Selenwuha. The wereda has been named after its urban town, located some 180 kms south and 600 kms north away from Mekele, Tigray and Addis Ababa, Ethiopia. The total population living in Alamata wereda is estimated to be 91866. The total cultivated land is estimated to be 34,503 ha. Of this, around 33,814 ha is cultivated through rain-fed while 689 ha is through irrigation. The district is characterized by bimodal rainfall with average annual rainfall of 663mm. Flood diversion is the most commonly used traditional system of supplementing the erratic rainfall pattern. The average annual temperature is 29.7⁰c with the maximum and 14.6⁰c the minimum, averaging 22.2⁰c. Its altitude ranges from 1300masl to 2300 masl.

Gargale is a small rural village located about 10kms away at the north east of Alamata town. Villagers are collectively settled on either sides of the Addis Ababa –Mekelle road .In the village, there prevail poorly constructed cottages in the open. Very few cottages are found in compound. The conditions of the cottages reflect the status of the villagers. On the other hand, there are also iron-roofed wooden houses. These houses seem to be lately constructed, and many of them are involved in some sort of non-farm activities: hair styling, crafts, snacks, local alcohol houses, shops, restaurants, mills etc...Also evident in the village are a small poorly constructed Church and a well-built Mosque.

Such basic services as primary education, electricity, television, clinic including privately owned, transport, vet post, pipe water, etc.. have began flourishing in the village .On the other hand, there is no land line tele service including mobile. The vet post is also blamed for the limited service it provides. It used to be open only on Mondays during this observation because Monday is a market day in Gargale.

With the exception of the business men, indigenous villagers are basically farmers. They live on a mixed livestock-crop production system as a livelihood strategy. In other words, villagers are both livestock producers and crop producers. In the livestock production system, there prevail such animals as cattle, sheep, goats, donkeys, horses, mules, camels, hens, but are very few in many households. In the crop production system, villagers produce such cereals as sorghum, maize, teff, and pulses and oil seeds. This system use flood diversion as water resource in addition to rainfall. However, the size of arable land is deteriorating from time to time on the top of soil infertility.

Villagers are predominantly unskilled although there are emerging government sponsored extension services to equip them with modern skills of both productions. In addition, the majority of them are illiterates as a result of which they are easily exposed to health problems like any rural village.

Villagers are also noted for backward financial system. Savings on ones own initiative has not started yet. It is rather seen as an alien culture. On the contrary, extravagance has been considered as good indication of ones personality.

Although they can access credit from "Dedebit Microfinance Institution " , it is not uncommon that the borrowed money is unproductively invested on such matters as wedding, religious parties, etc...Similarly, remittances gained from relatives living abroad mainly in the Arab world is wrongly invested. Public transfer also forms a common phenomenon this time around.

Indigenous Villagers have had well established social relationships among themselves. These networks are reflected in many instances, be it good or bad .Some of the circumstances include: traditional associations, religious or local festivals, neighborhood, mourning, wedding, etc...These relationships are ,however, treated according to the local institutions specific to them. On the other hand, gender inequality is still in practice that women are viewed inferior to men. Class or Cast related discriminations are also in place. That marriage between the so-called *Chewa* (decent or feudal by birth) and the so-called *Buda* (blacksmith) is prohibited is a case in point. Harmful traditional attitudes are also evident. This can best be illustrated by what an old person in the village said against infertility vaccination .According to him, population explosion has been resulted from government driven vaccination campaign against unintended pregnancy. Though the motive of the campaign was to avoid having excess number of children, the old villager argued that it was after the introduction of the infertility vaccine that women in the village give birth now and then. Instead of retarding birth, the vaccine has facilitated (aggravated) birth since its introduction. This is so, he said, because wrong doings like vaccinating women against fertility is against the will of God, Allah. Allah in response to this evil action has resulted in population explosion along with drought as punishment.

After a drive or walk straight down to Addis Ababa direction southwards for 10 kms from Alamata town, a turn to the east becomes the next job. Some few hundred meters interior from the cross country highway, a village called Harle, a former kushet of selenwuha, but currently an independent one appears. Again after some drive through Harle to the east another small village known as Gedera comes next. Leaving Gedera behind, a drive still towards further east for 3 kms proves Selenwuha (**Gotu**) in which this study was conducted.

This is a small rural village with few cottages. The cottages are beautifully constructed. Compared to Gargale these cottages appear to be newly or lately built. The condition of the cottages is appealing. On the other hand, there are also some iron-roofed wooden made houses on either side of the main road which dissects the village in to two. The number of the iron-roofed houses is less than that of Gargale's. Rural toilets are found in almost every compound. This was so as a result of health extension campaign. These sorts of toilets are not observed in Gargale. On the other hand, there are also non-farm business activities in such a way that there are only three rural snack serving tea with bread and two shops. Such basic services as primary education, electricity, telephone (satellite-based), transport, health, etc...are into being. As opposed to Gargale, Mobile phone works here, but television does not.

Animal feed (Sorgum straw and Teff straw) is being accumulated in every compound in excess heaps. How much is excess is, however, up to the peasants. My judgment lacks their understanding. But, I can only say that there are heaps in almost every compound.

The cattle are also well-built. They all appeared well-fed. It seems that there has not been any feed shortage. As opposed to Gargale, cattle are scared when hear motor noise. This might have something to do with the remoteness of the village that motor noise is alien to livestock.

Like any rural area, villagers are predominantly unskilled, illiterates, and easily exposed to health problems. They also exercise backward financial systems. Credit access is also similar to that of Gargale. Inappropriate investment is also a common feature. On the other hand, villagers have entertained established social networks among themselves for many a long year. Bad or good relations associated with the social relationships are in place.

In short, both the villages are characterized by poverty, food insecurity, dependence on aid, unsustainable use of resources, etc...

3.3.2. Actors

The primary participants in this study were 40 dairy producers and crop producers at the same time in the two kebeles because the kind of production system identified in the study area was a mixed livestock-crop production system. This implies that actors produce not only dairy but also crop simultaneously. In addition, some dairy producers take part in non-farm activities for additional income generation.

The majority of dairy producers constitute male heads aged ranging from 29 to 70. The rest is females aged between 29 and 53. On the other hand, many of them are illiterates, but very few can read and write. Some three (two men and a woman) have completed primary education. Nearly half of dairy producers adhere to Orthodox Christianity while the other half are Muslims mainly found in Gargale.

All of the actors own their own local cattle although there are disparities in size. Very few dairy producers also have "Barka" breeds, together with the local breeds. Dairy producers use cattle for multipurpose. However, cows are mainly used for milk production in the production system. In some households, actors also possess sheep and goats. On the other hand, they also own land although fragmented like in any other rural area in Ethiopia.

3.3.3. Events

The emphasis of this study was the every day experiences and events of dairy producers in relation to indigenous knowledge.

3.3.4. Processes

This study paid due attention to the role of indigenous knowledge employed by participants in the process of dairy production.

3.4 Data Collection Strategies

3.4.1. Observations

I conducted direct observations in the two kebeles .I took field notes at the research field sites and kept a diary during the research study.

3.4.2. Interviews

At the beginning of the study, I conducted a face-to-face interview with such key informants as development agents, rural office heads, etc---. I was next engaged in 2 focus group interviews. Each focus group consisted of 6 participants. This implies there were 12 participants from the two kebeles. Third, I conducted an in-depth case-study. Two cases, one from each kebele, were interviewed in-depth towards the end of the study.

3.4.3. Documents

I also managed to collect data from documents in relevant offices and secondary sources, but could not find any available data directly relevant to the issue under this study.

3.4.4. Audiovisuals

I also used audio visual materials to collect primary data.

3.5 Data Recording Procedures

- I used an observational protocol for recording observational data. This protocol (form) consisted of two sections in a single page. I used one of the sections to record descriptive notes. In the descriptive notes section, I recorded details related

to my observations. I also used the other section to record reflective notes. In the reflective notes section, I kept a field diary to articulate my personal thoughts/hypothesis for further validation or additional data bases

- I used an interview protocol for recording information during an interview and kept memos.
- I used a digital camera, borrowed from an old friend, to take photographs and a tape recorder to tape interviews.

3.6. Data Analysis and Interpretation

Although there exists no fixed way of qualitative data analysis, I considered the steps below.

