

Addis Ababa University

College of Development Studies

Ecological Implications of Pastoral Livelihood Diversification in Fantalle woreda

A Thesis Submitted for the Fulfillment of Masters Degree in Rural Livelihood and Development

By Muluneh Mosisa

26965

Adviser: Workneh Negatu (PhD)

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Title

Ecological Implications of Pastoral Livelihood Diversification in Fantalle Woreda

By

Muluneh Mosisa

DEVELOPMENT STUDIES

APPROVED BY THE BOARD OF EXAMINERS: SIGNATURE

Dr. Ali Hassen _____
CENTER HEAD

Dr. Workneh Negatu _____
ADVISOR

Dr. Getnet Alemu _____
INTERNAL EXAMINER

DOCUMENTATION CENTRE
INSTITUTE OF DEVELOPMET RESEARCH
ADDIS ABABA UNIVERSITY
P. box 1176, ADDIS ABABA
ETHIOPIA

B8102

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Acronyms

- AAU: Addis Ababa University
- ANP: Awash National Park
- ASAL: Arid and semi arid lands
- CBD: Convention on biological diversity
- CSA: Central statistical agency
- CARE: Cooperation of American relief elsewhere
- DFID: Department for international development of UK
- EEA : Ethiopian Economic Association
- EPRDF: Ethiopian People Revolutionary Democratic Front
- FGD: Focused group discussion
- FIIBP: Fentalle Integrated Irrigation Based Project
- GB: Great Britain
- GTF: Gudina Tumsa Foundation
- Ha : Hectare
- HH: Household
- HoA: Horn of Africa
- HPG: Humanitarian Policy Group
- KII: Key informant interview
- Km : kilometer
- NGO: Non governmental ogranization
- Ql : Quintal
- PA: Pastoral Association
- SLF: Sustainable livelihood framework
- UK: United Kingdom
- UN: United nations
- MSF: Metahara sugar factory
- WUE: Water Use Efficiency

Glossary

Aadaa:	Culture
Abba Bokku:	President of the oromo gada system
Abba dula:	War leader in Oromo gada system
Abba ganda:	Village leader of karrayyu oromos
Damina:	Administrator of a Karrayyu ganda (village)
Gada system:	Traditional administrative system of oromo people
Ganda:	Village level social grouping in Karrayyu pastoralists
Heera:	Justice
Kalo:	Closure of grazing land
Malka:	Source of water
Ona birraa:	Grazing area for the Autumn season in Karrayyu pastoral area
Ona bonaa;	Grazing area for the winter season in Karrayyu pastoral area
Ona gannaa:	Grazing area for the summer season in Karrayyu pastoral area
Qallu:	Religious leader in oromo gada system
Seera:	Law

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Abstract

The objective of this thesis research was to describe the consequences of pastoral livelihood diversification strategies on the local ecology. A survey type of research was employed, by taking a sample of 90 households in three kebeles out of the total 18 kebeles by using systematic sampling. Besides, focus group discussion and key informant interview were used.

Pastoral livelihood assets such as human indigenous knowledge, social relationships among the pastoralists and traditional institutions such as Gada system are important in wise management of pastoral rangeland and natural resources. All the respondent households assume themselves as pastoralists, while their livelihood is diversified 37% to crop farming, 10% to charcoal/firewood selling, 12% to wage labor, 4% to petty trading, and 4% to mining. The data indicated that diversification to cropping and charcoal/firewood making cause negative ecological consequences such as shrinkage of rangelands, deforestation, and increased salinity of soil, soil erosion, damage to the 'gada' ceremonial sites (destruction of trees that were used for Gada gathering), extinction of grass species and wild animals, and threat to the most resilient pastoral system. The study also found out the constraints of diversification to cropping, mining and charcoal/firewood making as climatic conditions of dry land areas, soil properties, rent out of land to urban dwellers, perception of pastoralists on water point development, low level of skill of water users to utilize economically, prevalence of pests and shortage of pesticides, and conflict on land sharing since communal land holding is accustomed to pastoral areas.

The following policy implication has been recommended: Pastoral livelihood diversification strategies should be focused to environmental friendly and ecologically suitable activities such as value addition to the livestock products; irrigation water should be used for rangeland improvement and for livestock drinking than for cropping; Pastoralists should be consulted and be able to decide for their destiny; seasonal mobility has to be recognized as adaptation mechanism to the lowland ecology; pastoral livelihood assets such as human capital and social capital that support ecological adaptation have to be improved; concerned government bureaus and offices such as the Land and Environmental Protection Office have to be committed to manage the environmental issues; and pastoralism in this country is going to diminish and hence it should be preserved for heritage.

Key words: Pastpralism, Livelihood, Ecology, Diversification

Chapter One
Introduction

1.1 Background

Pastoralism is a way of life, where humans live on products of domestic animals. Swift (1988) defines pastoral production systems as those in which 50% of gross household revenue (total value of marketed production plus estimated value of subsistence production consumed within household) comes from livestock or livestock related activities. In Ethiopia, pastoralism is a way of life for more than 8 million people, which is around 12% of the total population of the country. Geographically they are located in lowland part, and they also cover 61% of total area of the country (Getachew 2001b). Similarly in Oromia regional government, 4 million pastoral communities exist in 33 woredas that cover 40% of the total landmass of the region.

According to Ayalew 2001, before the introduction of large scale irrigation and tourism attraction in the Awash valley, the livelihood of pastoralists was viable, self sufficient and largely self supportive. However, after the intrusion of such projects, the pastoralists resource base has become constricted; the mobility of the herd has also been curtailed and started to exploit the nearby grazing land, which has a serious impact on the grazing cycle of the pasture.

Different manmade and natural catastrophes threaten pastoral livelihood. According to Anniley (2009), in the last six decades pastoralists and their traditional means of livelihood has been exposed to intense pressure. Some of the man made catastrophes include establishment of national parks, delineation of national boundaries, the settlement of agriculturalists in pastoral areas, establishment of large irrigation farming, establishment of factories in pastoral areas, conflicts with neighboring pastoral and non pastoral groups, and others, that resulted in the displacement of many pastoralists from their traditional pasture lands (Getachew 2001b, cited in Anniley 2009). In addition pastoralists are forced to settle

permanently in specific area through provision of irrigation for crop farming, against their traditional pattern of movement between various areas in response to variation in rainfall and pasture. Drought is another natural phenomenon that threatened pastoral livelihood.

Under such circumstances the pastoralists have attempted to respond to the challenges they are facing, by engaging in non-pastoral economic activities (livelihood diversification). They have adopted new coping and adaptive strategies which include a shift to settlement; reliance on economic activities outside of the pastoral sector like wage labor, opportunistic farming, commercial activities, etc to cope up the problem of poverty (Getachew 2001b).

Fantalle pastoralists have diversified their livelihood to crop farming, charcoal/firewood selling, and petty trading. The woreda is occupied by Karrayyu pastoralists, situated in the Upper Awash Valley, a portion of the Great East African Rift Valley, with altitude range between 940 to 960 m.a.s.l, temperature of 9.6 to 42.0 degree centigrade, and mean annual rainfall of 553 mm, and is characterized by hot and dry climate with high evapotranspiration. It is assumed that the diversification activities listed above (especially cropping and charcoal/firewood selling) may worsen the harsh ecological conditions of the pastoral areas. Therefore, it is important to assess the ecological impact of pastoral livelihood diversification.

1.2 Problem statement

The livelihood of Fantalle woreda is based on pastoralism. They rear different types of livestock including cattle, sheep, goats, and camel. Their nutrition and income depends on livestock and products of livestock. Additionally, livestock are also used for other purposes such asocial prestige and accumulation of capital. Pastoralists used adaptive strategies to the dry land harsh environment through seasonal mobility from less forage and water areas to better areas, and change of herd composition.

Fantalle and other pastoral woredas of Oromia are charecterized by low and erratic rainfall (400-700mm), depleted surface water, hostile temperature, alkaline and saline soil, and frequent drought. Pastoralists face different constraints like the shrinkage of pasture land due to establishment of national parks, factories, large-scale irrigation farming; conflicts, drought and the like. Due to these factors, many pastoralists lost their livestock and became poor. The poor pastoralists have diversified their livelihood strategies to crop production (opportunistic farming), trade, sale of firewood and charcoal, and labor work, besides the major pastoral livelihood strategy. Besides the above natural and man made catastrophes, there are also opportunities such as irrigation facility for diversification especially to crop farming. Crop farming and charcoal/firewood selling are assumed to destroy the local ecology.

Additionally, the government is currently encouraging the pastoralists to settle and diversify their livelihood activities to especially crop farming, through the supply of different infrastructures like irrigation facilities, schools, clinics, etc. One of the irrigation projects currently practiced in pastoral areas is the Fantalle project which is used for both Fantalle and Boset woredas. The initiative to supply these infrastructures is not totally bad, but the question is whether the intervention is in accordance with the existing socio ecological context. GTZ & OBARD (2000) states that dry land farming in Borana lowlands and other pastoral areas can be recommended only in pocket areas with more favorable moisture conditions, eg in depressions or higher elevations.

Ellis (2000) assumes that rural livelihood diversification can potentially provide environmental benefits in two ways. One is by generating resources that are then invested in improving the quality of the natural resource base. The second is by providing options for the time spent in exploiting natural resources, e.g. gathering activities in forests is less remunerative than time spent doing other things. On the contrary, different literatures and experts working in pastoral areas complain that land tillage and selling of charcoal and firewood in arid and semi arid areas worsen the ecological and climatic change.

More than 10,000 hectare of land is cultivated each year by rainfall in the woreda. Besides, 3733 hectares of land was cultivated by irrigation from year 2008-2010. Reports indicated that almost all the rain fed crops do not give yield every year due to erratic nature and shortage of rainfall. Immature drying crops are observed on their fields. The irrigation facility has solved their severe water needs, enabled production of some crops for household consumption, and used for rangeland improvement. There are complaints from the side of pastoralists and concerned experts that crop farming by rain and irrigation has also caused some negative ecological consequences on the livelihood of pastoralists. Charcoal and firewood selling has been widely observed in the woreda especially on the roadsides. The activity is believed to cause deforestation and worsen ecological degradation as well as climate change.

Any livelihood diversification activity is said to be sustainable when it can cope with and recover from stresses and shocks, maintains its capabilities and assets, while not undermining the natural resource base. The diversification strategies carried out in this pastoral woreda are assumed that they destroy the pastoral livelihood system that is more resilient to the harsh ecology; and the activities themselves are not sustainable. The diversification strategies would result in different consequences that would be irreversible. Therefore, this study is intended to assess the ecological effects of pastoral livelihood diversification strategies in Fantalle woreda.

1.3 Objectives

The general objective of this study is to describe the consequences of pastoral livelihood diversification on the local ecology in Fantalle woreda.

The specific objectives are:

- To assess the relationship between pastoral livelihood diversification strategies and the local ecology in the study woreda.

- To assess the relationship between pastoralism and the local ecology in the study area.
- To explore constraints and issues related to pastoral livelihood diversification.

1.4 Scope of the study

This study is limited to Fantalle woreda, with emphasis to ecological implications of pastoral livelihood diversification. In this study the livelihood assets that have relationship with ecological management have been described; and the relationship between pastoral livelihood diversification and the local ecology has been assessed. It is based on household survey and FGD in three kebeles. Fentale woreda is located in East Shewa zone of the Oromia Regional State, at 200km from Addis Ababa city. The findings would be generalized to all pastoral areas of the country.

1.5 Significance of the study

The researcher realizes the rational of the study in that the findings will establish information for interested people who want to understand the relationship between pastoral livelihood diversification and the local ecology. The result of the study will also help concerned organizations especially policy makers to design pastoral development policies and systems in accordance with their local ecology.

In Ethiopia, the experience of assessing ecological issues prior to conducting and designing community development is not well developed. Therefore, it is hoped that this research partly helps to fill such gaps. Finally, the findings of the research may serve other researchers who want to conduct further studies in the mentioned topic in Ethiopia.

1.6 Limitations of the study

The data has been collected from three kebeles out of eighteen rural kebeles with the assumption that all the rural kebeles have similar characteristics. The sample size was minimized due to shortage of time and finance.

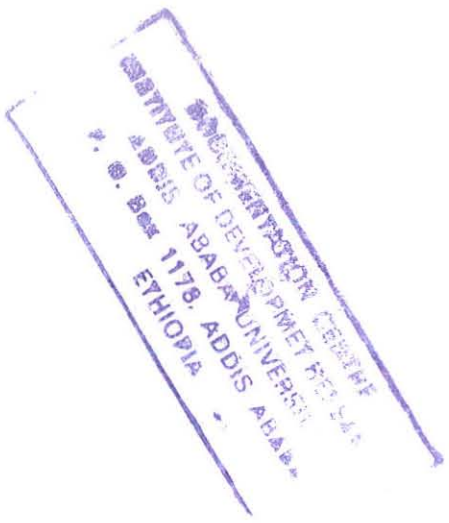
The study was based on secondary data in addition to primary data. But lack of some important secondary information from the woreda office, and lack of meteorological information of different items and of the years before 1985, has hindered the researcher from carrying out a detailed and better analysis. The meteorology station also does not have information for evapotranspiration, sunshine, wind speed, wind direction, etc except rainfall and temperature from 1985 to 2010.

In order to carry out a detailed study on ecological implications of pastoral livelihood diversification, it would be better to incorporate laboratory tests and to assess the situations that existed before diversification and after diversification. But this could not be considered due to lack of information for before diversification except oral expression of elders, and due to shortage of time and finance. Restriction on the page number also has limited the researcher from explaining his idea in a detailed manner.

1.7 Organization of the thesis

This thesis contains five components. The first chapter/section is the introductory part that contains background, problem statement, and objectives. The second chapter/section is the literature review that deals with theoretical and empirical studies concerning the problem under study. In this part different literature has been reviewed with relation to all the specific objectives. The third chapter is the methodology and description of the study area.

The fourth and fifth chapters are the empirical parts of the study. In the forth chapter, findings of the study are presented, and analyzed; whereas conclusion and policy implication (recommendation) has been derived in the sixth chapter.



Chapter Two

Literature Review

2.1 Theoretical studies

2.1.1 The concept of livelihood

Ellis (2000) defines livelihood as assets (natural, physical, financial, social and political), activities and access to these (mediated by institutions and social relations) that together determine the living gained by individual or households.

Livelihood is comprehensive concept that involves access to resources, and activities that households undertake in order to secure their means of living, and strategies that they pursue under either normal or abnormal/crisis situations. The type of activities practiced and strategies followed by households may lead to either sustainable (desirable) or unsustainable (undesirable) livelihood outcomes (Degefa 2005).

Dawit (2009), Anniley (2009), Sara (2009), Gufu (1998), Markakis (2004), and DFID (1999) agree on the profile of pastoral livelihood assets as follows.

Financial assets

Financial assets comprise of inflows of cash from income, gifts, etc as well as stocks and savings held by a family. Pastoralists have relatively high financial assets in the form of livestock and in some areas, also cash remittances, but also face high vulnerability to capital losses and food insecurity.

Human capital

Human capital is skill and knowledge of family and people, the ability to work, good health, strength, etc and the quality and quantity of labour. Pastoralists possess rich indigenous knowledge of managing their natural resources such as rangeland, water, livestock and support for each other; but have very poor access to human health and formal education.

Within a given country, health and education indicators are often far worse in pastoralist areas relative to national-level figures.

Social capital

Social capital includes the networks and relationships that people develop and use to build trust and enable them to work together effectively and efficiently, relationships, reciprocity and exchange; working in cooperation; providing safety nets and supports. Pastoralists usually possess high social capital, because cooperation between households is needed to manage livestock in a harsh environment. Their social capital includes complex social support systems based on the exchange of livestock.

Natural capital

Natural capital is the natural resources on which a livelihood depends; pastures, water, soil, trees and tree products, genetic resources, etc. Natural capital is often relatively low in pastoral areas e.g. low and variable rainfall, but pastoralists 'do a good job in managing in a harsh environment'.

Physical assets

Physical capital is the infrastructure and producer goods that support a livelihood and allow people to be more productive-shelter, transport, tools, etc. Infrastructure is far lower in pastoral areas compared with other areas of a given country. Roads and communication infrastructure is usually very weak.

Political assets

Political capital is the political representation and voices of pastoralists and includes the capacity of these communities to make claims on government for protection and basic services. In Africa, pastoralists are poorly represented within government, and the economic and social benefits of pastoralism in terms of national economies are not well understood. Weak infrastructure (physical capital), loss of key resource assets (e.g., dry season pastures

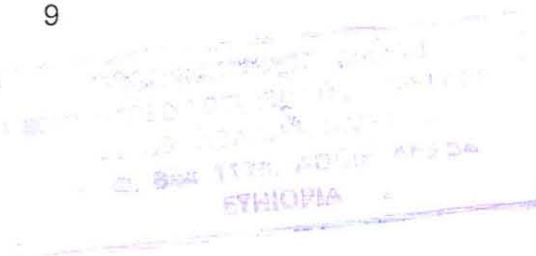
and water points) and weak education and health services (human capital) are a reflection of relatively low political capital (DFID, 1999). It also states that lack of education among pastoral communities is key determinant of pastoralists political marginalization, as it significantly reduces their ability to engage in advocacy activities and 'to understand and speak out for their rights'.

2.1.2 The concept of Pastoral livelihood diversification strategies and the ecology

Rural livelihood strategies include agricultural extensification (increasing farm size) and intensification (raising farm yields), income diversification (off-farm economic activities), and migration (Scoones 1998). There are three dominant livelihood activities in Ethiopia: agriculture, income diversification, and pastoralism (Devereux, 2000).

Adding crop farming to livestock rearing has limited risk diversification advantages, and should therefore be interpreted as distress diversification in the face of an increasingly unviable livelihood strategy. The shift from nomadic pastoralism to sedentarised agropastoralism accelerated after the succession of droughts and famine that have decimated livestock herds since the 1970s. Including mortality, sales and slaughter, cattle herds were reduced by an estimated 72% in Afar region during the 1972/4 drought famine, by 60% in Borena during the 1984/5 famine, and by 78% in Somali and Borena areas during the 1995/7 drought. The cumulative effect of these shocks was to reduce herd sizes below levels that pastoralists consider viable to meet their food and cash needs and to reconstitute the herd (Ibid).

Stream of activities lead to stream of benefits, in other words, livelihood outcomes. Livelihood outcomes consist of increased income, improved food security, reduced vulnerability to shocks, stresses and seasonality, and sustainable use of local natural resources (Ashley & Corney, 1999). Conversely, successful livelihood strategies could lead to outcomes that are the reverse of the former, such as reduced income, food insecurity, increased vulnerability and unsustainable natural resources management.



Smallholder, subsistence and pastoral systems, especially those located in marginal environments, areas of high vulnerability of rainfall or high risks of natural hazards, are often characterized by livelihood strategies that have been evolved to reduce overall vulnerability to climate shocks (adaptive strategies) and to manage their impacts ex-post (coping strategies). The distinction between these two categories is however frequently blurred: what start as coping strategies in exceptional years can become adaptations for households or whole communities. Many defining features of dryland livelihoods in Africa and elsewhere can be regarded as adaptive strategies to climate variability (Morton 2007).

Ellis (2000) categorizes the reasons for livelihood diversification of rural households and individuals as necessity and choice. Necessity refers to involuntary or distress reason for diversifying such as population pressure, land fragmentation, environmental degradation, and others; diversification by choice implies to vulnerability or proactive reasons for diversification. Therefore, pastoral livelihood diversification is the process by which the pastoral households construct diverse portfolio of activities and assets in order to sustain and improve their standard of living, and also to mitigate the risk factors that surround their livelihood activities (Anniley, 2009).

According to Ellis (2000) livelihood diversification by rural households can have different effects on local environment depending on the opportunities available and the strategies that are adopted to respond to those opportunities. He states that growth of non-farm income sources if accessible in remote rural areas might reduce the need for landless rural dwellers to carry out extractive practices in local environment for their survival. This has been called the 'substitution of employment for environment'. He also states that diverse livelihood systems might be expected to offer greater protection against erosion or catastrophes than non-diverse ones. In this sense, livelihood diversification may be thought of as contributing positively to sustainable rural livelihoods.

On the contrary, UN OCHA (2007), David & Charlotte (2004), Schwartz, 2004, and Adugna & Aster (2007) describe the negative consequences of pastoral livelihood diversification on local ecology as follows.

Intensive farming utilizes key resource areas. The problem for pastoralists is that when farms monopolize the limited areas of higher moisture and higher nutrient soils, the rest of the landscape may be rendered unusable by pastoralists. However great the profits from farming the ecological losses and social costs of declining pastoral system often overweigh it. Areas with highly variable rainfall are vulnerable to drought, and while farmers may use irrigation along some permanent water courses, the dangers and costs of salinity in high evapo-transpiration environments must be taken into account (UNOCHA, 2007). Similarly, Davis & Charlotte (2004) state that irrigation development has often come with high environmental price tag, because in some cases the value generated by irrigation proved to be less than the value generated by the ecosystem they replaced. The costs range from aquatic ecosystem degradation, fragmentation and desiccation of rivers, and drying up of wetlands.

Sedentarization has been favored at various times by colonial and post colonial governments, for a variety of reasons; a sedentary population is seen as easier to control and tax by the state, easier to deliver services to, and simply more 'modern'. Behind this lies a lack of recognition that mobility is a necessary and rational response to environmental condition, and not merely the product of cultural wanderlust. Sedentarization policies, which included the use of irrigation schemes to settle pastoralists, are now rarer, or at least less explicit, than they were in the 1960s and 1970s. Generally pastoralists have reacted at best opportunistically to state sponsored sedentarization, continuing to keep or re-invest in livestock, and such policies have not delivered either welfare or environmental benefits (Morton *et al*, 2000).

The arguments of anthropologists and others that pastoralism is a rational and sustainable way of exploiting arid and semi arid lands, backed by considerable indigenous knowledge

and skill, have been widely and successfully disseminated. This has led to a generalized feeling that it is difficult for either scientific research or technical cooperation to improve significantly pastoralist production systems (Ibid).

The environmental rationality of pastoralism based on mobility and communal tenure, 'other things being equal', has been persuasively demonstrated over the last decades by scientific and social scientific research. Pathways from such analysis towards practical development based on support to communal resource management have also been well described (Morto *et al*, 2000). Communal tenure systems in dry regions regulate access to users and sanction abusers, have mechanisms in place to conserve resources at certain times of the year to guard against mismanagement, and are more effective than exclusive and private forms of ownership. While land degradation does occur in pastoral regions, it is due not to generalized overpopulation but uneven population distribution, made worse by excessive population concentrations around mechanized boreholes and small towns. Furthermore, boreholes and irrigation projects promote overcrowding by both farmers and herders, leading to inter-pastoralist as well as farmer-vs-pastoralist competition and conflict (Elliot, 2007).

2.2 Empirical studies

2.2.1 Indigenous knowledge of ecological management

Internally, the community uses its judgments to alter allocations of communal resources. The internal adjustments are designed to ameliorate increasing grazing and food insecurity. The rules and regulations are those traditionally used. The internal responses to resource pressure provide gradual changes. The adjustments are favorable to members regardless of their wealth status. The resources reallocated would not lead to immediate breakdown of the indigenous resource administration. By contrast, the externally imposed resource allocation threatens indigenous arrangements, making every one vulnerable. The pace of change and the agents controlling it are responsible for the breakdown of the indigenous natural resources administration. The traditional rules and regulations of resource allocation are ignored. Political contingencies, influences and administrative decisions have an overriding effect.

The community rather than being active participants in reallocating resources become observers. Privatization of resource tenure rights is an alien idea. In their concept of territorial rights the land belongs to all Booran/Karrayyu. The non-Booran/non-karrayyu have user rights. Right to own and right to use resources are distinguished. In case of user rights, resources are "temporarily" transferred for use. Such transfer would not allow the users to dispose the resource. Farming establishes user rights without changing ownership rights. Those who move to other places may pass the cultivated piece of land on to others but are not allowed to dispose it (Gufu, 1998).

According to Ayalew (2001), traditional system of transhumance that Karrayyu adopted until recently was a tri-patterned migratory cycle which enabled them to meet the exigencies of climatic variations and maintain a relative balance between wet and dry season pasture. With shrinkage of land resources, however, this trinity of cyclical movement has been severely disrupted, and the Karrayyu pastoralists are no longer able to follow their traditional patterns of migration. This situation has brought about far reaching consequences to the remaining natural forage and the ecology as a whole. The first direct impact of large-scale interventions on Karrayyu is their loss of flood fed dry season pasture for their livestock. It is only natural that they would resort to their wet season grazing territory during the dry periods of the year as well. This did away with the old distinctions between wet and dry season grazing due to the imbalance between the size of land and herds.

2.2.2 Pastoralism and the ecology

Karrayyu practice multispecies pastoralism, and so rear cattle, camel, goats and sheep. Apart from herding, the Karrayyu in certain neighborhoods have also begun to engage in small-scale irrigated and rain fed crop production. Cultivation which is the recent phenomenon in Karrayyu life, dates back only to 1980s, but continue to expand. It began mainly as response to the expropriation of their grazing land and the consequent weakening of their pastoral means of livelihood; high price of crops and fluctuating supplies of agricultural produce on the market; loss of livestock due to diseases; declining productivity of livestock sector itself;

the increase in human/animal ratio which resulted from a fast growth rate in human population; and due to land tenure insecurity for pastoralists. The increased involvement of herders in farming is explained partly by the changes in the term of trade disadvantageous to livestock products, and most importantly the increasing alienation of land formerly under pasture, which has contributed to high rate of settlements among pastoralists (Ayalew, 2001). The change from a long ranging and highly mobile herding system to a short-range and semi-sedentary one bears the potential for both negative and positive effects. Amongst the most obvious negative effects are: the increase of environmental degradation; increased production risks for the individual herd owner as well as for the industry as a whole due to the disappearance of traditional adaptive management strategies; and the accelerated breakdown of social structures which previously served as a form of social security system within herding communities (Schwartz, 2004).

A major asset of Ethiopia is its people, indigenous institutions, livestock and land resources. According to Gufu (1998), in the lowlands, the communities have developed coping strategies over centuries to optimize production in a harsh environment. Development and relief efforts by the government and NGOs have not strengthened the capacity of the pastoral peoples to survive. On the contrary, their institutions which are the strength of the indigenous management systems have been weakened. Dependency is created and the system of self-help disabled. The justification for land alienation is often that the land will be put to a better use and that the community will be benefiting from the development that takes away part of their grazing land. For instance, water development on private ranches, building of veterinary clinics and employment opportunities for the displaced would be compared with the opportunities forgone for losing the land.

Pastoralism represents one example of an area for investment in which the dual objectives of development and biodiversity conservation can be achieved. The important role of pastoralism in terms of culture, tradition, livelihoods and the provision of ecosystem services must be recognized. Countries such as Spain, France and Switzerland are investing in mobile

pastoralism to protect biodiversity (Ayana 2011). He also states that mobile schools for pastoralists in Russia and Sudan contributed to the achievement of MDG-2 on universal education; and maintaining and enhancing adaptable and flexible pastoral systems in the face of increasing environmental and global economic challenges is necessary to achieve MDG-1 to end extreme poverty and hunger.

Similarly Thornton in Jeff (2009), stated that under the current trend of climate change livestock particularly animals that are known to be tolerant of heat and drought, can survive in conditions that are far more severe than crops can manage. He also indicates that under these conditions, livestock could be the key to keeping food on the table and for earning income as well. Additionally, IPCC (2007) depicted that with the future trend of climate change, many African farmers will be shifting from crop to livestock production which might be rational ecologically and economically.

2.2.3 Crop farming in pastoral areas versus the ecology

Farming has been practiced for more than three decades and maize was cultivated dominantly both by irrigation and rain fed. Recently, fruits and vegetables have become important cash crops in the area. Accordingly, sedentary pastoral community has been growing in number in the neighborhoods very close to Awash river, and sugar plantation irrigation scheme. Most of these inhabitants are largely poor people who understood that they can no longer survive in the pastoral livelihood system. As the result, they migrated to these areas looking for perennial water for cultivation. Maize is the only crop that is cultivated by every rainfed farmer. They prefer it because the seed is cheap, it does not require fertilizer, and it can be grown with the minimum sufficient rain, and if it fails the straw is used as buffer feed for livestock (Dawit, 2009).

What is reflected in all policies of the three regimes of Ethiopia that have surfaced to date is the view that pastoralists are inefficient land users, who roam over a disproportionately large area with their animals, thereby degrading rangelands by over-stocking (Kassahun *et al*,

2000). According to the most recent land use/cover of the different pastoral regions in Ethiopia, the area categorized or converted to crop agriculture has shown a dramatic increase (Morton *et al*, 2000).

Dry land farming, which is expanding within the agro-pastoral context, has adverse effects on range condition and soils. Land clearance and the sparse and temporary ground cover provided by annual crops favor increased erosion and often lead to irreversible degradation of range areas (desertification). The consequence of all these effects, beside the inevitable range degradation, slow decline of herd productivity, reduced size of individual livestock holdings and productive land, and an increasing drought susceptibility of the whole system (Schwartz, 2004). Cultivation also accelerates nutrient depletion from the soil and exposes the soil to erosion as the soils of the arid and semi-arid lowlands are very fragile. On average, crop failure is experienced every 4-5 years in 10 years, and most respondents indicated that they are able to achieve a reasonable harvest only for one or two years in five years time (Adugna *et al*, 2007). A significant percentage of rainwater in dry land areas is lost as surface runoff, where as much of the rest evaporates or percolates deep into the ground where plant roots cannot reach. Erosion is related problem. Dry land soils are often thin, have poor soil structure, are low in organic matter and are bare of vegetation (OBARD & GTZ, 2000).