- First, I organized and prepared the data for analysis on the basis of thematic issues related to research questions of the study.
- Second, I went through all the data to get a general sense of the information and to reflect on its overall meaning.
- Third, I identified data gaps and filled in the gaps
- Fourth, I started detailed analysis with further articulation of the coding process
- Fifth, I utilized the coding process to generate a description of the setting or people as well as categories or themes for analysis.
- Finally, I used mainly a narrative text, table photos to convey the findings of the analysis and made an interpretation or meaning of the data.

3.7. Verification

To improve the credibility of data, I considered some appropriate strategies. Among these, one appeared to be **Persistent Observation**. By staying in the research field site for consecutive three months from January 23 through April 20, I observed participants in their natural setting. The other one proved to be **Triangulation**. Through multiple methods of data collection, I collected data from different sources. The collected data were then looked in to from various perspectives. Another strategy remained to be **Debriefing**. After having presented the data to a relevant group (vet professionals in the study area), I made an effort to come up with improved data through questioning and

discussion. The other consideration related to **Member Checks**. By taking the final report to two participants from each tabia, I checked whether participants feel that they are accurate. Finally, **Self-audit** was always apparent all the way to the conclusion of the research project.

3.8. Ethical Considerations

In doing field research, it is argued that many ethical dilemmas happen to prevail. This is so because participants are human beings with problems, concerns, and interests. The values held by any particular ethnographer do not always go together with those held by participants (Spradley, 1980). On the other hand, the direct personal involvement of a field researcher (ethnographer) in the social lives of other people raises many ethical dilemmas (Neuman, 1997). To address ethical issues, therefore, the following ethical principles suggested by Spradley (1980) were considered in this study.

- **Considering Participants First**
Priority was given to participants when there is a conflict of interest with a view to protecting their physical, social and psychological welfare
- **Safeguarding Participants Rights, Interests, and Sensitivities**
The rights, interests and sensitivities of participants were safeguarded.
- **Communicating Research Objectives**
Clear verbal [and/or written] articulation of research objectives was made to relevant participants
- **Protecting the Privacy of Participants**
Anonymity of participants was maintained to protect their privacy.
- **Not Exploiting Participants**
An effort was made so that participants would neither suffer from the project nor be exploited for personal gain
- **Making Findings Available to Participants**
Reports on the findings of the research project were made available to participants in a relevant channel

Chapter Four

Data Analysis and Interpretation

4.1. Traditional Cow breeds Selection and Breeding Practices

4.1.1. Selection Practices

In male headed households, males usually select cow breeds. Although rare, very few female heads do also perform the selection. This normally occurs only when the need arises. There is no as such fixed (particular) time for the selection of breeds. While selecting breeds, dairy producers employ certain local technologies that are acquired informally through observation from their parents in particular, members of their society in general. These are discussed as in the following.

Color of the Skin

Like other local technologies, color has been used as a factor for breed selection in the study area. As a factor in the modern technology (scientific methodology), it has also been a constituent in the traditional knowledge of breed selection in the district. Accordingly, there are certain desirable and undesirable colors for the local dairy producers.

To begin with the desirable ones, a breed known as '*khaihTorie*' (a red with white spots), appear to be the best selected by dairy producers followed by a breed locally called '*Odesh*' (black with many white spots almost all over the body) for dairy production.

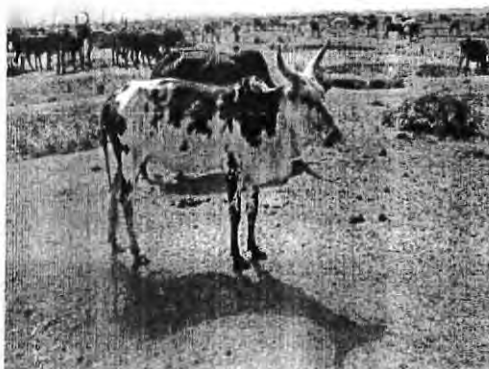


Figure 1a. *KhaihTorie* breed



Figure 1b. *Odesh* breed

Source: All the photographs are the researcher's own figures

Apart from this desirability, a cow breed locally known as '*chiley*' (bright black) looks partly desirable for cultural reasons. People with spiritual mentalities locally known as '*Ba'al Tahazi*' (witches) usually select the *chiley* for superstitious purposes as opposed to dairy production. This context denotes that there is some room for spiritual beliefs to influence breed selection based on the color of the skin. The local public verse below illustrates the above tradition.

**ያባባ እንትና ልጅ ከጃችን ብትገባ
ለትልልቆቹ ጭለይ ኮርማ ጀባ**

For elders would *chiley* be delivered
Should the bride has been secured

(All the translations throughout are the researcher's)

With regards to the undesirable colors, a black breed is not totally preferred. Unless it was born in either the producer's own house or a neighbor's, no one dares to select and buy a black cow breed from market. Another undesirable color of breed becomes a white color. A white-colored breed sounds unwanted because producers believe that white-colored breeds can not withstand harsh climate conditions. In other words, white breeds are not drought resistant breed types. The idea behind seems that these breeds expose dairy producers economy when feed shortages prevail during the dry seasons.

Breast, Tail and Stature

Dairy producers have had local tradition of using the nature of the breast, tail and stature as inputs to select cow breeds. With regards to breast, two things matter here, length and size. To be fit, a dairy cow needs to possess four long and equal in size breasts. However, if the breasts become too short and unequal to milk, it appears crystal clear that the cow breed will not be considered for dairying. Along with this comes the nature of the tail. A desirable tail needs to be long. This should be coupled with a well built physical appearance of the cow. If the breed qualifies both characteristics, the local dairy producers never hesitate to make the respective decision.

Breed

Breed has also been part of the indigenous system of breed selection in the production process. According to the dairy producers, the local breeds, *Raya* or *Harmo*, are easily identified traditionally. Dairy producers differentiate the locale *raya* or *harmo* breeds from other cow breeds easily. Selection based on breed for participants implies retrieving certain endemic traits of the local breeds. These traits (qualities) might sound difficult for outsiders to sort but easy for the indigenous dairy producers. These traits include behavior, whether aggressive or decent or easily manageable etc...

Health

The local dairy producers also take health of the cow breeds in to account while selection. Health analysis (diagnosis) does not require modern medical tradition for the local people (dairy producers). To select the desirable healthy breed, they normally use their indigenous knowledge of ascertaining well being. To this end, producers informally collect data on background information about the breed. Such data as whether the breed has been patient, the kind of disease that has been diagnosed, the local treatment that has been considered, whether or not the animal has been vaccinated, etc. are gathered for scrutiny. Based on the outcomes of the analysis, dairy producers reach decision.

Feed Intake

Whether or not a cow breed consumes much also matters in selection. Dairy producers through informal channels study on breeds' feed intake behavior. In other words, dairy producers collect information on the previous feed intake record, although irregular, of breeds. As an input for selection, feed intake signifies different meanings to producers. For those who can afford feeding animals at ease, much feed intake implies that high milk yield. The more they consume the higher will the productivity of milk be. But for those with limited or poor capacity, excess feed in take connotes an obstacle in the production process. This has practically to do with the deteriorating status of rangeland, decrease in size of farm land (fragmentation of land) or environmental degradation. In short, dairy producers pay due regards to feed intake trait of breeds during selection.

Productivity of Milk

Another criterion employed by dairy producers in selection relates to the amount of milk output a breed produces. Using the local social networks, friendship on neighborhood or any other, participants press hard to collect information on whether or not a known cow breed in the village gives considerable (high) milk yield. Factors associated with productivity of milk are also scrutinized

Age

According to the local tradition of dairy producers, number of teeth tells something about age of a breed. Most dairy producers appear well aware of the proxy nature of (number of) teeth for age. To select a desirable breed, dairy producers scrutinize age indirectly through examining teeth. For the dairy producers a cow breed with less than eight (8) teeth proves unfit for dairy production, and hence becomes disregarded.

Price

For dairy producers, animal resources constitute the most invaluable assets. The point of departure for selection centers on the deep rooted value of owning dairy cows. In other words, participants treat price in light of the strong beliefs they have towards possessing dairy cows. Dairy producers never hesitate to pay every possible price to own these resources actually after assessing the local market. This doesn't mean however, that exaggerated price is taken for granted.