Farming is one means of economic diversification. The ecological crisis in the area has made it difficult for the pastoralists to rely on livestock alone for food. Growing of crops is a response to food insecurity. Adugna *et.al* (2007) asserted that grains availability delays sale of livestock thereby boosting livestock production. On the other hand, farming is practiced in the bottomlands where moisture conditions are favorable. The bottomlands are traditionally used for calf grazing reserves. Thus loss of the bottomlands to cropping makes livestock vulnerable during drought, when the landscape is in a greater demand. Farming is causing transfer of the communal grazing land to private use with negative consequences on the indigenous management system (Ibid).

The internal adjustments to diminishing resources and loss of grazing lands to farming system is one of the major factors in resource tenure rights changes in the rangelands of Borana. Currently, it is estimated that between 2% and 3.4% of the rangeland areas of Borana are under cultivation. The proportion may seem small, but it is the prime grazing lands that are being converted into farm lands. Farming has taken up bottomlands where moisture conditions are favorable. The bottomlands are traditionally used for calf grazing reserves. Loss of the bottomlands to crop cultivation makes livestock vulnerable during drought, when the landscape is in a greater demand (Coppock 1994, cited in Kassahun *et al*, 2000).

In majority of the lowlands, planted crops were observed drying at vegetative and flowering stages due to moisture deficit where as crops normally reach milky or maturity growth stage during the assessment time. Almost 95% - 99 % yield loss was anticipated in Moyale, Meyo, Arero and Dire due to the unfavorable rainfall of the season and impact of last drought. The prospect was relatively better in Yabello,Teltele and Dugda Dawa as planted crops were under seed setting and maturity stage. At some stages during the season, armyworm infestation was reported from all woredas except Gelana and Abaya. Respective woreda agriculture offices made pesticide spraying to minimize the impact thus controlled the situation. The overall yield loss at zone level was estimated at 25% - 35%. (Disaster Prevention and Preparedness Agency, Early Warning System, 2006)

2.3 Conceptual framework

Coceptual framework of pastoral livelihood diversification has been presented as shown in diagram below. Pastoralism has been threatened by natural and man-made catastrophes. The natural catastrophes include drought, shortage of rainfall, diseases, and the harsh climatic condition; whereas man-made catastrophes include conflicts; expropriation of their grazing lands for factories, park, and state farms; settlement of farmers in their grazing territory, and restriction of mobility. These catastrophes forced pastoralists to diversify their livelihood strategies to crop farming, charcoal/firewood production, mining of stone, wage work, and

petty trading. There are also opportunities that initiated pastoralists to diversify their livelihood. These include irrigation facility and market opportunity.

The diversification strategies such as cropping, charcoal/firewood production and mining caused negative ecological consequences including erosion, release of CO_2 (global warming) through land tillage, shrinkage of rangeland, salinity and deforestation. The consequences of existing diversification strategy have resulted in degradation of the overall ecology, decline of pastoralism and poor outcome of the diversification activities themselves; and the final output has been unsustainable/undesirable livelihood outcome. On the other hand, diversification towards milk selling, milk processing, meat processing, fruit production would be sustainable because they are friendly to the ecology and can be carried out simultaneously with pastoralism.

Pastoral Livelihood Diversification Framework

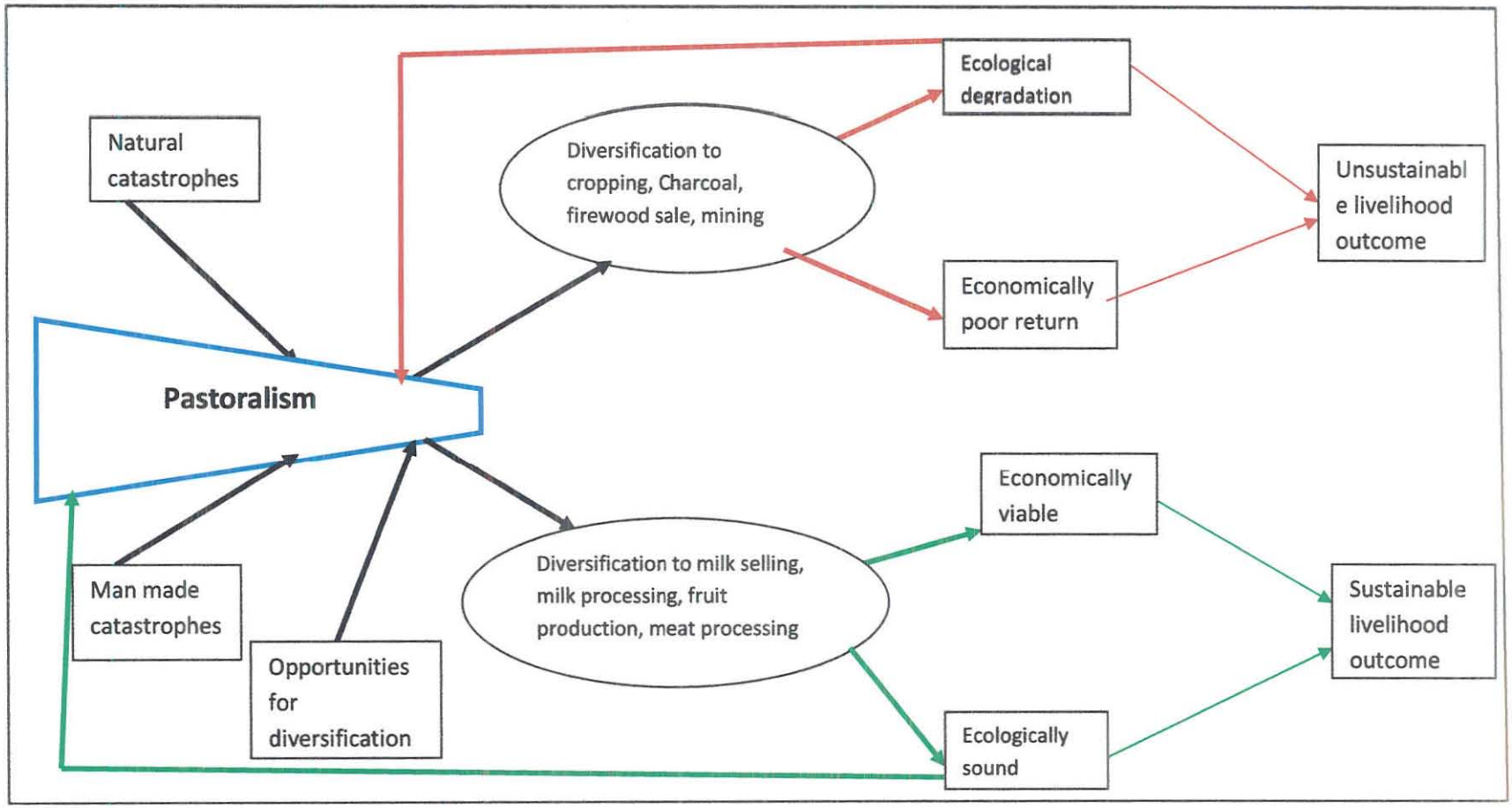


Fig 1: Pastoral Livelihood Diversification Framework (prepared by the researcher, May 2011)

Chapter Three

Methodology and Description of the Study Area

3.1 Methodology

3.1.1 Sampling design

Out of the total eighteen rural kebeles, three kebeles were selected randomly. Systematic sampling was employed to take ninety (90) sample households proportionally from the three kebeles. The selected kebeles were Gelcha, Dhebitti and Ilala Kereri. It was assumed that all the kebeles have homogeneity. The time available for the research, the financial availability and total number of the kebeles were taken into consideration to take 90 sample households. Based on the number of population in each kebele, the sample was 35%from Gelcha, 38% from Ilala Kereri and 27% from Dhebitti kebeles.

Table 1: proportional sample taken from the kebeles

Name of kebele	No of households	% of hh	Sample households
Gelcha	505	35%	31
Ilala Kereri	548	38%	34
Dhebitti	394	27%	25
Total	1447	100%	90

Source: Fentalle Woreda Pastoral Development Office, 2010

3.1.2 Data sources

Sources of data were primary as well as secondary sources. Secondary data were collected from published literatures like books, journals, and magazines and web sites; and unpublished literatures were research reports, organizational reports, academic thesis reports, and the like. Primary data were obtained from sample households, key informants and focused groups. Key informants included 3 development workers, 1 forage expert, 2 agronomists, 1 expert from Oromia Land and Environmental Protection Bureau, one

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Veterinary worker from Oromia Pastoral Area Development Commission, one agronomy expert from Oromia Water Works and Design Enterprise and 3 pastoralists. Focused group discussion was held with 3 groups (one in each kebele) comprising of 5-8 members especially the elders.

3.1.3 Data collection methods

Structured survey questionnaires-for-interview were employed to collect data from household sample respondents. Additionally, key informant interview (KII) was used with 3 extension workers in two kebeles, 3 experts from woreda pastoralist area development office, 1 expert from Oromia Land and Environmental Protection Bureau, one Veterinary worker from Oromia Pastoral Area Development Commission, one agronomy expert from Oromia Water Works and Design Enterprise, and 3 pastoralists. Focused group discussion (FGD) was used with three elders' group from the society including 5-8 members each. Male and female were incorporated in each group. Similarly, observation was used to assess the existing situation; and in-depth-analysis of different cases of households were employed.

The questionnaires were prepared in English and translated to Oromo language in order to address the local ethnic group. The questionnaires were prepared in the way that they can address the selected variables. Selection of variables was limited to those that are highly related to the livelihood diversification of pastoralists and local ecology of the pastoralists.

3.1.4 Data analysis

The collected data was stored in SPSS, and was analyzed. The data was coded, cleaned, and entered into computer for processing. It was processed and analyzed by SPSS program. The coding of the qualitative data eased the analysis. Quantitative analysis was conducted by using descriptive statistics such as frequency distribution, percentage and proportion. Besides, qualitative analysis was also carried out. To achieve the stated objective the data were presented in tables, graphs, maps and charts.

3.1.5 Ethical considerations

After approval of the proposal by the advisor, the College of Development Studies of Addis Ababa University sent a letter to the study area and respective bureaus. Informed verbal consent was obtained from each respondent, and they were told that they have the right to not give or give information and the right to withdraw if they are not interested at the middle or any time they wish. Orientation and training was given to enumerators on how to collect data by respecting the respondents.

3.2 Description of the study area

3.2.1 Location

Fentale woreda is located in East Shewa zone of the Oromia Regional State. The woreda is situated at about 200km from Addis Ababa city. The altitude ranges between 940 to 960 m.a.s.l. and is characterized by hot and dry climate. The total area of the district, Fentale, has about 133,964 hectare of land. The woreda has 18 rural and two urban kebeles (Metahra town itself and Haro Adi town).

The woreda is situated in the Upper Awash Valley, a portion of the Great East African Rift Valley. The physical feature of the area is mainly extensive plain land and is situated along the Awash River. Awash River is the main and the largest water body in this arid and semi-arid area. Basaqa Lake forms another physical feature of the land in the study area. This lake is situated at the northern side of Metahara Sugar Estate and on the western fringe of Metahara town. The lake is not used for human and livestock consumption due to high salt content.

To the north and north-east of the plain lowlands of the study area are found Mount Fantale, and other undulating plateau like Barru Harka, Boset and Fentale Tinno and some other small peaks. Mount Fentale with its relatively steep bottom covers a large area limiting the possibility of plain pasture. The height of Mount Fentale is about 2007m.a.s.l. Mount Fentale has also a Crater Lake of 35m deep and width of 3.5 km in diameter (OWWDSE, 2009).

3.2.2 Climate

The climate of Fentale area exhibits typical characteristics of arid and semi-arid environments. The yearly maximum temperature ranges from 32.0 to 42.0 degree centigrade while the minimum temperature ranges from 9.6 to 22.0 degree centigrade. The mean annual rainfall is about 553 mm. Rainfall of the area is very erratic and scarce occurring two or three times yearly. The main rainfall season, which accounts for the largest total rainfall of the year occurs from July to September, and this season is locally termed as Summer rain (which is

the main rainy season in the area). In good years the area also experiences some amount of rainfall in the month of December. The other rainfall regime, called Belg rain, occurs from February to April. This one is very important for the Karrayu pastoralists in particular, since it comes at the point when herds and human are exhausted by the long dry season.

3.2.3 Population

Fantalle woreda is inhabited by the Karrayyu oromo, who are engaged mainly in pastoralism. The woreda has a total household of 9696 and total population of 82,225. On the other hand, according to the 2007 population and housing census data the total population dwelling in the rural parts of Fentale district is about 61,708 (75%), out of which around 33,069 were male and 28,639 female. In addition, about 20,517 (25%) people were living in urban areas of the district (CSA, 2007). CSA census also indicated that the number of female population is smaller than that of male. Out of the total population, about 53% were male while the female constitute about 47% of the population in the district. In the rural areas about 53.6% and 46.4% male and female respectively live in the district. The majority of the rural population are pastoralists and agro-pastoralists.

Table 2: Total population of rural kebeles in Fentale woreda

No	Kebele	Household			Population size		
		Male	Female	Total	Male	Female	Total
1	Qobo	538	58	596	1890	2287	4177
2	Tuttuti	981	348	1329	4344	4959	9303
3	Dhagaedo	460	73	533	2151	2223	4374
4	Bantimogasa	326	495	821	2292	2495	4787
5	Haroqarsa	480	140	620	1560	1540	3100
6	Galcha	383	122	505	2112	1164	3276
7	Dhebiti	274	120	394	1184	1184	2368
8	Ilalaqarari	476	72	548	2011	2172	4183

9	Gola	308	40	348	1011	864	1875
10	Alge	195	63	258	650	701	1351
11	Godofafate	227	48	275	777	616	1393
12	Diresaden	337	148	485	1959	1479	3438
13	Garadiima	256	94	350	1245	657	1902
14	Gidara	345	147	492	1718	1362	3080
15	Tuuro	281	148	429	1042	798	1840
16	Kanifa	390	105	495	1320	784	2104
17	Saraweeba	480	40	520	1630	1231	2861
18	Fateledi	543	155	698	2243	1247	3490
Total		7280	2416	9696	31,139	27,763	61,708

Source: Fentale woreda administration office, Nov 2010

Fentale woreda Pastoral Development office has also indicated that the majority of the kebeles in the woreda are predominantly either pastoralists or agro-pastoralists. Hence, out of the 18 rural kebeles, currently found in Fenatle district, four (Benti Moggasa, Dhagaheddu, Qobbo and Haro Qersa) were pure pastoralists, while fourteen kebeles lead agro-pastoral way of life of which six are engaged in irrigation farming. This means only six kebeles out of fourteen agro pastoral kebeles got access to irrigation facility.

3.2.4 Housing

With regard to housing, the majority of the Karrayu houses were thatched (grass-roofed houses) and made of simple materials. The traditional houses of the Karrayu were cone-shaped, and the shapes of the roof of the houses resemble the hair style of the Karrayu men. With the decline of nomadic pastoralism, such traditional houses are being changed into more permanent and sedentary type of houses similar to those of the Ittu and Arsi Oromo.



Figure 2: Typical (traditional) house of the Karrayu (Picture taken by researcher, Nov 2011)

3.2.5 Infrastructure and Institutions

The main asphalt road from Addis Ababa to the eastern part of the country passes through the study area. There are also all weather (gravel) road and dry weather roads in the woreda in almost all the kebeles. 8.6% of the househlds have access to asphalt road that crosses the woreda, 43.5% of the households have access to gravel road, and 47.9% have access to dry weather road. As far as distance from road is considered, 45.6% of the households are on 4km distance from main roads, 28.9% are on 2km distance, and 25.6% are on 1km distance from main roads. The major type of transportation used in the woreda is animal driven cart. 67.8% of the household use animal driven carts, 17.6% use vehicles, and 14.4% use no transportation (are pedestrians).

The only railway line in the country, which extends from Addis Ababa to Djibouti passes through the study area. Utilities such as telecommunication service, electricity and postal service are also available in Metahara town of Fantalle woreda. One commercial bank of

Ethiopia and one Oromia Cooprative Bank are also serving in Fentale district, and are situated in Metahara and Haro Adi towns.

3.2.6 Water Supply and Sanitation

Awash River is the main and the largest water body in this arid and semi-arid area. The river is about 1200 km long and is one of the largest rivers in the country. This river has its origin in the highlands around Ginchi(capital town of Dandi district)and Ada'a Barga woredas of West Shewa zone of Oromia region, about 90 km west of Addis Ababa. This river has been used for irrigation in Fantalle woreda. In the north and north-west of the irrigation project, there is a river called Bulga, which again has its origin in the highland areas. The Karrayu Oromo, in particular used the water from this river, for its 'medicinal' value in few months of the year when their stock suffer from some kinds of diseases. Now-a-days this river came to be a place of contention between the Karrayu and their Afar and Argoba neighbors, in that the Karrayus accessibility to it has become limited.

Water supply in the woreda is insufficient that potable water availability in the study area was very poor and access to water was the main concern for the community. Source of water supply in the study area include boreholes, unprotected and unclean water from Awash river, cistern and piped water(piped water is only for Metahara and Haro Adi towns and the surrounding rural kebele of Galcha). The major source of water in the woreda is ponds, Awash river and tap water respectively. According to Oromia Water Works Enterprise, since the construction of Fantalle irrigation, the major source of water for both humans and animals has been the water that has been diverted from Awash River. Since the water from this river is not protected and clean, it has been understood that the people dwelling in the area including the irrigation project beneficiaries are suffering from diseases like jardia, bilharzias and typhoid fever among others. Even the district capital, Metahara town itself got potable water supply from Awash river very recently(in 2006). Before this time, drinking water for Metahara town was used to be transported from Adama town and from Addis Ababa(100km and 200 km away from Metahara town respectively).

According to Fenatle woreda water resource office; there were about 10 boreholes and 117 cisterns (roof catchments around schools mainly for the schools themselves) in the woreda. The boreholes were situated in 6 kebeles of the woreda. Two of the boreholes were in Tututi, three in Dhebiti, two in Ialaqarari, the other three in Bantimogasa, Dirresaden and Turobadanoota(one borehole for each) kebele. In addition, water collected immediately after rain is used by the rural community both for human and livestock consumption in the area. Fentale woreda water resource office head has also indicated that the underground water in the area is not suitable for human consumption since it has high fluoride content which is a danger for human health.

Basaqa Lake forms another physical feature of the land in the study area. This lake is situated at the northern side of Metahara Sugar Estate and on the western fringe of Metahara town. The lake is expanding at alarming rate. The spill-out of irrigation water towards the lake has contributed a lot to increase in size of Basaqa lake. According to Oromia Water Works Design and Supervision Enterprise (2009), its surface area has increased ten times its original size in the last 20 years, from 3.5.square kilometer to 35 square kilometer. It has strong salt content so that it cannot provide any service for both animal and human water needs. Basaqa Lake occupied a large portion of one of the traditional Karrayu grazing ground and ecological category called *Ona Birra*. The lake has posed salinity problems on MSF and on rangelands and farmlands, blocked livestock drinking points, inundated 160 ha of land from MSF, forced ERA to raise level of the road, inundated 35 sq km of grazing land and also created fear of inundation among the residents of Metahara town.



Figure 3: Basaqa Lake (Picture by researcher, Nov 2011)

Basqa lake has overrun and overwhelmed about 12 small water bodies(*malkas*) which originally were fresh water and had been used for human as well as animals' water consumption. These small water sources (springs)-or 12 *malkas* included Hara Guddo, Masqale, Habicha (believed to have 'medicinal' value), Dafto, Hara Tiqo, Sora, Gudube, Dureyii Guddo, Hadhaya, Dureyii Tiqo, Hadhaya Roobe Jilo and Laga Adii. Most of these water bodies were spring water /mineral waters.

3.2.7 Basic Social Services

Both health and education services are forms of human capital. Social services are also among the important components, in that the situation of these services directly or indirectly affects the labor supply and productivity of a given population both in quantitative and qualitative aspects. In this regard education and health are the types of social services that can be considered.

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It is readily understood that education has got a paramount importance in facilitating development intervention and enhancement of development activities at large. More importantly education has a significant role to play in the enhancement and development of human capital. Education is also fundamental instrument for the improvement of the quality of human life and ensuring social and economic progress. Moreover, education facilitates information dissemination regarding modern agricultural technology, input utilization, technical know-how, environmental preservation and sustainable development among others. In this regard people engaged in pastoral and agro-pastoral way of life in Fentale woreda do not have adequate access to education owing to their livelihood condition, which is mostly mobile.

Due to the high demand of child labor in this pastoral area, a large number of children in Fentale district in particular look after livestock rather than going to school. The opportunity cost of child labor seems to be high for livestock rearing than sending them to school. Moreover, as has been verified through the field survey conducted in the area, problems related to food deficit and scarcity of potable water supply obviously affected school enrollment and attendance in the area.

On the other hand, though the total number of schools is relatively good, the level of education and its quality appears to be low, as stated by Fentale woreda education office. According to the data, there are about 29 schools of various levels in the woreda, which include 27 primary and 2 secondary schools. One of the secondary schools (constructed by GTF) has been shifted from Matahara to Haro Adi town due to flooding by Beseka lake in the last year, whereas the second one is located in MSF compound and is mostly used for workers of the factory.

Table 3: Number of schools in the study area

Schools by Grade	Number
Grade 1 to 4	15
Grade 5 to 8	12
Grade 9 to 10	1
Grade 11 to 12	1
Total	29

Source: Districts Education office, 2010

In addition, the number of students attending in the schools indicated above is also depicted as follows. There were about 14,402 students (8297 male and 6105 female) in the schools of the study area. That is about 57.6% were male students while 42.4% were female.

Table 4: Number of students by grade and by sex in the study area

Grade	Male	Female	Total
1 to 4	4550	3400	7950
5 to 8	2650	2000	4650
9 to 10	840	560	1400
11 to 12	257	145	402
Total	8297	6105	14402

Source: Fantalle district education office, 2010

The table shows that, 30% of the elementary school students join secondary school, 8% join preparatory class, and from those who reached secondary school only 28% reach preparatory class. There were also about 321 teachers with various qualifications in the study area. Inadequate number of qualified human power as well as budget shortage was the other major problems regarding education in the area. Lack of certain equipments and facilities like

computers, projectors, duplicating machines telephone, fax, etc. were stated as problems encountered in the provision of educational service.

Health is a prerequisite for increases in productivity. It is readily understood that, access to quality of health care is one of the major factors determining the ability of individuals and communities to obtain a secured livelihood. In one way or another, ill-health of the members of the working population in particular, may disrupt development activities. As per the data obtained from Fentale woreda health office, there were about 35 health service rendering institutions in the woreda as a whole. Except health posts (one health post for each kebele in the 18 rural kebeles) the majority of the health institutions were situated in the town of Metahara, and MSF state farm. Hence, there are 17 health service institutions in the town, which include 1 health center, 9 clinics, 3 pharmacies and 3 rural drug vendors; in fact, there is one hospital which is mainly meant for the MSF employees in the state farm compound). Though, the health status of the people is very low due to lack of clean drinking water and poor sanitation.

3.2.8 Settlement pattern

The settlement pattern in Fentale woreda in particular is clustered and this is based on *ganda*/village/and kin relationship and herd system. The *ganda* originally constituted a group of people who herd together. A *ganda* was a territorial based herding group headed by the Abba *ganda*(head of the village). The *ganda* was a temporary herding camp comprising people with different *gosa*/clan/ affiliation. Those who dispatch their livestock together with each other for grazing usually form a *ganda*, in which the *ganda* is headed by the *Abba ganda*. With the transformation of way of life from pastoral to agro-pastoral way of livelihood the people in their area tended to cluster into a *ganda* with their own kin rather than the previous grazing management related settlement. With the increasing decline of pastoralism and the establishment of the kebele institutions at community level, the role of *Abba ganda* is gradually becoming unimportant.

3.2.9 Social organization

Social organization of the Karrayuu Oromo is very similar to that of the Borana Oromo of southern Oromia. The *gosa*(clanship), the council of elders, the *Gada* system, the *Qaallu* and the *ganda* are the main traditional institutions on which all social, economic, cultural, spiritual and even political affairs of the Karrayu are based. There are two major structures from which other sub-clans trace their lineage in Karrayu society, named *Dullacha* and *Baso* major clans; similar to the *Sabbo* and *Goona* of the Borana Oromo. The *Gada* and the *Qaallu* play almost identical roles similar to that of the Borana in leading and guiding every aspect of life of the society under their jurisdiction in the area. The *ganda* of the Karrayu also has the same function and similar structure to that of the *olla* (village leadership) of the Borana.

The important traditional institution upheld for centuries by Karrayu is the *Gada* system. The *Gada* system in the area brings every individual Karrayu under one umbrella, avoiding clan and local identities. There are five tuuta(parties)in the *Gada* system. The office of *warra seera* (*Gada* leaders), *Abba Bokku*(the president of the *Gada*), *Abba duulaa* and the *Qaallu* (religious leader) have their own responsibilities and duties in the *Gada* system.

As indicated above the *Gada* institution is one of the most important traditional institutions of the Karrayu Oromo of Fentale district. There are holy grounds and Gada ceremonial places in the Karrayu land. In this regard many of the *malkas*(watering points) are also ritual places and a few are places of Gada power transfer. For example, *Malka Ulee Warra Qallu*, is a place where the *Qallu gosa*(a senior and honored *gosa*),settle to lead a prayer. The place is considered pure as the *Qallu* himself does. Each year, at a regular place, every Karrayu makes a pilgrimage to this place and anointed by the *Qallu*. At Malka Ledi and Malka Gobbu, a lamb is ceremonially slaughtered. Buna qala (roasted coffee with butter) is prepared. A prayer is extended to *Waqa* (God) for rain, health, cattle and human fertility. The two rituals take place just after mid-September when pasture from the *Ona Gana* is exhausted and water is dearly needed both by people and stocks. Malka Abadir is the most renowned ritual place. It is situated at a place where there is ample pasture. Furthermore,

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there is a big tree called *Oda* (a sycamore tree), at Abadir which is traditionally used as place of Gada power transfer. Those elected officials of the *tuuta* in power live at one village, called *Yaa'a Gabala* (places where the leaders settle). This village forms the political center of the entire Karrayu country and society, because it is from this village that directions and orders radiate to each *gosa* and sub-*gosa* of the Karrayu. This group (the *tuuta*) is the highest law-making body in the Karrayu society. The *abba gada* and village leader make decisions on rangeland utilization that each *ganda*(village) heard together at a specified grazing area for specified time. Mobility for search of feed and water also is decided by the *abba gada*.

One of the major traditional institutions of the Karrayu is the *Qaallu* institution. *Qaallu* is a religious leader and ritual expert; and is an integral spiritual part of the Karrayu and the Oromo society at large. *Qaallu* is regarded as the most senior person in the lineage and *gosa* and the most respected in the society. The *Qaallu* even though he has no political authority, has a paramount role in the society. During the transition of the *Gada* of the class from one *Gada* grade to another the *Qaallu* oversees the general procedure of the traditional rites, and anoints and bless the participants. In every political and ritual performance of any *Gada* class, the presence of the *Qaallu* is mandatory. Besides the traditional institutions, there are government institutions such as woreda adiministration and kebele adiministration in the woreda. At the woreda level, the Office of Land and Environmental Protection is concerned with the issue of land use management, land administration and environmental protection.

Chapter Four

Results and discussions

4.1 Livelihood assets and the local ecology

4.1.1 Access to natural capital

The land resource in the area in general has been categorized into various types as indicated in the following table. Most of the land is unusable due to accumulation of volcanic ashes and bush encroachment, followed by farmlands and state farms, whereas grazing land declined to 9.44% of the total landmass.

Table 5: Land use pattern in Fentale woreda

Type of Land use	Area in hectare	Percent (%)
Unusable area	37544	28.03
Arable land	19885	14.84
State farm	15600	11.64
Bare land	13834	10.33
Grass land	12642	9.44
Rural infrastructure	12514	9.34
Bush and Shrub land	9240	6.9
National park area	3850	2.87
Wet land (Beseka lake)	3800	2.84
Urban area/land	1277	0.95
Forest land	458	0.34
Private investment	200	0.15
Total	133965	100

Source: Fentale district Pastoral Development office, 2010

4.1.2 Human and social capital

According to FGD and KII conducted in three kebeles, pastoralists have rich indigenous knowledge in managing rangeland, water and other natural resources, but have very poor access to human health and formal education. They manage their rangeland through temporary mobile system from low forage and water area to better areas. The system saves degradation because they revert to regenerated areas after mobility. Additionally, pastoralists allocate water points in a rational way. Even if an aid organization comes to dig water points in their area, they do not allow it anywhere. They select the site rationally. This is because digging water points densely causes rangeland degradation because high population of livestock is gathered there.

Besides, pastoralists have strong social relationship because they have fast information transfer system, and they support each other during bad times. For instance 'Busa Gonofa' is used when someone out of them faces risk of livestock loss. They contribute livestock heads in order to rehabilitate the person. The other environmental friendly social relation is the 'Gada system' and eldership that are carried out under tree shade. Unwise cutting of tree is not allowed in the Gada system. Sycamore tree, used for Gada gathering is not cut down at all. Therefore, the pastoralists have social and human capital that respects natural resources and then enables them to adapt to the changing ecological conditions.