Agro ecology

Agro ecology where the breed comes from also forms an aspect of the local knowledge system used in selection. In this regard, dairy producers primarily gather information informally about the agro ecology where the cow breeds come from. Whether breeds are from highland or lowland, marsh or otherwise are traditionally examined. Participants then analyze the inherent traits of breeds in light of agro ecology. Based on the outcomes of the analysis, dairy producers treat breed selection.

In short, dairy producers employ various indigenous strategies in the selection practices. These knowledge systems have been gained and developed informally from within their community. On the other hand, both local and modern technologies of breed selection are integrated when local peasants and government professionals consider selection together. Professionals give due regard to the long established tradition of breed selection. They accept the local wisdom with enthusiasm declaring that the local knowledge system of dairy producers matches heavily with the modern technology of breed selection.

4.1.2. Breeding Practices

Most dairy producers use the natural breeding practice. That is most households make use of the local bulls for mating. According to participants, mating occurs any time, but has something to do with whether cattle are well fed or not. This has been illustrated in analogy by a dairy producer in Selenwuha as:

ሃምሀ ስብኣይ ሸገ ሰበይቲ ምስ ጽቡቕ ጫና
 ትርእሎ ሰበይቲ ምስራር ቻሕ ድብሎ፣
 ከፍቲላ ሃም ሰብ ሸገ ላሕሚ ትርእሎ ሰርሎ።

When men with a balanced diet are attracted, they normally become anxious for sexual intercourse. So is the reality in cattle. Cattle do mate on their own if well-fed, not by imposition. The initiative for mating triggers the moment a bull is attracted by a well-fed good looking cow breed.

This implies that breeding has more to do with the existing animal feeding practices of dairy producers. Here, one can see that feed shortages can negatively influence breeding especially in drought prone areas as in the study area.

On the other hand, very few households also use Artificial Insemination for breeding. In this connection, dairy producers have demanded for the delivery of genetically potential dairy cattle. Genetic improvement empowerment does not come free of cost, but once

attained it is generally there without further effort (Wiener, 1994). However, this modern reproductive service delivery appears very limited in the study area. Dairy producers complain against this inaccessibility. With regards to the producers' preference of breeding practice, most of them preferred artificial insemination to the natural method

4.2. Ethno veterinary Practices

Like many indigenous people in rural areas, most male heads in the study area have long been exercising ethno veterinary practices. The local medical tradition has been accumulated through observation and real life experiences. Accordingly dairy producers have developed their own indigenous medical practices. Coupled with the use of modern medicine, participants still employ ethno veterinary practices to fight against diseases that attack their animals. Nevertheless, dairy producers have recently resorted greatly to the modern medical tradition though unsatisfactory the service is.

. But why is the vet service so limited to the extent that peasants always complain against it was the real question raised. A vet professional responded,

It is not only the vet service that is unsatisfactory this time around , but it is everywhere in the wereda that services are not up to what is expected of them. This is so because offices are under the timely Business Process Reengineering that restructuring of organization has minimized the service delivery. It is crystal clear that the dissatisfaction with the existing realities are well understood by the part of the government officials of the wereda. But, once things are set, I can assure you service delivery will be on the right track.

Although the above explanation relates the unsatisfactory nature of the modern service delivery to the then BPR, the service was practically limited in its scope not only in the study area but also all over Ethiopia .This is so because the problem is rather related to the economical status of Ethiopia by and large than the introduction of the BPR.

4.2.1. Major Diseases Dairy Producers Described

Rinder pest: *Degehabe*

Rinder pest is a condition recognized by such symptoms as drooling lameness, diarrhea, shyness, high fever, inflammation of the tongue etc...According to dairy producers, this disease was a major health threat for their animals two or three years earlier. However, it has currently been eradicated by vaccination.. Nowadays, it is uncommon that cattle are infected with rinder pest in the study area. The table below shows the traditional ethno veterinary practice of dairy producers on rinder pest.

Table 1 diagnosis and treatment of rinder pest

Symptoms	Drooling Lameness Diarrhea Shyness High fever Inflammation of the tongue
Causes	Contaminated feed or water
Season	Every time
Species Affected	Cattle
Treatment	Hiding the patient animal Stop smoking the ' <i>karfo</i> ' Preventing women from smoking themselves

Blackleg: Gogoysa/Gogobsa

Blackleg refers to a disease clinically characterized by such symptoms as lameness, loss of appetite, rapid breathing, usually depressed, high fever, coughing, rough hair coat. As opposed to rinder pest, this disease is still a threat.

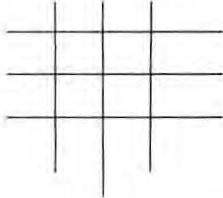
Table 2: diagnosis and treatment of blackleg

Symptoms	Lameness Loss of appetite Rapid breathing Usually depressed High fever Coughing Rough hair coat
Causes	Contaminated feed or soil
Season	Rainy season
Species Affected	Cattle
Treatment	Stubbing at two spots above the nose ,left and right Stubbing at the joints where the abdomen and back legs intercept or Stubbing under the abdomen Keeping the patient away from water Keeping the patient away from sunlight Detaining the patient for 2 or 3 days in the barn

Anthrax: Tafia

This is characterized by bloat, rough hair coat, loss of appetite or depressed appetite in hot times. The local name of this disease is derived from the name of an organ of the body of an animal, pancreas.

Table 3 diagnosis and treatment of anthrax

Symptoms	Bloat Nasal bleeding Rough hair coat Loss of appetite or depressed appetite in hot times
Causes	Unknown
Season	Every time
Species Affected	Cattle, sheep ,and goats
Treatment	Branding the infected area with hot 'guba'(metal), usually found on the left side of the body before the infection spreads on to the right part. But if it spreads, the animal dies. Style of ironing looks like 

Ideseb/ Gibrto/ Sehor

Ideseb is a condition caused when witches using their evil spiritual powers commit evil things on animals with a view to harming the owner of the animal. This disease is identified with symptoms like scrapping, bleeding when rubbing, blood oozing through the body, rubbing against tree, depressed appetite, alopecia (loss of hair)

Table 4 diagnosis and treatment of Ideseb

Symptoms	Scrapping Bleeding when rubbing Blood oozing through the body Rubbing against tree Depressed appetite Alopecia (loss of hair)
Causes	Evil spirit of witches
Season	Any time
Species Affected	Cattle
Treatment	Prayer Holy water Witch

Although agree with the symptoms, some participants argued that there exists a so-called 'Ideseb' animal disease is only a here say for them. However, they never experienced it on their own. Based on their oral understandings, this disease is believed to have been characterized with the aforementioned symptoms.

Dislocation

This refers to the physical dislocation animal encounter. As a physical damage, it is easily noticed by any dairy producer but the treatment is channeled to a very few experienced local doctors in the study area.

4.2.2. Diagnostic Skills

The ethno veterinary practices of participants emanated basically from their indigenous knowledge of animal diseases. This understanding has led to the development of traditional disease diagnostic skills, which forms the basis for treatment of livestock diseases. The indigenous knowledge on diseases is orally passed on from one generation to the next and especially from the elders to the young.

Participant practitioners normally depend on visual, audio and physical senses to establish a diagnosis and on rare occasions post-mortem examination is employed to confirm cause of death of an animal. This study reveals that participants use symptoms of disease, knowledge of known vectors of livestock diseases, knowledge on seasonability of disease outbreak and species affected by specific diseases as important tools of the traditional disease diagnostic procedures.

Symptoms

From the above tables, participants' ability to diagnose Rinder pest, blackleg and Anthrax compares positively with that of the modern practice. The symptoms described traditionally heavily matches with the modern clinical characterization of the diseases. An exception here relates to the disease that participants call the 'Ideseb'. This leads to the contradiction that 'evil spirit or other wise' has no room in the scientific medical tradition.

Vectors of Disease

Dairy producers also traditionally base themselves on vectors of disease to diagnose cattle diseases in their locality. Accordingly, they believe that rinder pest and blackleg are caused by contaminated feed or water at common feeding and watering points. This traditional description goes hand in hand with the modern veterinary practice. On the other hand, dairy producers fail to identify the causes for anthrax. Failure to characterize the cause of anthrax is also evident in some other Indigenous people. Like the *Ideseb*, participants tend to relate it to some sort of super natural power.