4.2 Livelihood strategies of the households

4.2.1 Pastoralism and its ecological implication

The main source of income for the people dwelling in Fentale woreda is livestock production. Four kebeles (33% of the households) are pure pastoralists, whereas the remaining kebeles are agro-pastoralists of which six kebeles have accessed irrigation facility. According to the household survey conducted in November 2010, all the respondents consider themselves as pastoralists. However, 37% of the households are engaged in crop farming, 12% in wage work, 10% in charcoal/firewood production, 4% in petty trading, and 4% in mining simultaneously with pastoralism.

Table 6: Livelihood activities of households

Activity	Gelcha kebele		Ilala Kererri Kebele		Dhebitti kebele		Total	
	Number of hh	%	Number of hh	%	Number of hh	%	Number of hh	%
Pastoralism only	11	35%	7	19%	14	56%	30	33 %
Crop farming plus pastoralism	10	32%	15	44%	8	20%	33	37 %
Charcoal & firewood prodn plus pastoralism	3	10%	4	13%	2	8%	9	10 %
Wage labor plus pastoralism	5	16%	4	12%	2	8%	11	12 %
Petty trading plus pastoralism	1	3%	2	6%	1	4%	4	4%
Mining plus pastoralism	1	3%	2	6%	1	4%	4	4%

Source: Household survey, Nov 2010

Total number of livestock of the household respondents equals to 6020, whereas the total number of livestock in the woreda was 304,932. All the mentioned number of livestock graze on a total grazing land of 12642 hectare. This shows that the stocking rate equals to 25 animals per hectare, which is the reverse of the normal stocking rate (densely populated in the context of pastoral area). In the pastoral areas, the normal standard of stocking rate is 15-20 hectares per animal because as rainfall decreases stocking rate decreases. The data shows that high population of animals graze on limited size of grazing land, and hence causes degradation of the rangeland. This is one important negative ecological effect caused by

overstocking. However, the root cause of the problem is shrinkage of rangeland due to expropriation for the aforementioned purposes that forced them to accumulate their livestock on limited area.

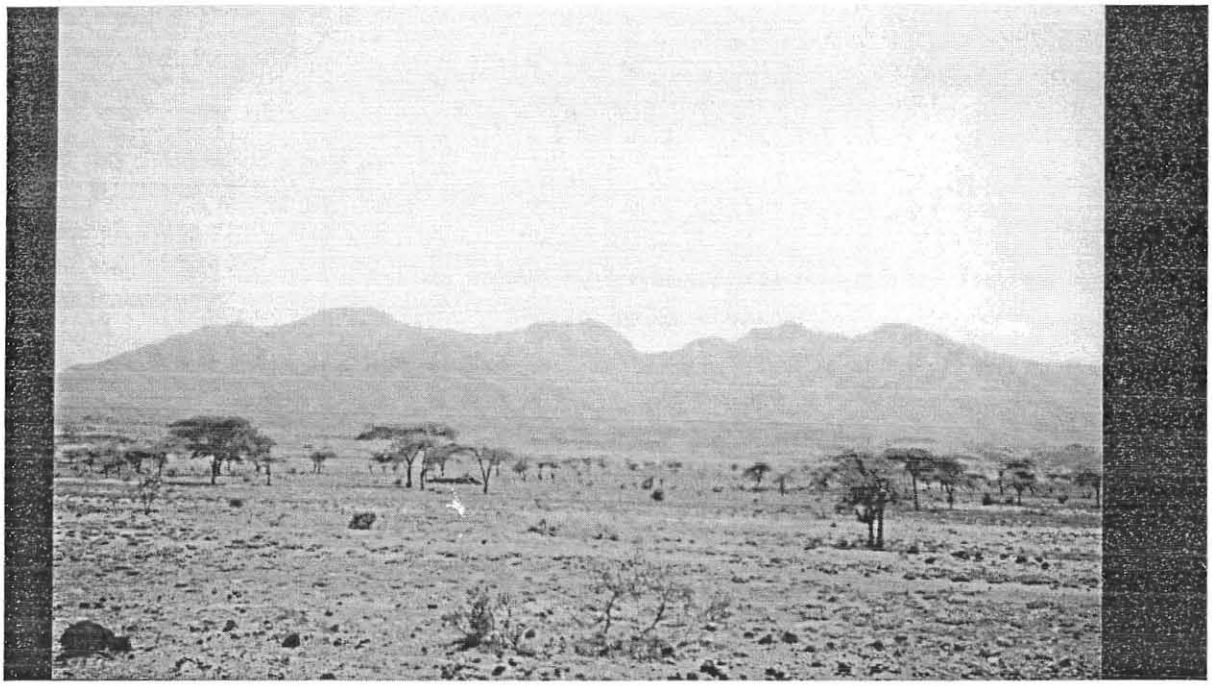


Figure 4: partial view of Fentale Mountain and its surrounding rangeland (Picture taken by researcher, Nov 2011)

Due to the recurrent drought in the area, there was no adequate livestock feed, which leads to none or very low amount of milk and no adequate nutrition. During drought, since the body condition of the livestock, especially cattle's body condition easily deteriorates, this results in low market value. According to some informants that had been contacted, a significant number of livestock had been perished due to the drought that was occurred in 2006/2007 in the area. For instance, Bulga Bosha (key informant and a father of 17 children and 3 wives) indicated that he lost about 278 livestock within two years time (2006/2007) due to drought. Accordingly, he lost 22 cattle and 130 goats in 2006; and 18 cattle, 100 goats and 3 camels were died as a result of the drought that occurred in 2007.

The FGD stated that before land expropriation, the Karrayu enjoyed full rights over their pasture and water resources. The FGD participants have also substantiated that the Karrayu bitterly complain that their major grazing and watering lands were expropriated from them without their consent and willingness. This was because of the establishment of Awash national park, Matahara sugar factory and state farms.

In the past the Karrayu could easily make decisions on their movements in accordance with the existing ecological patterns. They used seasonal cycling of grazing land in order to adapt to drought and the changing ecological condition. Hence, there had been three ecologically differentiated pasture zones in Karrayu area. These were *Ona Ganna*(summer or wet season grazing zone); *Ona Bona*(winter or dry season grazing zone) and *Ona Birraa*(autumn, dry season grazing zone). Such ecological zones are differentiated by three basic components: the spatial and temporal movements of herd and men, rainfall regime and pasture and water availability.

FGD participants also indicated that *Ona ganna* is wet season grazing area, and is located towards and around Fentale Mountain, which is the highest peak in the area. *Ona ganna* grazing zone serves for about four months (i.e., June, July, August and September). *Ona birra* is towards the Awash River and around the area that has been inundated by Basaqa Lake. *Ona birra* begins from October and extends up to mid-January; while *Ona bona* is from mid-January and continues up to end of March. Except *Ona gana* the two grazing zones (*Ona birra* and *Ona bona*) were almost diminished due to various factors. *Ona birra* was occupied by MSF and inundated by Basaqa Lake, while *Ona bona* has been incorporated into the Awash National Park. The FGD participants have also indicated again that currently, they remained only with one grazing zone (*Ona gana*) in and around Fentale Mountain. In general the households indicated that rangeland is declining in the woreda (96% of household respondents) since 1970s and is accelerated in the year 1990s. The decline of rangeland is attributed 57% to expansion of state farms, parks, irrigation and cropping activities, 19% to

expansion of Beseka lake, and 11% to population pressure. Actually the major expropriation of their rangeland has been commenced before 1970s by establishment of Awash National Park and Matahara Sugar Factory.

According to FGD, KII and household survey, mobility to long distance has been restricted, and frequency of mobility to short distance has increased. The participants believe that mobility enables the pastoralists to manage the natural resources properly. The reasons for decrease in long mobility include conflicts with neighboring ethnic groups such as Affar, Argoba, Amhara and Somale; and expropriation of their land by state farms, factories, national parks and neighboring groups. Frequency of short distance mobility to Shasheme, Zuway, Arsi, Adama and Bishoftu areas(cropping areas) has increased due to severe shortage of pasture. They move to these areas after crop harvest in order to feed their livestock on crop residues. The respondents indicated that rangeland degradation caused by pastoralism is insignificant compared to cropping and charcoal/firewood making, but rather restriction of seasonal mobility enhances accumulation of heard on limited area and that results in degradation of the ecology.

Before loss of their large area of grazing land (*Ona- Birra* and *Ona-Bona*), owing to various factors, the Karrayu stocks consisted more of cattle than any of the other species. More importantly, cattle have high cultural reputation in the Karrayu Oromo tradition. Camels and small stocks like sheep and goats consisted smaller proportions in the total animal population of the Karrayu livestock production. The Karrayu people in the area do not like to tell the exact number of the livestock they own. They think that, counting livestock may hurt the livestock; even they perceive that counting may induce death of the animals. The other intention of not telling the exact number of livestock to outsiders is also to avoid tax levy on animals.

With the onset of herd loss, the Karrayu began to change the composition of their herd in favor of sheep and goats due to various reasons. As the grazing space and the availability of

pasture decreased due to loss of land and the resultant overgrazing, rearing cattle which requires relatively longer movement and wider space has become very limited. Small stocks, however, do not require such bigger niches as cattle do. Secondly, in the face of diminishing pasture, drought which very often recurs has a more serious effect on cattle population. Thirdly, rehabilitating cattle through restocking has become more problematic for households as it requires more capital than restocking small stocks (goats and sheep). Finally, change in livestock composition pattern of the people dictates such changes as decrease in pasture land; drought caused serious effect on cattle population than shoat and camel; and restocking of cattle has become problematic. This year the proportion of shoat and camel reached 52% and 15% respectively, where as the proportion of cattle population reached 26.5%. Adjustment of the livestock composition enables the system to adapt to the changing ecology.

Table 7: Livestock composition of the total household respondents

Type of livestock	**Number**	**Percentage**
Cattle	1595	26.5%
Sheep and goat	3151	52%
Equines	280	4.5%
Camel	891	15%
Chicken	11	2
Total livestock the 90 hh respondents	6020	100

Source: Household survey, Nov 2010

The current diversification practices as well as the development interventions are believed to destroy the existing pastoral livelihood. The rural dwellers in Fentale woreda were also engaged to a certain extent in poultry production. Traditionally, poultry production is not convenient to pastoral people like the Karrayu; mainly due to the mobile style of living they were accustomed to. In addition, they were reluctant to eat chicken meat owing to their traditional belief (they say 'chicken usually feed on refuses, unpleasant rotten materials including human excreta), and so that eating chicken meat means eating indirectly what they

ate').In fact poultry farming is not compatible with the way of life of pastoralists, since they always move in search of water and forage for their livestock, and hence, it is not convenient to move with hens. The feed for poultry production is also difficult to obtain for the pastoralists.

Donkeys are also becoming increasingly important in the area. Donkeys are important pack animals, and are used to fetch water, to transport grain from market to village and green-tops of cane sugar as a source of forage for animals during the dry seasons. With regard to grazing, goat and sheep are attended by children and the women, while the camels are taken to far away areas and looked after by the youngsters. Camels are also reared by the Karrayu. Those people who were engaged relatively in pastoralism around Dhebiti and Harrole take their camel herd to distant areas as far as Shashemene.Camels also browse bush trees and so are more suitable to the area. It is said that goats tolerate drought than cattle and sheep, hence, the Karrayu and their Itu counterparts focused more on rearing of goats than sheep. Similarly they give due attention to rearing camel than cattle due to its tolerance to the changing ecology (by browsing bushes on the areas where grasses are degraded, and are tolerant to water stress).

Forced by the problem of food shortage and decreasing of livestock, which is the result of recurrent drought and shortage of rainfall which again resulted in animal (cattle in particular) feed shortage and led to the perish of a large number of cattle, a number of people who were previously pastoralists are gradually being engaged in agro-pastoral way of life. Even though, livestock production faced different catastrophes in the past, they still rely on livestock production for their livelihood. The FGD and KII indicated that pastoralism is resilient to the dry land ecology, because during drought and water shortage it is possible to move with livestock, whereas it is not possible to move with crops or farmland. Additionally, the use of drought tolerant livestock species such as Borana cattle and the change of cattle composition are some of the mechanisms of adapting to the dry land ecology. Experts of the pastoral development office of Fentale district indicated that the pastoralists who have a significant

number of livestock to rely on for their livelihood do not want to be engaged in cultivation; instead they desire to continue and strengthen livestock production activity rather than cultivation.Literature state that pastoralism is more rational way of managing the dry land ecology. Additionally the FGD participants stated that pastoralists are the only group of society who utilized the harsh dry land ecology that would have been unused for any economic activity. However diversification towards crop farming, charcoal/firewood selling, and mining threatens the pastoral system.

The FGD and KII informants stated that pastoralism is a more environmental friendly activity in the dry land ecology. This is because it does not require deforestation, vegetation clearing or land tillage. We know that vegetation clearing and land tillage enhance soil erosion and release of carbon dioxide (CO_2) to the atmosphere, and consecutive worsening of climate change. Pastoralism is rather friendly to the environment in that it requires the land to be covered by grasses for livestock feeding. Concerning erosion hazards, only 2% of the household respondents have observed erosion on their rangeland, where as 94% of them observed erosion hazard on their farmlands. This shows that soil erosion is less intense on rangelands than on croplands. All the household respondents prefer pastoralism than any of the activities practiced there; and stated that it is more viable livelihood strategy in the dry land ecology. As Ayalew (2001) said, the continuance of livestock production practice signifies that pastoralism maintains itself in one form or another by assuming fresh elements as it adapts to hardships and constraints. The respondents also stated that in agriculture led industrialization of Ethiopia, it is not mandatory to transform pastoralists to crop farmers and then to industry. Rather pastoralism can be transformed to industry

In fact the importance of mobility is high in that it enables a rational management of the dry land resources through mobility from low feed resource to better ones. This is very important for copping the drought season. This days mobility is constrained by delineation of regional and national boundaries, population pressure and conflict. The FGD, KII and households indicated that mobility through national boundaries has to be recognized for solving the

problem. Actually it is known that pastoralism is not totally successful. It faced different catastrophes and constraints. But it is a more resilient activity to dry land ecology compared to any of the agricultural activities. The respondents assume that any activity to be introduced to that ecology should begin from pastoralism that existed for long period; and it should be built on pastoralism. Principles of development also support the idea in that any development activity should start from what is there. It should not be contrary to the existing situation. For instance, value addition to the livestock products can be carried out hand in hand with pastoralism. Therefore all the household respondents prefer pastoralism complemented by diversification towards environmental friendly activities and value addition to livestock products as their future livelihood strategy.