Effects of Season

It has also been part of the local ethno veterinary practice that the occurrence of diseases is connected with season. Dairy producers are well aware of the impact of season on an outbreak of a certain disease. This forms an important diagnostic tool for the local dairy producers. They know, for example, the blackleg becomes a serious health threat for cattle during the rainy season although it can occur any time. Similarly, bloat occurs in wet seasons because it is usually then that green grass is available.

Species Affected

From the informal experiences they have come across, dairy producers also know which species are affected by which animal disease or which disease attacks what animal. Traditionally, dairy producers take for granted that rinder pest, black leg, and *ideseb* attack cattle. On the other hand, anthrax attacks not only cattle but also sheep and goats.

4.2.3. Treatments

Among the traditional curative practices employed by dairy producers, branding or ironing sick animals is a common treatment. This treatment is applied to such a disease as the anthrax. When an animal suffers from an anthrax, dairy producers immediately brand what they call the infected area with hot '*guba*' (a local branding metal), usually found on the left side of the body before the infection spreads on to the right part. Unless the branding is made right away, the animal dies.

Another ethno veterinary practice widely used by dairy producers appears to be stubbing. Stubbing is, for example, considered if an animal suffers from such diseases as blackleg, bloat, etc....In case of black leg, dairy producers stub the sick animal at two spots above the nose, left and right or at the joints where the abdomen and back legs intercept or under the abdomen. Along with the stubbing, the patient animal, detained in the barn, is kept away from water and sun light.

Dairy producers also make use of holy water or prayer to treat diseases that are believed to have been caused by sorcery or magic like the 'ideseb'. Similarly, they commit practices as not cleaning milk utensils, or preventing women from smoking (cleaning) themselves or keeping the sick animal from others sight in treating the rinder pest. This is, however, contrary to the other practically connected or attached treatments with the patient animal. In general, the local medical traditions serve as first aid treatments immediately after the occurrence of diseases but can not serve the preventive role. According to dairy producers, this has been achieved through the modern medical traditions.

4.3. Feeds and Feeding Practices

Animal feeds and feeding practices constitute the major inputs in any dairy production. The major feed resource in the study area relates to grazing. In this regard, most dairy producers source animal feeds from their own crop farms. Some participants use a combination of own farm and communal grazing for their cattle. A group of still other dairy producers access other feed resources

Dairy producers in the study area use both conventional and non conventional feed resources. The provision of both feed resources is practiced in most dairy production systems in Ethiopia. Among the common feed resources, participants provide their dairy cattle with such feeds as sorghum straw, maize straw, teff straw, grass, peanut straw, plant weeds, and non-conventional feeds like *hatella* (brewery by-product from locally produced beer), salt (in the form of bar, locally known as *ganfur*), leaves of cactus tree, fruits of acacia and 'Bedana' tree and etc.

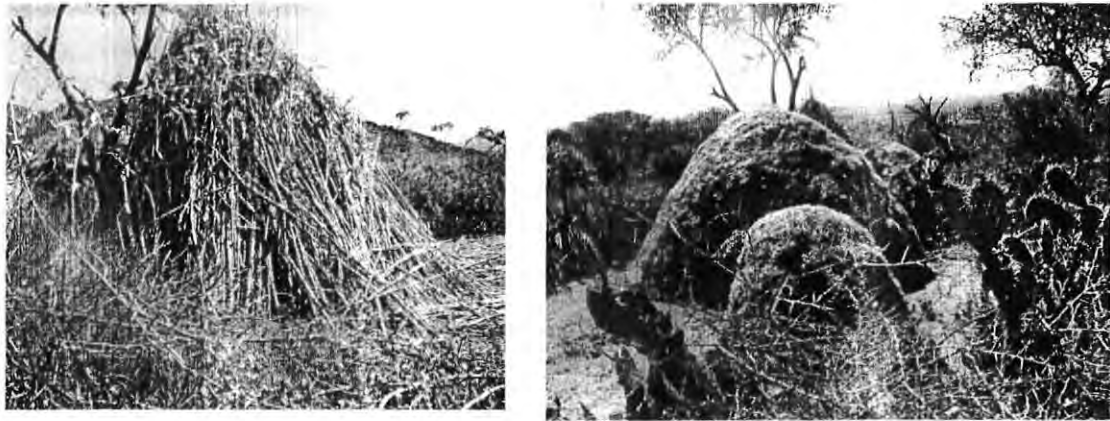


Figure 2 Crop residues stacked in producers' compound

Crop residues appear the major source of feed from February to July. Weeds grown everywhere form the feed resource from July onwards. In this regard, a weed locally known as 'Kinche' serve as feed during the dry seasons. However, this weed carries with it drawbacks. Unless it is served at its early stage, it gets poisonous at later stage. By then, the weed ,if eaten, changes the texture of milk cows provide thereby making it sour. Leaves of cactus trees are used during the dry seasons along with other leaves and fruits common in the same season. On the other hand, *hatella* or salt are used anytime depending on the purchasing power of dairy producers.

As to the best feeds, most male heads know the best feeds for their cattle in the study area. According to them, the best feeds used in the dairy production system include: long green grass locally known as *Tahag* , green maize straw, dry maize straw, peanut straw, infertile sorghum (*mekhan mashila or kezeba*) leaves, shrubs, fruits of trees etc. In short, green forages (feeds) form the best feeds in the production system. However, the best feeds are not usually available or accessible as the demands of dairy producers these days. Among the factors associated with the shortages, environmental degradation takes the lions share. Green feeds become hard to find during the dry seasons on the top of the low land (hot) nature of the study area. An increase in cattle population also worsens the feed shortages. There has been a visible mismatch between cattle and grazing capacity of communal grazing land in the study area. Fragmentation of farm land also adds fuel. This is actually not study area specific. Deterioration of land size witnesses all over Ethiopia resulted from population explosion especially in the rural areas.

In response to seasonal fluctuations, however, dairy producers in the study area have always resorted to the traditional tracking strategies. These include destocking, increasing locally available feed, migrating animals to areas where there exists fodder and reducing animal feed intake.

As an indigenous strategy, dairy producers destock their cattle during drought. This implies participants minimize the number of cattle through sale. Producers in turn use the money raised from the sale to purchase feed for the remaining dairy cows until additional compelling circumstance occurs for further destocking. This way, participants proceed with destocking as a local way out of drought. On the other hand, price fall proves an inherent feature this time around, influencing income.

The other alternative dairy producers practice during drought relates to increasing locally available feed. In the study area, participants usually work hard to accumulate crop residues in their compound for later use. But if the crop residues collected have totally been consumed, dairy producers collect cactus leaves from elsewhere to provide their cattle. As a matter of fact, cactus tree is abundantly grown everywhere in the study area. Participants' task in this regard appears to be collecting the cactus leaves and roasting them with fire to remove the thorns before provision. In this connection, the very headache dairy producers face becomes that cattle usually get board (dissatisfied) with roasted cactus leaves after a while.

Migrating animals to areas where feed is available also forms the third local tracking strategy during an outbreak of drought. This strategy is also practiced in many drought-prone rural areas of Ethiopia. In this regard, dairy producers move their animals to the neighboring rural areas such as Mekhoni north east, Afar region south, Kobo, south and the northern and western highlands of the wereda. However, the region or the larger geographical location has frequently been hit by recurrent drought. In other words, the adjacent areas to which dairy producers are supposed to move their cattle have similarly been exposed to frequent outbreak of drought. Therefore, moving animals suggests migration for many kilometers, which proves a very difficult task for dairy producers to

resort to. Words of a participant in Gargale illustrate this as ,”Our cattle usually die before we access feed resources through migration to nearby areas. Last year, there was a serious feed shortage through out the year resulted from drought in the region as a whole. So we had nowhere to migrate to.”

Finally, dairy producers in the study area usually try to reduce animal consumption when drought occurs.

In order to collect animal feed, usually straw, dairy producers employ human labor, camel, donkey, horse, mule, but do not use cattle for transport. According to a dairy producer, using cattle for transportation purpose, with the exception of straw, has long been a local tradition in *Raya*. On the other hand, participants use locally made cutting tools such as sickle, ‘*gojemo*’ , mechanically made *Gegeera*, etc.

Dairy producers in the study area never employ modern feeding practices in the production system. Improved feeds have no room in the traditional dairying. The provision of concentrates is predominantly practiced in the urban town (Alamata) by two commercially driven investors, who run dairy production for profit along with meat production.

4.4. Water and Watering Practices

Like feed, water appears to be one of the major inputs in any dairy production. In this regard, the major sources of water in the study area include: rivers, pipe water, dams and wells.

In Gargale, dairy producers obtain water for their cattle mainly from manually dug small but many wells collectively found at a common point called *Dayou Dile*, which takes 30 minutes on average walk to the south east from Gargale. This water point, a flat vast green field, is always populated with a great deal of livestock from kushets (villages) of Gargale for watering.



Figure 3 The Watering Post at Dayou Dile, Gargale

Watering animals is children's responsibility. Little cattle herds water animals once a day early in the morning, and then cattle go for feeding the whole afternoon. While watering, children make use of such tools as half cut plastic jerry cans which were originally oil containers, wooden made bowl (tin), aluminum bowl to serve, and upper – open vegetable oil cans tied with long rope to fetch water out of the wells.



Figure 4 Children watering animals at Dayou Dile, Gargale

Here, one can see that both manually made and mechanically produced artifacts are involved in the watering practices. This implies both local indigenous knowledge and modern technology are incorporated. However, the modern technology is not considered as it is. The mechanically produced tools have slightly been adapted to the demands of dairy producers. This proves an aspect of adapting and expanding indigenous knowledge systems.

In Selenwuha, dairy producers access water for their animals mainly from manually dug big dams, locally known as *horeye*, found at about five dispersed points, out of which, however, only two were filled with water during this observation.

With regards to pipe water, dairy producers use these sources as supplementary and a dry season sources. Other wise, they do not consider them on a regular basis. Accessibility of these sources proves to be very limited. There prevail very few public water posts in the

study area. The service delivery is not as such accessible when ever the need arises, but on a scheduled program, usually early in the morning.

Housing Systems

In the study area, dairy producers practice three housing systems. The majority of the producers keep their cattle with in their own residence compound. This practice prevails more in Selenwuha. Here, every compound is so wide that it can shelter many cattle at ease. Another group of dairy producers shelter their cattle in poorly constructed open barns, with in their compound. This is more evident in Gargale. Very few other producers use closed barns as a shed for their cattle. Such barns are characterized by loose construction, improper drainage but proper ventilation.

4.5. Rangeland and Natural Resource Management



Figure 5. Villagers conserving natural resources at Mt. Gargale, Gargale

Except for Mondays in Gargale , Tuesdays in Selenwuha and holidays, dairy producers were not seen in the study area during this observation because all the villagers were engaged in a 40 day natural resources conservation campaign. Dairy producers have long been managing rangeland and natural resources traditionally. As a local tradition, dairy producers exercise certain practices.

In relation to feeding, dairy producers graze their cattle in light of seasonal realities .During the wet seasons, animals are allowed for free grazing on communal grazing, etc.. This is so because there prevail green grass everywhere. On the other hand, at the beginning of the rainy seasons in Selenwuha , grazing in the *Sera* is prohibited. This means that grass will have time to regenerate during the rainy seasons .To this end, cattle are not allowed to graze in the *sera* until the grass grows to the extent it is ready for grazing .When it is believed that the limit has been achieved, grazing will then be allowed for a week or two depending on the demands of the villagers up on approval by the *Abohagay* .On the other hand, the *sera* is open for free grazing during the dry seasons. Water use is also conducted depending on the seasonal realities or availability of water in the study area. In both villages, both resources are traditionally managed by a group of elders. These groups of elders do have different names in the two villages .In Gargale, they are known as *Shimagle A'di*. On the other hand, In Selenwuha, they are traditionally called the *Abohagay*.

With regards to energy use, dairy producers resort to dry animal dung and crop residues as source of fuel with a view not to cutting trees in the study area.

On the other hand, such conservation practices as terracing, constructing gully checks, conservation-oriented agronomic practices in each producer's farmland, are predominantly employed.

According to the local traditions of the village, rangeland and natural resources are administered by a body known as '*Abohagay*'. This body is a group of four publicly elected members of the village responsible for rangeland and natural resources management. Once assigned, this organ is accountable to another local superior public

elect organ known as *Atbaki*. Superior to both local institutions is the social court. This is a government body as opposed to the previous two local organs.

Appointment Procedures of Abohagay

Members of Abohagay are usually nominated by the public. To be a successful nominee, one should fulfill certain socially acceptable requirements. He must be one who: serves justice; believes in equality; is ethical; is honorable; thinks democratically, etc... Age is not a factor if the above and other relevant requirements are met.

During election, a nominee can not (should not) reject the nomination. If one fails to accept the nomination, the would-be assigned *abohagay* or newly elected members, who accepted the nomination, will impose (pass) punishment upon the member who rejected the nomination for the misconduct. The guilt should, then, pay the amount immediately. And if the guilt again fails to act according to the verdict, the case will be forwarded to the *Atbaki*, the superior local court for further punishment. The *Atbaki* then decides that the guilt should be an out cast. No relationship of any type with the guilt is allowed.

Stigmatization continues until the guilt surrenders and obeys the resolution passed by both local organs. When the pain from the stigmatization worsens the guilt surrenders and appeals to the *Abohagay* in public at the center of the village for mercy. Mercy will be served with serious preconditions that he will not commit any misconduct in the future. On the other hand, if the guilt takes for granted that the verdict against him is not just, he can appeal to the social court, government court. This is simply a possibility but not a solution to him. Over the years, what has been decided by the local organs has never been disregarded by the social court, rather punishment will be aggravated. In the mean time, if this same guilt commits additional misconduct, he will be totally stigmatized.

Years of Service

There is not as such any limit in time span for service. However, service depends on the provision of good governance and justice by the appointees. So long as member of the *Abohagay* provides justice, the team can stay in power any longer for indefinite time.

However, if these conditions are not met, a new appointment will be conducted. This will be done in six months time. Along with the appointment, there is a practice of assigning a nominee who on his own reasons did reject the nomination earlier but who after some time later showed consent for the post. However this is done after a proportionate punishment.

Local rules and regulations

Some of the local institutions include:

- Any tree must not be cut unless up on approval by the *Abohagay*. There are times when cutting tree is allowed up on approval. For instance, if a villager marries or faces mourning or gives a socially accepted festival, he selects trees from the *Sera*(a dense forest) that are supposed to be enough for the festival and lets *Abohagay* know the details. When permission is secured, he cuts trees. Cutting goes as far as what is enough for the festival. It is totally prohibited for the one with the case to go beyond the limit. If he does it means that he committed crime against the local institutions.
- Tree branches must not be cut
- Irrigation should not be diverted out of the schedule
- Grazing in the Sera is prohibited unless permitted
- If one is seen grazing opposite to the grazing time, he must be reported to the local body by everyone. Every community member does have the responsibility to report. This goes to the extent that a wife must expose her husband if her husband does against the local rules.
- Not reporting while seeing that there has a misconduct committed is also against the rules. Therefore, the local institutions regarding rangeland and natural resources are seriously strict, more than any government rules and institutions. In the villagers eyes, the local rules are superior to any other rule including governments

4.6. Processing Animal Products

Milking Practices

Milking in different parts of Ethiopia is primarily handled by women. However, milking in the study area is predominantly handled by men. This goes more or less hand in hand with the Fogera area of Amhara region where milking is entirely performed by males (Belete, 2006). It must not be forgotten in here that women also join hands in the milking practice in the study area.

Nearly all the dairy producers manually milk their cows twice a day. The same is true for dairy producers in many parts of Ethiopia. In other words, the frequency of milking in various parts of Ethiopia is twice a day as in the study area. And this is normally done early in the morning and late evening. However, no exact or specific time has been identified.

Dairy Products Utilization

In the study area, the average daily milk production per local (*Raya*) breed amounts to 2 to 3 litres, but, 10 to 12 liters for the *Barka* (*bagait*) breeds. From the figures, one can see that dairy producers with the *Barka* Breeds perform and benefit much more than those with the local breeds. However, the *raya* on *harmo* breeds provide the already mentioned amount of milk (2 to 3 litres) in a situation where there prevail feed shortage, poor health care, unimproved genetic make up and other relevant input. This suggests the local breeds are not performing good, calling for improvements in the basic inputs.