4.2.2 Crop farming and its ecological implication

Apart from livestock rearing, Karrayyu pastoralists have also begun to engage in crop farming by using rain and irrigation. Crop farming is the major diversification activity in the woreda. Cultivation that is a recent phenomenon in Karrayyu's life, dates back only to 1980s but continued to expand. Similar to Ayalew (2001), the FGD and KII indicated the reasons for which pastoralists engage in crop farming as response to the expropriation of their grazing land and the consequent weakening of their pastoral means of livelihood; high price of crops and fluctuating supply of crops on the market; loss of animals by disease and decline of productivity due to climate change and loss of pasture; tenure insecurity motivated them to practice cultivation to obtain land titles; and increase in human/animal ratio as the result of high growth rate of human population. Currently, 37% of the household are engaged in crop farming besides the pastoralism. They do it as opportunistic farming, not as permanent means of livelihood. More than 10, 000 hectare was cultivated by rain, whereas 3733 hectare has been cultivated by irrigation. The major crops currently grown (rain fed agriculture) in the woreda include maize, teff, haricot bean and recently various types of vegetables such as onion and tomato, especially on the irrigation project area.

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ADDIS ABABA UNIVERSITY
P. O. Box 1176, ADDIS ABABA
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The FGD and KII has also pointed out that cultivation was not socially appreciated in Karrayu society. Among the Karrayu, there had been (it is still so among those Karrayus who are alien to farming practice) a sort of filial reverence to Earth which is deemed too sacred to be pierced by hoe or the plough. According to the same source, the taboo is stricter for men than for women to dig a ground. The men also regarded the digging of the soil as 'womanish' work. However, this attitude has been changing gradually, since a number of Karrayu people are being involved in farming activities in the area.

According to Gufu (1998), the pastoralists are aware that farming, if not controlled, would conflict with livestock grazing. The checks and balances on sizes of crop lands assisted gradual adjustment of land use, under the resource tenure regimes. Pastoralists do not make permanent investment in farming. Families who farm a patch in one area may move elsewhere where they acquire another temporary patch. The abandoned patch then reverts into the communal grazing land. The FGD and KII informants substantiated this idea.

They also indicated even though the Karrayu were forced to be engaged in crop cultivation, they do not do the farming activities themselves. They usually lease out their farmland to urban dwellers. The lease of farm land in the area has two forms. The first one is that the Karrayu land holders claim some amount of money from the urban dwellers for the use of a plot of land over a year or so. The urban people who held land through lease usually plant onion, cabbages and water melon. Currently, onion is widely planted for its growing market demand. Most of the urban dwellers usually use the plot of land they obtained through lease, three times a year, while they pay only for the first season of the year/or for one time harvest in a year.

The second form of land lease is a kind of sharecropping. In this case, land lease agreement is made between land holder and urban dweller, without land but who has money and drought animals for farming, and a Karrayu land holder who has neither oxen nor money but only land for farming. The agreement goes that the two share the cash proceeds after the crop

is sold on the market. Accordingly, they agree to share the cost of inputs, which includes seeds, pesticides, and payment for labor and drought animals. The Karrayu who leases out his plot of land, most of the time has no money, so that he cannot pay for the expenses immediately. Thus, the urban dweller usually covers all the costs of inputs and the Karrayu owes the urban dweller at the end when they share after they sell the product on the market. Furthermore, the urban dweller can have more than one sharecroppers or partners. The urban dweller can work on three or four plots at the same time. Here is where the Karrayu enter into a form of exploitative relationship. They entered into the grip of the urban dwellers through fraudulent acts and ownership of capital and sheer cheating is made upon them.

However, crop production has been constrained by various factors such as inadequate and erratic rainfall, high prevalence of pests, lack of pesticides, high evapotranspiration and soil salinity. Data obtained from the woreda pastoral development office indicates that productivity of crops in the area is very low. For instance productivity of cereal crops and pulse crops has been reported as 3-9 quintals and 2-5 quintals respectively in year 2008-2010 on rain fed cultivation. Dawit (2009) states that whatever they produce is consumed at home, and there is no need to measure their harvest. A good harvest could last for two months in a family of seven members; where as a bad season is simply no harvest at all. The FGD and household interview also support this idea.

Table 8: Productivity of crops

Crop type	National Standard of productivity		Actual productivity of the woreda	
	Rain fed	Irrigated	Rain fed	Irrigated
Maize	56	60	9	15
Onion	120	200	30	100
Tomato	250	300	75	200
Haricot bean	20	25	2-5	8

Source: Fantalle woreda pastoral development office, Nov 2010

Fantalle irrigation has created another opportunity for engaging in crop production. OWWDSE(2008) states that the environmental benefits of the irrigation project is multiple in that it ensures high survival rate of seedlings in future endeavors of re-plantation, increases biomass and wildlife attraction (saves wildlife migration); improves the livelihoods to detach people from unwise use of natural resources especially deforestation for charcoal making; it improves rangeland's possession of grasses and browse plants; improves the severely affected sanitation state of people; and the residents will attain legal ownership of the land over which they hold customary right. It also states that charcoal/firewood making will decline in the long run as people engage in crop farming by irrigation water. The project has been operational since 2008, with the plan of covering 18,000 hectares of land in 11 kebeles to benefit 24000 households. Since the last two years, 3733 hectares of land has been cultivated by 4977 households in six kebeles. However the local dwellers (karrayyu) do not have the culture of crop farming, and hence have rented out and/or sharecropped their irrigation lands to urban dwellers. As the result they lost and are losing the expected benefit.

Moreover, a large number of people in Fentale woreda in particular had problem of food security. For instance, according to Food Security Desaster Prevention and Preparedness Bureau of Oromia, about 30,642 people had problem of food insecurity in the woreda, out of which 15,760(26.7%) and 14882(25.3) were beneficiaries of direct support and indirect support (supported through public work) respectively.

The FGD and KII data show that large area of rangeland has been converted to crop land from year 2008 to 2010. The Woreda Pastoral Development Office reported that the size of land converted to cropland was 3733 hectares. This practice has contributed to the reduction in productivity of livestock as the result of feed shortage. According to OWWDSE(2008), the cost of converting the grazing plains into crop fields, is as good as tasting the inherent consequences of rapid shifts from a formerly evaluated and ecologically resilient system of production (pastoralism). This means, future losses that may occur in the form of absolute

overgrazing or land use conversion could cost the pastoral way of life itself beyond compromising pastoral livelihoods.

Scholars agree on the rationality of pastoralism to managing dry land ecology; and rangeland is one of the three pillars of pastoralism (rangeland, livestock and people). 77% of the respondent households indicated that crop farming in Fantalle pastoral areas affected rangelands negatively. Similarly, 72% of the respondents indicated that livestock feed decreased since the beginning of crop farming in the woreda. Ayalew G(2001) describes that crop farming which is the recent development in Karrayyu life dates back to 1980s, but continues to expand. The respondent households and FGD participants also agree on the event. The practice was introduced by Ittu Oromos who migrated from Hararge to the woreda due to the famine that occurred in 1980s.

The respondents indicated that crop farming caused erosion in pastoral areas. Dry land soil is sandy and fragile that can easily be eroded by rainwater when exposed to rainfall. The erratic heavy rainfall creates runoff that washes away the soil. De-vegetation and land tillage for crop farming highly contributes to soil erosion. 83% of the household respondents witnessed that they observed erosion for the first time since the year 1980s, whereas 11% of them observed erosion since 1970s. This time exactly corresponds with the beginning of crop farming in the woreda. This is an indicator that crop farming causes erosion more than any of the activities.

FGD indicated that soil salinity is increasing all over the woreda. 72% of the respondent households responded that they cannot use irrigation land consecutively (more than two years) because of the consequent salt accumulation that can only be minimized by fallowing. Additionally, the irrigation project has an outlet towards Beseka lake (that has high concentration of salt), and is accelerating the expansion of the lake. Oromia Water Works Design and Supervision Enterprise (2009) stated that Beseka lake has increased ten times its original size from 3.5km^2 to 35km^2 in 20 years. In the last year Beseka lake has flooded part

of Matahara town, and as the result one secondary school has been closed and transferred to Haro Adi town. Elders complain that "where ever Beseka water reaches, the soil becomes saline and no vegetation grows on it". It is estimated that Beseka lake has the potential of flooding Matahara town, Haro Adi town, Alge, Gola, Gelcha, Kobo and Benti mogasa kebeles.

The FGD and KII also indicated that salinity has negative effects on livestock production in two ways. On one side it reduces forage availability because vegetation cannot grow on saline soil. On the other hand, salty grass has health problems on the livestock. According to Dr. Feisa Tufa (one of the KII), salty grass caused bloat, problem of metabolism, diarrhea, dehydration and secondary infection on the livestock. The KII and FGD participants also commended that irrigation water would better be used for rangeland improvement than for cropping.

According to FGD conducted in three kebeles, different grass species and wild animals disappeared due to the degradation of the land resources. Grass species such as Coqorsa (Bermuda grass), Baallamii (Andropogon Abyssinicus), Sambaleexa (savana grass), and thatch grass (Hypernia rufa) existed in the woreda until the mid of Dergue regime, but are currently extinct. The extinct wild animals include Lion, Buffalo, elephant, and ostrich. The participants stated that these species disappeared since the beginning and mid of the Dergue time. This time matches with the beginning of cultivation and charcoal selling.

Oromia Pastoral Area Development Commission stated that land use of all pastoral areas has been studied by a consultant organization. The land use study has differentiated crop land, grazing land, and others. According to this study, only bottomlands that are suitable to cropping will be cultivated. It is expected that the implementation of this study will save rangelands from inappropriate cultivation.

The households, KII and FGD have identified that crop farming in dry lands of the pastoral areas has different constraints that are listed as follows:

1. Climate of the area

Fantalle is categorized as semi arid zone with annual rainfall of 553mm, temperature of 9.6-42°c, with high evapotranspiration. In such areas moisture is the most limiting factor for crop production due to the high variability and erratic nature of rainfall (unless irrigation is used). Rainwater can be lost in dry land areas in the form of percolation (infiltration beyond root zone), evapotranspiration and runoff. Nature of the soil texture determines the soil water holding capacity. Dry land soil is characterized as having sandy texture that has less water holding capacity.

Temperature, humidity and wind are elements of climatic factors that affect the rate of evaporation. High temperature and dry wind velocity intensify both evaporation and transpiration from soil and plant surface. One of the respondents in KII, Mitiku Bekele (senior soil expert), stated that evapotranspiration is high where plants are grown on soils with modest moisture level than where soil moisture is low. This is to be expected because at low soil moisture level, water uptake by plants is restricted. In other words, the rate of evaporation from water saturated soil surface is higher than from that of dry soil mass. Therefore most of the irrigation water used in the dry lands is lost in the form of evaporation.

2. The nature of dry land soil

The KII and FGD indicated that the properties of dry land soil highly constrain crop farming. Mitiku Bekele (one of the KII) and woreda experts agreed on the properties of dry land soil as follows:

- NPK absorption is reduced definitely on dry land soils, and hence has low NPK.
- Under drought condition organic matter decomposition and hence nitrogen mineralization is minimal, and therefore dry land soil has low organic matter content.
- Where water is limiting, the uptake of soluble nutrients in soil water is minimal.

- In heavy rain, NO_3 moves down ward in the soil profile below the root zone.
- Dry land soil has sandy texture that has low water holding capacity
- Dry land soil has poor structure
- Low number of soil micro organisms (consumers and decomposers)
- High potentiality of basic cations and soluble salts like Ca+, Mg+, K+, So_4, Nacl, Cacl, Mgcl and high soil PH which is often greater than 7(alkaline).
- The cations are located on the surface of the soil, and hence the soil is saline.
- The soil has shallow depth.

In general, fertilizer will not increase yield without sufficient plant water; and increasing stored soil water by conservation or irrigation will not increase production without adequate fertility. Hence, the above properties of dry land soil are constraints for practicing crop farming as livelihood diversification in dry land areas such as Fentalle woreda.

3. Karrayyu people rent out their land

With respect to crop farming with irrigation, the respondents raised their fear of land renting. Generally 0.75ha of land has been provided to each household on the irrigation area. The irrigation project was developed for the sake of the Karrayyu people who widely inhabit there. But according to OWWDSE (2009) the pastoralists have low working culture with respect to crop farming. KII indicated that due to this culture and taboo, the local Karrayyu people have rented out their land on irrigation project to outsiders such as urban dwellers, and lost the expected benefits and this may expose them to exploitation.

4. The nature of land distribution

Data from woreda pastoral development office indicates that only 0.75ha of irrigation land has been provided for the households. Actually this size of land is meant for crop cultivation. But FGD participants like Haji Qasero stated that pastoralists who have large number of livestock have the fear that they may not be provided with enough grazing land when the land in the area is put under cultivation. They claim that extra land has to be provided them

as rangeland. On the other hand, the participants fear that the land is provided for the existing generation (dwellers) only, and there will not be enough land left for the coming generation. Additionally the participants have the fear that undesirable land holding act will exist by using kin relationship and clan ties, through the weakening of communal land ownership that has strong management system.

5. Perception on water development in pastoral areas

It is obvious that water is the major limiting factor in dry land areas where pastoralists are situated. In order to solve the problem, the government and different NGOs assume digging of water points and construction of irrigation schemes as orthodox idea. On the contrary, pastoralists do not accept this as it is. All the FGD and KII participants substantiated that development of water points without the consent of pastoralists has negative impact on their livelihood. Gufu Oba (1998) states that following pond developments in the1970s, large populations of livestock and the main settlements were attracted to Diid Hara (in Borana). Between 1974 and 1990 the number of settlements increased by more than 200%. Availability of permanent water in the former wet season rangelands altered the patterns of grazing to a full year. Initially, water development resulted in an increase in herd growth. However, as grazing pressure increased and patterns of traditional grazing deteriorated, high livestock mortality occurred. The negative effect of pond development is only being comprehended after environmental damage occurred.

Water source developers have repeatedly ignored the sociological significance of water and its critical influence upon pastorals decision making. Often, this lack of understanding has resulted in bloody and fatal conflicts, destruction of pumping equipments and the degradation of the surrounding land. Water development should continue to be a priority in areas where water is a limiting factor. However, the development of water points should be carefully planned in terms of density (risk of irreversible degradation, loss of eco-system resilience) and in terms of access to tenure of resources and changes to these which may be induced by the new development.

Hence, FGD participants indicated that construction of water points in pastoral areas favors increase in livestock population around the points that leads to degradation of vegetation cover including grasses and forest resources. Despite of the water shortage, pastoralists do not want the construction of water points here and there.

6. Low level of skill of water users to utilize water economically

According to Abuhay Takele (2006), crop farming systems to be considered in dry land areas include appropriate forms of soil moisture conservation techniques, conservation tillage and cropping systems; and one must maximize the water use efficiency (WUE) for crop production. It has been described that pastoralists have low working culture with respect to crop farming. The KII and FGD indicated that pastoralists have less experience of land preparation, sawing, watering, etc, that constrain crop farming. Unwise use of water leads to wastage of this scarce resource.

7. Crop farming is the most climate sensitive sector that can be affected highly due to drought, flood and shortage of rainfall.

8. Prevalence of pest attack

The FGD also indicates that due to prevalence of pest attack in dry land areas, diversification to crop production is under danger. Epidemic pests such as army worm, migratory birds, and locust cause significant harm on crops every year. Besides, there is lack of relevant pesticides in the area.