The majority of dairy producers in the study area utilize whole milk predominately for home processing. This is entirely different from the urban dairy production system in that milk production in urban Alamata entails predominantly for sale. Very few proportion of dairy producers use milk for consumption and sale. However, selling whole milk as an economic activity is still a taboo. If milk is to be sold, then it has to be processed in to butter for many of the dairy producers in the study area.

Milk Handling

Milk management has a lot to do with milking utensils. The nature of milk utensils determine the quality of milk produced. This in turn depends on the quality, method and frequency of cleaning milking utensils.

As to the nature of milking utensils, many of the dairy producers in the study area employ traditionally made milking utensils. These utensils are made of wooden materials easily accessible in their localities. The utensils also minimize extra costs for buying plastic or metal utensils from the market. However, they are inherently fragile materials.

With regard to maintaining dairy hygiene, women in the study area maintain dairy hygiene using their traditional knowledge. In this regard, women wash milking utensils with or without hot water before and after milking.

After washing, they usually smoke the utensils with aroma producing plant locally known as *Awle'e* (*Olea Africana*). Smoking of milk utensils prior to milking and churning is a common traditional practice in most parts of the country (Ayantu, 2006). Some farmers use trees and shrubs to preserve livestock products such as milk. Wood from some of the trees/shrubs is burned and produces smoke that is forced into gourds used to store the milk. This smoke is believed to increase the shelf life of milk and to impart desirable flavors to the "clotted" and concentrated product. Studies conducted at Sokoine University of Agriculture (SUA) on traditional smoking of milk practiced by different tribes in Tanzania show that smoke treatment inhibits growth and activity of mesophyllic and thermophilic lactic acid bacteria (Chenyambuga *et al* 1993).

Related to smoking but a different local tradition has been that women normally get a piece of *Olea Africana* wood burning in an already stored milk with a view to preserving it. As to frequency of cleaning, women clean the milking utensils before and after milking. However, there was no as such a scheduled program for cleaning.

Although, the local practice of milk handling deserves its own credit, it would be unwise to take it for granted. Contamination, for instance, can result from improper personal hygiene, an inherent feature of the local people like any other peasant, or unsafe seals of milk containers. In their very nature the seals of milk utensils as manually made, do not exactly fit with the containers. This creates gaps in between. These gaps might let such small insects as fly enter in to the containers and contaminate the milk.

Milk Processing

Nearly all dairy producers in the study area have had local tradition of processing milk to derive other products. In this process, women churn whole milk using traditional churning utensil known as *Laga* (wooden pot). This is different from the case for the central highlands where clay pot is mostly used (O'mahoney and peter, 1987)



Figure 6 Laga, Karfo and, Kacho respectively, local milking utensils

According to many dairy producers, Butter churning takes place twice a week due to the deteriorating amount of milk yield resulted from mainly feed shortages in the study area. Butter churning in this context is predominantly preferred for various basic reasons.

One relates to that women normally churn whole milk because there has never been a culture of selling whole milk in the study area. The selling of milk has still been a taboo. However, there prevail very few consumers who buy milk on a contractual basis. This is more prevalent in Gargale than in Selenwuha.

The other reason is that selling butter, widely practiced, is more profitable for the dairy producers than selling whole milk on top of scarcity. Attached with this comes the fact that dairy producers can use butter and separated milk for household consumption, usually as stew.

Still another factor for butter churning refers to the cosmetic purpose of butter.

Women use butter in order to beautify not only themselves but also members of the household.. This is typical culture in the study area. In this regard, women prefer butter for its cosmetic purpose to household consumption during scarcity in their households.

A different but contributory factor for churning relates to the absence of whole milk market. This is a case in point in Selenwuha where there is no market even for goods and services, let alone a single item market. As a result, the primary dairy product traditionally processed in the study area proves butter followed by ergo (fermented whole milk).

Waste Management

Although poorly managed, animal dung has locally been used for various services in the study area. On the one hand, dairy producers use dung primarily as (indigenous) fertilizer in their farms. Here, male heads are predominantly involved in this routine. In this connection, dairy producers explained that they have always used animal dung because its importance has been remarkable in the productivity of their farmlands. But that, the compost usually exposes farmers to health problems in general, '*mich*' in particular

On the other hand, women use dung for household fuel along with other resources. They also decorate the floor and wall of their houses by mixing it with ash. It has also been a local tradition for women to make store (*godo*)local stove (*mgogoi*), shelf (*Chigot*) etc.. from animal dung.



Figure 7 local stove (mgogoi), shelf (chigot), and store (godo) respectively

Animal dung is also marketed and transported to some other places from Gargale, so no dung is found useless. According to some participants, producers who sold dung with maximum profit have been rewarded by the regional government.

Hide Processing

It has been evident in the study area that dairy producers have long been engaged in traditional hide processing. This does not imply, however, that this practice constitutes a regular routine for dairy producers. It is just that hide processing forms part of their economic activities.

Hide if not sold is traditionally processed in to household utensils. Some include: rope (*metsid*), sack (*lokota*), smooth decorated skin used for carrying babies (*mahzel or delebo*), bedsheet (*ma'esi*), cultural shoe (*shifay sa'eni*), an edge ornamenting piece of skin (*aleb*)



Figure 8 Traditional decorated Mahzel used to carry babies

.Hide unless marketed is, therefore, processed into basic household utilities for dairy producers in the study area. This economic activity suggests that dairy producers using their local knowledge can possibly reduce the additional costs of the afro mentioned household utensils to the best of themselves.

Horn Processing

In the study area, dairy producers have also had local tradition of hide processing. As a local practice, hide is processed in to such household utensils as cup(*wancha*), a tube like local medical apparatus used to absorb blood out of human body ,usually from part of the head and the back, for treatment(*mahguma*), handle of a knife ,etc...

4.7. Marketing Practices

Dairy producers in the marketing

Household women or little girls as young as 12 or so run the marketing of dairy products in the study area .Dairy producers use butter, ergo (fermented whole milk),and whole milk as the major primary dairy products for income generation ,and utilize separated milk mainly for household consumption and reception purposes. This doesn't mean, however, that dairy producers do not consume butter, ergo , and whole milk, Dairy producers sell their primary dairy products in the informal market.



Figure 9 kacho, local milk or ergo containing utensil

In the informal marketing system, women or little girls go (set out) for marketing containing dairy products in to traditionally made wooden materials such as 'kacho' for whole milk and Ergo , 'hamham' or/and 'kore' for butter. Dairy producers also set price of milk products on their own or in negotiation with consumers.



Figure 10 kore ,local butter utensil

As to the marketing channels, dairy producers deliver dairy products through the available outlets in the informal marketing system. In this regard, there prevail difference in both Gargale and Selenwuha.

In Gargale, dairy producers deliver whole milk directly to consumers on contractual basis or otherwise within their village. Another option for delivery is to sell whole milk for tea or coffee houses that are currently increasing in the area. Third, dairy producers sell whole milk in an open market points found in the village. External to their village, marketing can also be selling dairy products to consumers outside their village in nearby towns like Alamata.

In Selenwuha, on the other hand, dairy producers after walking longer kilometers out of their village deliver whole milk to consumers in nearby towns as Timuga or Wadga, which is the fourth option for the producers in Gargale. This is so because the market outlets accessed in Gargale are not available in Selenwuha.

This implies that dairy producers in Gargale have better access to the selling outlets in the informal marketing. This, in turn, improves their bargaining power in determining price although a combination of factors determine price.

The marketing channels for whole milk, ergo, and butter in the study area are indicated below.

A. Whole milk

Producer → Consumer

Producer → Trader (hotels, tea or coffee houses) → Consumers

B, Ergo

Producer → Consumer

Producer → Trader (hotels, tea or coffee houses) → Consumers

C. Butter

Producer → Consumer

Producer → Rural Assembler → Consumer

Producer → Rural Assembler → Retailers → Consumers

As shown above, butter marketing has better intermediates between producers and consumers. On the other hand, ergo and whole milk reach consumers through the shortest channels.