9. Conflicts

Conflict over land sharing is another constraint. The pastoralists have long experience of using the land communally, where as private ownership of land is a new phenomenon that occurred due to crop farming. Hence conflicts are raised on private land holding especially

on the irrigation site. The conflict might be intense on land sharing among the pastoralists and among the upstream and the downstream dweller.

4.2.3 Charcoal/firewood selling and its ecological implication

Recently, many Karrayus are being engaged in burning and selling of charcoal. Previously, charcoal selling was the most down-looked activity and hated by every Karrayu. Moreover, charcoal selling and burning was unknown in the area. It was later introduced into the area by people from the nearby town (Metahara). Nonetheless, an increasing number of the Karrayu are taking it up now. Due to the lingering cultural reason and lack of knowledge in burning charcoal the Karrayu bring people from towns and make them burn the charcoal. They share the end result and each party sells his own share on the roadside or in the town. The people from the town could not burn charcoal in the countryside without the permission from the Karrayu. Therefore, they need a Karrayu individual who would give them protection when they cut a tree and burn it. Still some of the able-bodied and those who do not want to share do the burning themselves. In most cases, the man burns the charcoal with town's gang or by himself while the wife sells it. In this way the old traditional conservation practice of the Karrayu that forbade the irrational cutting of trees is no longer reinforced. Trees are being cut down for charcoal burning, building houses, firewood, etc. and the land in the area is progressively getting bare.

ETHIOPIA



Figure 5: Charcoal ready for sale on roadside in Tuttuti kebele of Fentale woreda (Picture taken by researcher, Nov.2011)

The participants also mentioned that charcoal and firewood production as well as irrigation activity has accelerated deforestation in the woreda. The major charcoal selling PAs include Haro kersa, Dhebitti, Haro Ubba, Ilala kereri and Tuttuti. The data indicates that 10% of the households are engaged in charcoal and firewood selling activities, mainly because of life difficulty. FGD participants at Geicha stated that forest resources have been almost totally destroyed from Harroole, Qoran Goggogo, Hablo, Suta, Hadho and Muka Qerbeta sites of Dhebitti and Ilala Kererri PAs. They complain that the current government has worsened deforestation because of the weak control against people who commit this illegal activity; and they have suspicion that policemen have beneficial relationship with the illegal destroyers of forest. Forest resources have also been cleared from the irrigation areas and rangelands that are converted to cropland.

The FGD and all household respondents indicated that diversification to charcoal/firewood production has negative effect on the traditional 'Gada' system. It has been described that both cropping and charcoal/firewood production activities accelerated deforestation. People cut trees including the 'Oda' (sycamore tree) that is used for the gathering of 'Gada system'. They stated that 'Gada' ceremonial sites and points of 'Qallu' ritual places will be affected/damaged if necessary care is not taken before hand; and this will have negative social and psychological impacts on the society. Therefore, these activities contribute to the decline of the existing traditional institutions such as 'gada' system.

Rate of evaporation from soil surface is dependent up on the presence or absence of vegetation cover. For instance, with the same evaporation opportunity, the evaporation rate decreases in the following decreasing order: bare ground, crop land, grass land, sparse forests, dense forests. According to the FGD and household interview, source of wood for charcoal and firewood production in the woreda is from communal forests and the invasive bush tree (Prosopis Juliflora). This practice has made the pastoral lands to be bare land. Distance traveled each year to cut trees for charcoal and firewood has been taken as indicator for severity of deforestation in the woreda. In other words, the more accelerated the deforestation is, the farther the distance to cut trees for charcoal and firewood production.

Table 9: Distance travelled to cut trees for charcoal

Year	Distance traveled	Number of respondents	%
1970s	0.025-0.5km	7	78
1980s	0.25-1km	8	89
1990s	1-2km	7	78
2000s	2-4km	9	100
Total n^{o} of respondents engaged in charcoal/firewood production		9	

Source: Household survey, Nov 2010

The table above shows that distance traveled to cut trees for charcoal/firewood production has increased from year 1970s to 2000s. This indicates the severity of deforestation in the woreda .

The participants indicated that deforestation caused environmental and climatic problems at micro (local) level and at macro level. At micro level, deforestation has caused lack of shade for people and livestock, shortage of wood for construction and fuel, soil erosion and flooding due to high run off, loss of soil fertility, shortage of range for livestock, drying of water points, reduced underground water, migration of wildlife, increased temperature, and shortage of rainfall. Similarly, 55% of the respondents have observed erosion on their farmland, and this is an indicator that crop farming exposes soil to erosion. At macro level, it is believed to cause global warming and climate change.

The other consequence of degradation of vegetation cover through deforestation for charcoal and firewood making and through overgrazing is wind erosion. The entire woreda is heavily affected by wind erosion. The severity of this wind erosion is increasingly high on the bare lands. This has been observed clearly during the data collection time.

4.2.4 Petty trading and its ecological implication

Currently, the Karrayu are taking up petty trading. 4% of the households are engaged in petty trading. Many of those engaged in such petty trading are the women. Their merchandises are tobacco, coffee and *qorasuma(*aromatic wood traditionally used for fumigating churns and smoking of living room). The women use the profits to augment their household consumption. Men are involved in trading of chat. The women who trade are those whose husbands do not have reliable income source. Men traders are also those who do not have cattle and at the same time do not have another source of income.

Unlike most pastoral societies, for the Karrayus in the area, milk selling is a repugnant cultural practice. Due to the cultural taboo, those Karrayus who do have more lactating cows

themselves refrain from selling milk. The Karrayu thought that selling milk will affect the nipple of the cow and makes it dry, especially if the milk is boiled. On the other hand, the Somali and the Itu Oromo dwelling in the area supply the largest portion of milk to the town of Metahra and the MSF plantation workers. In fact, the Karrayu sell butter even though they used much of it for smearing their hair and clothes for cultural purposes, which is usually considered as a sign of richness. Now-a-days it has been proved that the Karrayu people have begun to sell cow's milk by gradually disregarding the traditional practice of not selling milk. With respect to ecology, petty trading of aromatic wood products may have minimal effect on ecological degradation; whereas selling of livestock products such as milk and butter have positive effect on ecological degradation. Records indicate that large portion of live animals and meat are exported from the pastoral areas. The FGD and KII as well as experts witness that the mentioned activities do not have negative effect on the ecology. This shows that diversification towards milk selling, butter selling, meat selling and livestock marketing strengthen the pastoral system; and also improves the living standard of the people leading to sustainable development.

4.2.5 Mining and its ecological implication

The data indicates that Karrayyu pastoralists diversified their livelihood towards mining of stone. 4% of the households are engaged in preparing of stone for construction purpose. Digging of stone has caused the clearance and excavation of rangeland. This practice has some negative effects on the ecology, despite of the economic benefit because digging causes degradation of the rangelands. Excavation of soil also enhances the release of carbon dioxide from the soil surface, and contributes to the worsening of climate change.

Generally, the respondent households have identified the ecological consequences of pastoral livelihood diversification towards cropping, charcoal/firewood making and mining. According to the data, all the households (100%) believe that rangeland shrinkage is caused by the mentioned activities; 67% said that crop farming causes aggravation of soil salinity; 72% said that the practices cause degradation of vegetation cover and deforestation; 92%

said that the practices are threat to the most resilient pastoral system; 61% believe that the activities damage *Gada* ceremonial sites; and 60% of them believe that the activities caused extinction of grass and animal species.

Chapter Five

Conclusions and Recommendations

5.1 Conclusion

Pastoralism has some negative effects on the ecology in that overgrazing by high population of livestock on limited grazing area causes rangeland degradation. Actually the root cause is shrinkage of rangeland by manmade catastrophes. Diversification strategies practiced in Fantalle woreda include crop farming, charcoal production, firewood selling, mining of stone, wage work, and petty trading. Despite of the constraints and challenges related to pastoralism, the pastoralists still prefer livestock rearing as the most viable livelihood activity in the dry land areas. Pastoralists have human and social values that promote the wise management of their natural resources and adapt to the local ecological conditions. The findings show that the deforestation and degradation of natural resources caused by cropping, charcoal selling, firewood selling and mining is very high. In pastoralism, livestock can graze under bushes and trees, and hence do not require deforestation unlike for cropping or charcoal making. It also does not require land tillage that enhances release of carbon dioxide to the atmosphere and worsen the global climate change.

Pastoralism is a livelihood strategy that enables a rational management and utilization of natural resources in dry land areas. It is more resilient to the dry land ecological problems than crop production, charcoal and firewood selling, and mining. For instance, during drought, crops totally fail with in a month or some, but livestock can tolerate for long period by moving from places of feed shortage to better areas. Besides, the pastoralists use change of herd composition in accordance with the ecological pattern. Currently the herd composition of Karrayyu pastoralists is towards more of small ruminants and camel than cattle. This is because small animals require small plot of land for grazing, are easy to restock during risk of drought, and goats and camel can browse bushes during shortage of grasses.

The activities such as cropping, charcoal and firewood making, and mining have got ecological effects such as shrinkage of rangeland, aggravation of soil salinity, reduced vegetation cover and deforestation, threat to the most resilient system (pastoralism), and extinction of animal and grass species. The economic benefits derived from diversification to such activities are very insignificant as compared to the effects. Productivity of crops in dry land pastoral areas, including the irrigation farming is very less as compared to that of highland areas. Even most of the time, there is no harvest at all. Individuals gain very minimal benefit from activities such as cropping, charcoal and firewood selling, and mining; but the cumulative effect on the public is very high in that the activities cause degradation of the whole ecology, and contribute highly to the climate change. Additionally, diversification to cropping has got different constraints. Generally, the mentioned diversification activities caused the decline of pastoral system that has been most resilient to the dry land ecological problems; and the activities mentioned above are not sustainable livelihood strategies. Whereas diversification towards milk selling, milk processing, meat processing, and fruit production are more friendly to the dry land ecological conditions.

5.2 Recommendations

Based on the findings of the research, the following policy implication has been forwarded:

1. Pastoral livelihood diversification strategies should be focused to environmental friendly and ecologically suitable activities. For instance, value addition to the livestock products including milk selling, milk processing, meat processing, and processing of skin and hides have to be promoted. Pastoralists should invest in industries and trading by selling some of their livestock. These activities generate more income to households and also keep the sustainability of livestock production system. Additionally fruit production can be carried out without disturbing the ecology. It improves the vegetation cover; does not require land tillage except spot digging; and it does not cause erosion. Similarly diversification towards crop farming should be limited to areas that are specified by the land-use-study. And diversification towards charcoal and firewood selling should be controlled (banned).

2. With the existing situation, there is no activity that can replace pastoralism in dry land areas. With the current capacity of the country, it would not be possible to irrigate all the pastoral areas, and use it for crop farming. However irrigation water can be used at specified areas for crop production simultaneously with livestock rearing. Crop production should not be expanded to rangelands beyond the specified area by the land use study. Additionally the use of irrigation water should not be restricted to crop farming alone. Within the context of pastoral areas, rangeland is the major pillar of their livelihood. Hence, irrigation water should be used for rangeland improvement and for livestock drinking.

3. The land use study of Oromia pastoral areas has to be implemented. Cropland has to be restricted to the set areas; and rangeland and others have to be classified accordingly.

4. Pastoralists should be consulted and be able to decide for their destiny. They have rich indigenous knowledge that can be utilized for improving their livelihood. Hence they should be able to decide whether to remain pastoralists or whether to diversify to other activities.

5. Pastoralists diversify their livelihood mainly because of poverty (loss of their livestock). Hence rangeland, water, market and infrastructure have to be improved in order to lead a modern pastoral livelihood. If these conditions are improved, no one from the pastoralists is interested to engage in cropping, charcoal selling and firewood selling. High population of livestock on the limited rangeland resulted in poor productivity. Hence pastoralists that have large number of livestock population should reduce their livestock, and engage in investment activities.

6. Seasonal mobility has to be recognized as adaptation mechanism to the lowland ecology. Pastoralists have to get access to move with in regions, from region to region, and across national boundaries during feed shortage and drought.

7. Pastoral livelihood assets that support ecological adaptation have to be improved. Assets such as human assets (their indigenous knowledge), and social assets (their social relationships and the Gada system) are very important for managing the harsh ecology and natural resources. Infrastructure and water facilities also enable them to lead a better livelihood. Therefore, these assets have to be improved either by government or non governmental organizations as well as by mobilizing the potential of pastoralists themselves.

8. Concerned government bureaus and offices such as the Land and Environmental Protection Office have to be committed to manage the environmental issues.

9. With the current trend, pastoralism in this country is going to diminish. Hence there should be a mechanism of preserving pastoralism for heritage.

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Annex-1

Addis Ababa University
College of Development Studies

Questionnaire for interview

Dear respondents, this questionnaire is prepared to collect data for the Masters thesis of Mr. Muluneh Mosisa. The study is focused to the pastoral livelihood diversification and its ecological consequences, in Fantalle woreda. Findings of the study will be used for educational purposes and as input for development interventions. Therefore, all respondents are requested to give realistic and reliable information.

I. General information about the respondent

1. Woreda:_____
2. Kebele_____
3. Name of household head_____
4. Name of interviwer_____
   Signature_____ Date_____

II. Household characteristics

5.	Sex of hh head	1. Male 2. Female
6	Age of hh head (years)	
7	Education of hh head	1. Non literate 2. Read & write 3. 1-4 grade 4. 5-8 grade 5. 9-10 grade 6. 11-12 grade 7. 0ther (specify)_____
8	Total family size	
9	Number of male children	
10	Number of female children	
11	Number of relatives	

III. Access and ownership of livelihood assets

A. Access and ownership to natural capital/assets (land, water, rangelands...)

12. Do you have access to land? 1. Yes☐ 2. No☐
13. How do you access to land? 1. Privately☐ 2.Communally ☐
14. If you have your own land, please tell us about your land

Code	**14.1 Type of land**	**14.2 Area (timmad)**
Code 01	Area of total own land holding	
Code 02	Own arable land	
Code 03	Own grazing land	
Code 04	Sharecropped /rented-in land	
Code 05	Sharecropped /ranted out land	

15. How do you characterize the fertility of the land you cultivate? 1. Lem (fertile) 2. Lem-tef (medium fertility) 3. Tef (infertile)
16. If you have rented out your land to others, to whom have you rented it? 1. Relative 2. Neigbour 3. Friend from the clan 4. Outsider 5. Other (specify)_____
17. If you own land communally, how do you manage it? 1. By clan 2. By kebele
18. Do you have sufficient rangeland? 1. Yes 2. No
19. Is your rangeland expanding or declining through time? 1.Declining 2. Expanding
20. If it is declining, when did it begin declining? 1. Before 30 years (1970s) 2. Before 20 years (1980s) 3. Before 10 years (1990s)
21. If it is declining, what are the reasons?_____

_____

22. Is crop land expanding or declining? 1. Expanding 2. Declining 3. No change
23. Do you have sufficient water for your family and your livestock? 1. Yes 2. No
24. What is the type of water source you use? 1. Tap water 2. Piped spring water 3. Unprotected spring water 4. River water 5. Pond water
25. How is your ownership of water points? 1. By clan 2. By kebele 3. Free access
26. What is the distance of water point from your residence?

B. Access and ownership of financial capital

	Questions	yes	no
27	Do you have savings in bank?		
28	Do you have savings in microfinance?		
29	Do you have savings in Ikub?		
30	Do you have savings in Idir?		
31	Do you get remittances?		
32	Do you have access to credit service?		

33. Please tell us about your source of credit (rank 1,2,3...)

Code	Source of credit	Yes	No
01	Bank		
02	Microfinance		
03	Iqub		
04	Idir		
05	Relatives		
06	Others, specify		

C. Access and ownership of physical assets

34. Please list the number and type of livestock heads you have

code	34.1 Type of livestock	34.2 Number of livestock
01	Oxen	
02	Cow	
03	Young bull	
04	Heifer	
05	Calf	
06	Sheep	

07	Goat	
08	Horse	
09	Mule	
10	Donkey	
11	Camel	
12	Chicken	
13	Others, specify	

35. What is the type of road you use in your locality? 1Asphalt☐ 2Gravel☐ 3Dry weather☐
36. What is the distance from road to your residence?
37. Do you have access to irrigation structures? 1. Yes☐ 2. No ☐
38. What are the transportation facilities available to you? 1. Vehicles☐ 2. Carts ☐ 3. Pack animals☐ 4. No transportation ☐
39. Do you think that transportation affects your livelihood activities? 1. Yes 2. No
40. Do you have access to telecommunication? 1. Yes 2. No
41. Please tell us about your agricultural inputs

Type of input	**38.1** Quantity used in 2010	**38.2** Source (supplier)
Selected seeds		
Fertilizer: DAP		
UREA		
Herbicides		
pesticides		
Fungicides		
Chemicals for post harvest pests		

42. If you do not use chemical fertilizers, what do tou use? 1. Manure ☐ 2. Compost ☐ 3. Home wastes ☐ 4. No fertilizer☐

D. Access and ownership of human capital

43. How many of the household members are healthy?
44. Did any one from your family members get sick in this year? 1. Yes 2. No
45. What did you do to help the sick person? 1 visited clinic ☐ 2 visited traditional healers☐ 3 took no action ☐
46. How many of the household members are capable to work?
47. How many children did you send to school?
48. If you do not send your children to school, what is the reason? 1. Not important to send ☐ 2. Financial problem ☐ 3. Long distance to school ☐

E. Access and ownership of social capital

49. Please state the distance of your residence from social services

Code	Type of social service	Distance in km
01	Distance to health institution	
02	Distance to school	
03	Distance to market	
04	Distance to telecommunication center	

05	Distance to road	

50. Do you get extension services? 1. Yes 2. No
51. How often are you visited by extension agent?
52. Is the role of Gada System the same to that it was before 50 years? 1. Increasing 2. Decreasing 3. The same
53. Do you prefer mobility or sedenterization? 1. Mobility 2. Sedentarization
54. Why do you prefer it?_____
55. Have you practised mobility in year 2010? 1. Yes ☐ 2. No ☐
56. If you stoped mobility, when did you stop it?
57. Are you a member of cooperative association? 1. Yes ☐ 2. No ☐
58. How do you evaluate nutrition of your family? 1 Sufficient ☐ 2 Medium ☐ 3 Insufficient ☐
59. Do you have political representation in national parliament? 1. Yes ☐ 2. No ☐
60. If you get problem and need money, do you get it from your relative or community? 1. Yes ☐ 2. No ☐
61. Do the community support each other during bad and good times? 1Yes ☐ 2 No ☐
62. Have you ever received assistance from your kin? 1 Yes ☐ 2 No ☐
63. Why did you get the assistance?_____
64. What was the assistance?_____

IV. Pastoral livelihood activities

65. Is livestock productivity increasing or decreasing? 1. Increasing ☐ 2. Decreasing ☐ 3. No change ☐
66. If it is decreasing, what is the reason?_____
67. Do you get sufficient product for your family from livestock? 1.Yes ☐ 2. No ☐
68. If 'no' how do you cope up?_____
69. How do you evaluate the viability of pastoralism? 1 Viable ☐ 2 Less viable ☐ 3 Not viable ☐
70. If it is not viable, what are the reasons?_____
71. When did you begin non pastoral activities for the first time?_____
72. Why did you begin non pastoral activities?_____
73. What are the types of activities that your family members are engaged in(rank the activities)

Code	**Activity**	**Rank(if you are not engaged in the activity, label it 0)**
01	Crop production	
02	Firewood and charcoal sale	
03	Wage labour	
04	Petty trade	
05	Mining	

74. Do you cultivate your land? 1. Yes 2. No
73. Pease tell us the types of crops you grow

Code	**73.1 Type of crops**	**73.2 Area (ha)**
01	Maize	

02	Sorgum	
03	Teff	
04	Millet	
05	Harrioat bean	
06	Seasame	
07	Vegetables	
08	Fruits	
09	Coffee	
10	Others, specify	
	Total area	

75. What type of fertilizers do you use? 1. Chemical fertilizers ☐ 2. Manure ☐ 3. Without fertilizer ☐

76. Contribution of pastoralism to household income

Type of livestock	Number of livestock	Number of animals sold during the last year household consumption	Monetary value (Birr)	Animal products sold during the last year for household consumption	Monetary value in Birr
Cattle					
Goat					
Sheep					
Camel					
Poultry					
Others, specify					

77. Contribution of crop farming to household income

Crop type	Area (ha)	Product (ql)	Hh consumption (ql)	Sales (ql)	Price of sales in birr	Carryover (ql)
Maize						
Sorgum						
Teff						
H/bean						
Others, specify						

78. Contribution of non farm activities to hh income

Activity	Quantity per year	Price in birr
Firewood sales		
Charcoal sales		

Wage labour		
Petty trade		
Mining		
Others, specify		

V. Constraints and issues related to pastoral livelihood diversification

79. Do you have skills for non pastoral activities? 1. Yes ☐ 2. No ☐
80. Have you got any training in other activities than pastoralism? 1. Yes ☐ 2. No ☐
81. Is your land convenient for crop production? 1. Yes ☐ 2. No ☐
82. Do you have access to market? 1. Yes ☐ 2. No ☐
83. Do you have forest trees for preparing charcoal and firewood? 1. Yes ☐ 2. No ☐
84. Do you have access to irrigation scheme? 1. Yes ☐ 2. No ☐
85. What do you think are the opportunities for non pastoral activities?

Opportunities	Rank
a. Availability of farming land	_____
b. Availability of irrigation water	_____
c. Market opportunity	_____
d. Access to roads, market, and telecommunication	_____

86. Major challenges to livelihood diversification? Rank them.

Challenges	Rank
a. Access to market	_____
b. Poor infrastructure	_____
c. Lack of agricultural equipment	_____
d. Lack of agricultural inputs	_____
e. Shortage of irrigation water	_____
f. Frequent drought	_____
g. Lack of start up capital	_____
h. Lack of skill	_____
i. Moisture stress that is unfavorable to crop production	_____
j. Soil salinity and alkalinity that does not favor crop production	_____
k. Lack of land for farming	_____

VI. Ecological consequences of pastoral livelihood diversification

87. Is crop production affecting rangelands positively or negatively? 1. Positively ☐ 2. Negatively ☐ 3. No change ☐
88. When did crop production begin for the first time in the local area? 1. 1970s ☐ 2. 1980s ☐ 3. 1990s ☐ 4. 2000s ☐
89. How do you observe livestock feed shortage since the beginning of crop production? 1. Increased ☐ 2. Decreased ☐ 3. ☐
90. How do you observe temperature rise since the beginning of crop production in the local area? 1. Increased ☐ 2. Decreased ☐ 3.No change ☐
91. Have you observed water erosion on your farm? 1. Yes ☐ 2. No ☐
92. When did you observe erosion for the first time?_____

93. How do you observe productivity of your land? 1 increasing ☐ 2 decreasing ☐ 3. No change ☐

94. Do you use irrigation land consecutively (year to year)? 1. Yes ☐ 2. No ☐

95. If it is not possible to use irrigation land from year to year, what is the reason? _____

96. If you sell charcoal and firewood, where do you get the wood from? 1. Own forest land ☐ 2. Communal forest ☐

97. Distance traveled to cut trees for charcoal and firewood:

Year	Distance traveled
1970s	
1980s	
1990s	
2000s	

Annex-2

Check list for key-informant-interview (KII)

I. Personal background

1. Name _____ 2. Sex_____ 3. Age_____
4. Education_____5. Occupation_____
6. Name of organization _____
7. Kebele _____ 8. Number of family_____

II. Pastoral livelihood related issues

9. How do you evaluate pastoralists' access to land?
10. Discuss pastoralists' access to water, type of water, distance to water resources in the woreda,
11. Discuss access to rangeland, and trend of rangeland shrinkage in the woreda.
12. Road access in the woreda, type, distance
13. Transportation access, type...
14. Number of livestock in the woreda, species, by kebele
15. Supply of agricultural inputs
16. Supply of credit services, how the community save their money
17. Nature of health services, and education facility
18. Extension services in pastoral areas.
19. Status of the existing social institutions (modern and traditional)
20. If rangeland is decreasing through out the years, what are the reasons for this?
21. Discuss natural constraints towards pastoralism.
22. Discuss the man made constraints towards pastoralism.
23. Major livelihood activities in the woreda, contribution, drawbacks,
24. The beginning of livelihood diversification, its status, and viability of the activities
25. How many kebeles can use irrigation facility? How many have used it up to now? What is the percentage of the population using irrigation facility?
26. Discuss on the importance of sedenterization and nomadic pastoralism
27. Challenges and opportunities of diversification

Annex-3

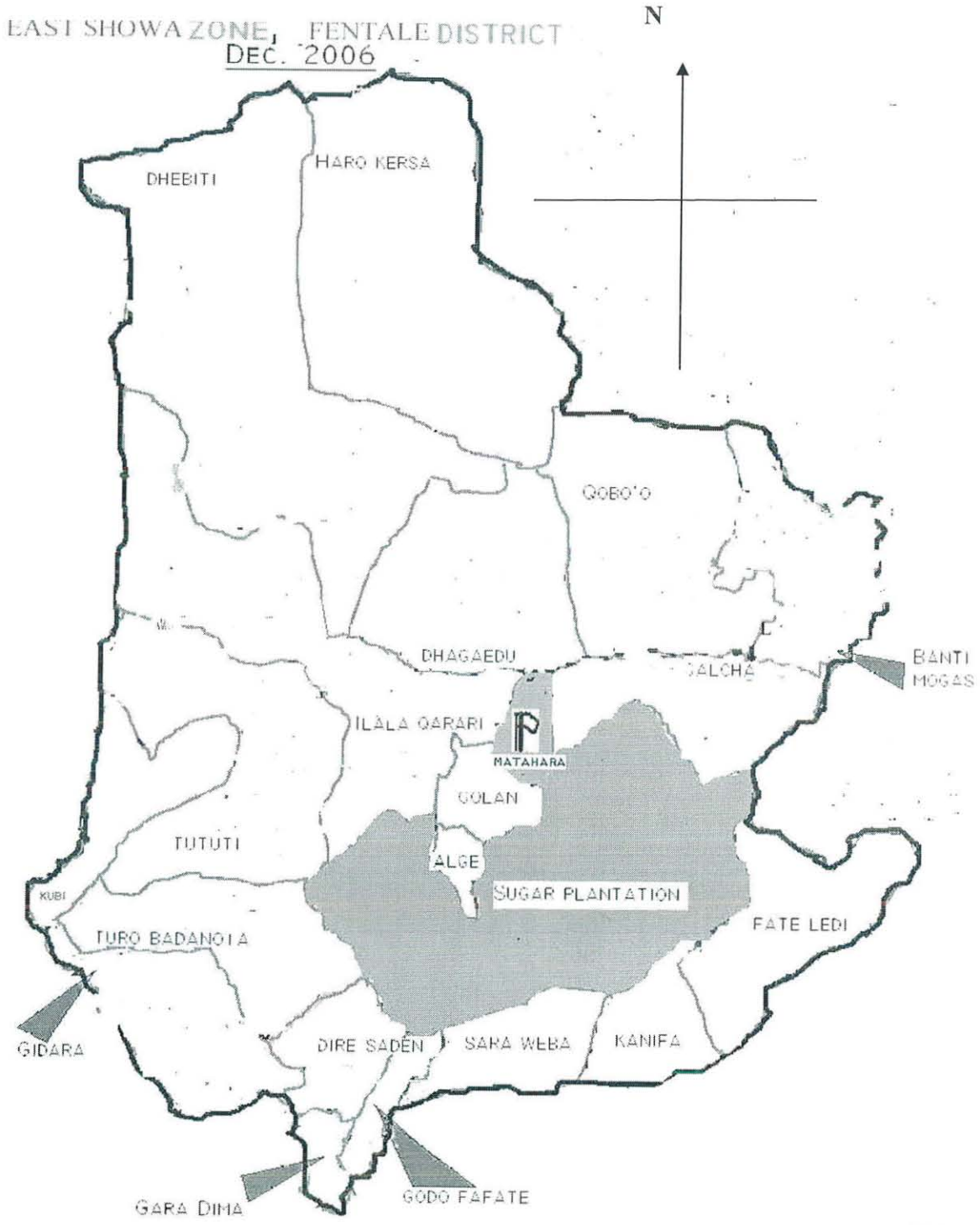
Check list for focused group discussion (FGD)

I. Background of respondents

1. Group title_____
2. Kebele_____, 3. Major Occupation _____
4. Why are you engaged in this occupation?_____

II. Pastoral related issues

5. How do you evaluate pastoralists' access to land?
6. Discuss pastoralists' access to water, type of water, distance to water resources in the woreda,
7. Discuss access to rangeland, and trend of rangeland shrinkage in the woreda.
8. Road access in the woreda, type, distance
9. Transportation access, type...
10. Supply of agricultural inputs
11. Supply of credit services, how the community save their money
12. Nature of health services
13. Education facility
14. Extension services in pastoral areas.
15. Status of the existing social institutions (modern and traditional)
16. If rangeland is decreasing through out the years, what are the reasons for this?
17. Discuss natural constraints towards pastoralism.
18. Discuss the man made constraints towards pastoralism.
19. Major livelihood activities in the woreda, contribution, drawbacks,
20. The beginning of livelihood diversification, its status, and viability of the activities
21. The use of irrigation facility in the woreda?
27. Discuss on the importance of sedenterization and nomadic pastoralism
28. Challenges and opportunities of diversification



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DOCUMENTATION CENTRE
INSTITUTE OF DEVELOPMET RESEARCH
ADDIS ABABA UNIVERSITY
P. O. BOX 1176, ADDIS ABABA
ETHIOPIA