With regards to marketing institutions, whole milk marketing is prohibited due to the long established cultural taboo in the study area. However, if it happens to be sold, local measurements are used as opposed to litre. Butter marketing, on the other hand, is locally

accepted both in the rural and urban markets. Local measurements are also used as opposed to kilogram. Similarly, ergo marketing is also possible and measured with local utensils unlike the litre. When marketing of butter takes place between neighbors, both the seller and the buyer agree on a price in reference to the price paid for the same amount in the proximate informal market and time on which the latest transaction has been made.

Price and Demand Determinants

As to price determinants, the informal marketing system in which dairy producers sell their dairy products without alternative has been dictated by factors that determine price and demand for dairy products in the study area. Some of these factors include: season, access to the market, fasting, festivals, etc...

According to dairy producers in the study area, the price of dairy products fluctuates as season changes. During the wet seasons, the price of dairy products decreases due to the availability of much milk resulted from better feeds. On the other hand, the price of dairy products gets higher during the dry seasons. This relates to reduction in the productivity of milk mainly due to feed shortages.

Distance from market also constitutes a factor in determining price of dairy products. The price producers fix in the production area is not comparable to the price in urban towns. For example, the price of a litre of whole milk in the rural Gargale is much lower than the amount of money requested for the same item in Alamata or Mekoni. Similarly, dairy producers in Selenwuha face not only price decrease but also difficulty even in accessing the market.

Another element in determining price in the study area relates to fasting.

During the fasting seasons of the adherents of the Orthodox Christian religion, the demand for dairy derivatives decreases. Accordingly, the price of these products gets lower. On the other hand, price increases during religious and cultural festivals in the

study area. This marks the fertile point in time for dairy producers to generate income provided that there prevail much milk productivity.

Costs and Returns

As to costs and returns, dairy producers in the study area do not have formal record keeping. As a result, costs and returns in the production process are not recorded and analyzed. This is so because many of the producers are not market oriented with the exception of very few dairy producers who own 'Barka 'breeds (a case in Gargale). Even those with market orientation after some training by government fail actually to practice formal record keeping without which talking exactly about costs and returns would become difficult.

From the overall reflections of dairy producers, however, it is implied that dairy production forms a worshiped economic activity regardless of costs and returns. This holds true even in situations where recurrent drought appears a routine in the study area. For many people, animals represent savings. The sale of livestock and manure can mean quick cash in hard times. Income from livestock and their many products – milk, eggs, meat, wool, leather, honey – can allow poor families to put food on the table, improve their nutrition, send their children to school and purchase medicine for themselves and their animals. Livestock also act as a kind of social glue. Loans and gifts of livestock connect people to other family members, as well as to communities and institutions. In many societies, bride dowries are paid in livestock. Herders who share livestock with their relatives also share the risks brought by drought and disease. Livestock are used to resolve conflicts, pay debts and settle scores. A family's place in society is often measured by the amount and kind of livestock it owns. When women own livestock, their social status can be improved, empowering them to participate in decision-making. Livestock serve a practical function, too. They carry heavy loads, help plough fields and provide means of transportation. Their manure fertilizes the soil. Most livestock graze on straw, grass, kitchen scraps and other waste, and thus convert unusable materials into high-quality food for humans. Their meat adds protein to cereal-based diets and can improve the nutrition of children (IFAD, 1994)

4.8. Challenges of the Traditional Dairy Production System

According to dairy producers, the traditional dairy production process in the study area is constrained by miscellaneous challenges. These include: animal feed shortages, land fragmentation, discouraging marketing systems, inadequate veterinary services, lack of training, poor extension services, etc

For the dairy producers, shortage of animal feed as a result of environmental degradation appears to be the major constraint in the production process in the study area. Along with this comes the deteriorating size of each producer's farmland from which the major feed resources, crop residues, are obtained.

In addition, the discouraging market realities in the informal marketing system pose problem in the production process in that there is no strong market chain between rural producers and urban consumers.. According to dairy producers, the study area is also characterized by inadequate veterinary services such as poor reproductive (genetic empowerment) services, poor medicine supply, lack of training on animal husbandry etc...

Chapter Five

Conclusion and Recommendation

This ethnographic study focused the role of Indigenous knowledge systems on dairy production systems in two rural villages of Alamata Wereda in South Tigray. These are Gargale and Selenwuha. In both villages, traditional mixed livestock-crop production was practiced. This implies that dairy producers were engaged in both dairy production and crop production simultaneously.

Most male heads usually select cow breeds. Although rare, very few female heads do also perform the selection. This normally occurs only when the need arises. There is no as such particular time for the selection of breeds. While selecting breeds, dairy producers employ such traditional technologies as color of the skin, breast, tail and stature, breed type, health, feed intake, productivity of milk, age, price, and agro ecology to consider desirable ones. On the other hand, natural mating though dictated by the nature of feeding is predominantly practiced along with insignificant artificial insemination.

Most male heads exercise ethno veterinary practices that are developed through observation and real life experiences. Based on such diagnostic skills as knowledge on symptoms of diseases, causes of diseases, seasons of disease and species affected, and dairy producers employ ethno veterinary practices to fight against diseases that attack their animals. Accordingly, they practice branding, stubbing, and using prayer or holy water to treat such important diseases as Anthrax, Black leg, Render pest, 'Ideseb' etc.. Nevertheless, dairy producers have recently resorted greatly to the modern medical tradition though unsatisfactory the service is.

Participants provide their dairy cattle with such common feeds as sorghum straw, maize straw, teff straw, grass, peanut straw, plant weeds, and non-conventional feeds like *hatella*, salt, leaves of cactus tree, fruits of acacia and 'Bedana' tree, etc... However, the best feeds used include: long green grass locally known as *Tahag*, green maize straw, dry maize straw, peanut straw, infertile sorghum, leaves, shrubs, fruits, etc... In response

to seasonal fluctuations, destocking of animals, increasing locally available feed, migrating animals to areas where there exists fodder and reducing animal feed intake are traditionally considered way outs. Local tools and pack animals are used to collect crop residues. On the other hand, modern feeding practices are never practiced.

The major sources of water in the study area include: rivers, pipe water, dams and wells. Watering animals is children's responsibility. Children make use of both traditionally made and slightly adapted tools for watering purposes.

Rangeland and Natural Resources are administered by a body known as '*Abohagay*', responsible for rangeland and natural resources management. Once assigned, this organ is accountable to another local superior public elect organ known as *Atbaki*. Superior to both local institutions is the social court. The management is taken place based on long established institutions.

Milking in the study area is predominantly handled by men. Nearly all the dairy producers manually milk their cows twice a day. The majority of dairy producers utilize whole milk predominately for home processing. Milk is traditionally handled using local household utensils. Women wash and smoke milking utensils to maintain dairy hygiene. Milk, dung, hid, and horn are locally processed in to economically important products.

Household women or little girls use butter, ergo, and whole milk as the major primary dairy products for income generation, and utilize separated milk mainly for household consumption and reception purposes. Dairy producers sell their primary dairy products in the informal market directly to consumers although there is disparity in the two villages. Price and demand have been dictated by such factors as season, access to the market, fasting, festivals etc. Costs and Returns in the production process are not recorded and analyzed. However, possessing livestock implies such desirable things as savings, social glue, insurance, inputs for conflict resolutions, status indicators, etc...

The traditional dairy production process in the study area is being constrained by such challenges as animal feed shortages, land fragmentation, discouraging marketing systems, inadequate veterinary services, lack of training, poor extension services, etc...

From the overall discussion, it can be concluded that Indigenous Knowledge systems has practical importance in the dairy production process in the study area although constrained by practical problems mentioned earlier. As a result the system is characterized by low productivity. For an increased productivity of the production system, therefore, I recommend Indigenous Knowledge Systems should further be studied and integrated with modern dairy production system in general and the following in particular.

- Traditional breed selection should be encouraged. On the other hand, the local breeding practice needs to be supplemented widely through improved delivery of Artificial Insemination.
- Although the local diagnostic skills prove impressive, more priority should be given to the modern curative practices.
- Government and concerned bodies should intervene to fight against feed shortages.
- Organized market for the purchase and sell of dairy products must be established.
- The provision of adequate veterinary services must also be in place.
- The provision of training on such issues as feed conservation methods, feeding practices, basic animal health, natural resource management, milk handling and processing, record keeping, etc...should be considered..

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Appendix A

Observation Guide

Traditional selection of cow breeds and breeding practices

In this category, some of the information can be on

- Who is involved in selecting cow breeds? The breeding?
- What is the setting in which selection of cow breeds and breeding practices take place like?
- What traditional technology is employed in the selection of cow breeds and breeding practices?
- What species are selected?
- What are the breeding practices like?
- What artifacts (equipment) are used in the processes? etc..

Traditional medicine and pharmaceutical practices

In this theme, would-be-collected data can include.

- Who takes part in the traditional medicine and pharmaceutical practices?
- What does the setting in which traditional medicine and pharmaceutical practices are undertaken look like?
- What are the indigenous disease diagnostic skills?
- How do they prevent and cure diseases?
- What tools, plants, or substances are used to prevent and cure animal diseases? etc..

Knowledge about feeds and feeding practices

In this domain, elements of the data can consist of:

- Who knows the best kinds of feeds and feeding practices?
- What is the setting in which best feeds are found like?
- What local knowledge is applied to access the best feeds?
- How do producers respond to seasonal fluctuations of feeds?
- What are the feeding practices like?
- What artifacts are used in the feeding practices? etc...

Processing animal products

In this category, information can be collected on:

- Who processes animal products?
- What is the setting in which animal products are processed like?
- How do producers milk?
- What materials are used to store milk?
- How do producers preserve animal products?
- How do they maintain dairy hygiene?
- How do they maintain personal and environmental cleanliness? etc..

Knowledge on range and natural resource management

In this theme, some of the data can include.

- Who manages range and natural resource?
- What is the setting in which range and natural resource management takes place like?
- What indigenous institutions are enforced to manage range and natural resources?
- How do they respond to environmental fluctuations, control bush encroachment, and overgrazing and rangeland quality?
- What equipment are used to manage range and natural resources?
- What indigenous institutions are available to manage conflicts on range and natural resources? etc . . .

Marketing practices

In this domain, would-be-collected data can contain:

- Who is responsible for marketing practices?
- What is the setting in which marketing takes place like?
- What traditional institutions are involved in the market?
- What products are normally sold in the market?
- What materials are used to contain and deliver products?
- What are the marketing systems?
- What are the costs and the returns? etc.

Adaptation and expansion of Indigenous knowledge

In this category, data can be collected on:

- Who adapts and expands indigenous knowledge in response to changing conditions?
- What is the setting like?
- What innovations have been introduced to meet new opportunities?
- What new cures are included in the existing cures?
- What equipment are used in the processes? etc.

Others such as, housing, traditional knowledge transfer mechanisms, similarity or contrast with scientific knowledge systems, producers' preference for either of the knowledge systems, challenges, etc. will also be in the would-be-collected data domain.

Appendix B

Interview Schedule

Thank you for being willing to take part in this interview. I first of all assure you that you will remain completely anonymous and no records of the interview will kept with your name on them.

Traditional selection of cow breeds and breeding practices with probes and prompts

- Who is involved in selecting cow breeds? The breeding?
- What is the setting in which selection of cow breeds and breeding practices take place like?
- What traditional technology is employed in the selection of cow breeds and breeding practices?
- What species are selected?
- What are the breeding practices like?
- What artifacts (equipment) are used in the processes? etc..

Traditional medicine and pharmaceutical practices with probes and prompts

- Who takes part in the traditional medicine and pharmaceutical practices?
- What does the setting in which traditional medicine and pharmaceutical practices are undertaken look like?
- What are the indigenous disease diagnostic skills?
- How do they prevent and cure diseases?
- What tools, plants, or substances are used to prevent and cure animal diseases? etc..

Knowledge about feeds and feeding practices with probes and prompts

- Who knows the best kinds of feeds and feeding practices?
- What is the setting in which best feeds are found like?
- What local knowledge is applied to access the best feeds?
- How do producers respond to seasonal fluctuations of feeds?
- What are the feeding practices like?
- What artifacts are used in the feeding practices? etc...

Processing animal products probes and prompts

- Who processes animal products?
- What is the setting in which animal products are processed like?
- How do producers milk?
- What materials are used to store milk?
- How do producers preserve animal products?
- How do they maintain dairy hygiene?
- How do they maintain personal and environmental cleanliness? etc..

Knowledge on range and natural resource management with probes and prompts

- Who manages range and natural resource?
- What is the setting in which range and natural resource management takes place like?
- What indigenous institutions are enforced to manage range and natural resources?
- How do they respond to environmental fluctuations, control bush encroachment, and overgrazing and rangeland quality?
- What equipment are used to manage range and natural resources?
- What indigenous institutions are available to manage conflicts on range and natural resources? etc . . .

Marketing practices with probes and prompts

- Who is responsible for marketing practices?
- What is the setting in which marketing takes place like?
- What traditional institutions are involved in the market?
- What products are normally sold in the market?
- What materials are used to contain and deliver products?
- What are the marketing systems?
- What are the costs and the returns? etc.

Adaptation and expansion of Indigenous knowledge with probes and prompts

- Who adapts and expands indigenous knowledge in response to changing conditions?
- What is the setting like?
- What innovations have been introduced to meet new opportunities?
- What new cures are included in the existing cures?
- What equipment are used in the processes?

Others

- housing,
- traditional knowledge transfer mechanisms,
- similarity or contrast with scientific knowledge systems,
- producers' preference for either of the knowledge systems,
- challenges,

Thank you for your help .Can I finally ask you if you think there is any aspect you would like to add.

Appendix C

Long Interview Schedule

Thank you for being willing to take part in this interview. I first of all assure you that you will remain completely anonymous and no records of the interview will kept with your name on them.

Name _____

Sex _____ Age _____

Marital Status _____

Family Size _____

Educational Status _____

Traditional selection of cow breeds and breeding practices

- Who is involved in selecting cow breeds in your household? The breeding?
- What is the setting in which selection of cow breeds and breeding practices take place like?
- What traditional technology do you employ in the selection of cow breeds and breeding practices?
- What species do you like to select?
- What are the breeding practices like in your household?
- What artifacts (equipment) are used in the processes? etc.
- Probes and Prompts.

Traditional medicine and pharmaceutical practices

- Who takes part in the traditional medicine and pharmaceutical practices?
- What does the setting in which traditional medicine and pharmaceutical practices are undertaken look like?
- What are the indigenous disease diagnostic skills you use to treat your cattle?
- How do you prevent and cure diseases?
- What tools, plants, or substances are used to prevent and cure animal diseases? etc..
- Probes and Prompts

Knowledge about feeds and feeding practices

- Who knows the best kinds of feeds and feeding practices?
- What is the setting in which best feeds are found like?
- What local knowledge is applied to access the best feeds?
- How do you respond to seasonal fluctuations of feeds?
- What are the feeding practices like?
- What artifacts do use in the feeding practices? etc...

Processing animal products

- Who processes animal products?
- What is the setting in which animal products are processed like?
- How do you milk?

- What materials are used to store milk?
- How are animal products preserved?
- How do you maintain dairy hygiene?
- How do you maintain personal and environmental cleanliness? etc..
- Probes and prompts

Knowledge on range and natural resource management

- Who participates in range and natural resource management in your household?
- What is the setting in which range and natural resource management takes place like?
- How do you respond to environmental fluctuations, control bush encroachment, and overgrazing and rangeland quality?
- What equipment are used to manage range and natural resources?
- What do you know about indigenous institutions available to manage conflicts on range and natural resources? etc .
- Probes and prompts ...

Marketing practices

- Who is responsible for marketing practices?
- What is the setting in which marketing takes place like?
- What traditional institutions are involved in the market?
- What products do you normally sell in the market?
- What materials are used to contain and deliver products?
- What are the marketing systems?
- What are the costs and the returns? etc.

Others such as, housing, traditional knowledge transfer mechanisms, similarity or contrast with scientific knowledge systems, preference for either of the knowledge systems, challenges, are also prompted and probed.

Thank you for your help .Can I finally ask you if you think there is any aspect you would like to add.

Appendix D

Focus Group Interview

Thank you for being willing to take part in this discussion .I first of all assure you that you will remain completely anonymous.

- Traditional selection of cow breeds and breeding practices
- Traditional medicine and pharmaceutical practices
- Knowledge about feeds and feeding practices
- Processing animal products
- Knowledge on range and natural resource management
- Marketing practices
- Adaptation and expansion of Indigenous knowledge

Thank you very much for your help and time.

Declaration

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

Declared by:

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