ADDIS ABABA UNIVERSITY

INSTITUTE OF DEVELOPMENT STUDIES

CENTER FOR ENVIRONMENT AND DEVELOPMENT

THE EFFECT OF LIVESTOCK PRODUCTION AND MANAGEMENT SYSTEM ON ENVIRONMENTAL RESOURCES, IN MIXED FARMING AREA. THE CASE OF SEKA CHEKORSA WOREDA , JIMMA ZONE OF OROMIA REGIONAL STATE.

By

Mesud Shahid

A Thesis Submitted to School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirement for the Degree of Maters of Arts in Development Studies

(Environment and Development)

Addis Ababa University

School of Graduate Studies

June, 2011

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

INSTITUTE OF DEVELOPMENT STUDIES (IDS)

Title

The Effect of Livestock Production and Management System on Environmental Resources, in Mixed Farming Area. The case of Seka Chekorsa Woreda, Jimma Zone of Oromia Regional State.

By

Mesud Shahid

DEVELOPMENT STUDIES

APPROVED BY THE BOARD OF EXAMINERS: SIGNATURE

Dr. Belay Simane _____
CENTER HEAD

Dr. Feyera Senbeta _____
ADVISOR

Dr. Belay Simane _____
INTERNAL EXAMINER

Acknowledgement

First and for all I would like to thanks the Almighty Allah who help me to successful completion of this study. I feel deeply indebted and to wish express my sincere gratitude to my major advisor Doctor Feyera Sembeta for all the wealth of knowledge passed on to me during my thesis research work. His useful comment and corrections on this work deserves much of the credit of the completion of the thesis. I would like to acknowledge my promoter Doctor Belay Simane to his constructive comment that helped me in all this thesis work

To start with, I would like to thank my institution, Samara University for allowing me to join the program and pay my salary through out the study period. My warm thanks go to Seka chekorsa Woreda Agricultural and Rural Development office staff especially those in livestock departments' I also like to thanks administrators and development agents who provide me the necessary material and information during the work.

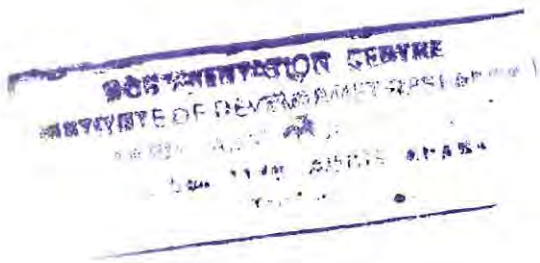
I would like also to acknowledge my enumerator who have tolerated the hardship during filling the questionnaires with full of patience. I am highly indebted to my friends Abduselam Muse and Elias Abdi for their genuine support and encouragement by providing me the necessary materials and comments.

I am particularly indebted to my beloved wife, Masho Abba Mogga for her moral and financial support even during my field work. My father Shahid yesuf, my Mother and all other relatives and friends that not possible to list their name, deserve to support during my study.

Table of Contents

Title **Page**

List of Tables and Figures



Acronyms and Abbreviations

AH	Allaga Handode
CBO	Community Based Organization
CGL	Communal Gazing Land
CSA	Central Statistical Agency
DA	Development Agents
DPSIR	Driving force Pressure State Impact Response
BOD	Biological Oxygen Demand
EPA	Environmental Protection Authority
FAO:	Food and Agricultural Organization
FDG	Focus Group Discussion
GDP	Growth Domestic Product
GH	Geshe Luchine
ILRI	International Livestock Research Institute
LSD	Lumpy Skin Disease
MOA	Ministry of Agriculture
NAMA	National Appropriate Mitigation Action
NGO	Non-Governmental Organization
SCWOA	Seka Chekorsa Woreda Office of Agriculture
SH	Shashamene
SIDA	Swedish International Development Agency
TLU	Tropical Livestock Unit
UK	Ushane Koche

Abstracts

The multiple contributions of livestock in natural resource based livelihood strategies are very well common in mixed farming system of the country. However, with increasing in number of population, that followed with serious land fragmentation and resource depletion, have caused the positive livestock-environment interaction to be deteriorated and so that the livelihood of the communities being adversely affected. This paper examines some environmental elements that are highly related with livestock sector and assess their degree of interaction in mixed farming area of Sekachekorsa wereda, Jimma zone of Oromia Regional State.. The household's livestock production system assessed in relation to some environmental resources specifically, grazing land, forest land, and crop land . The role of livestock in integrated land resource management, and some socio-economic constraints, that affect livestock production system and its contribution in natural resource management are also assessed.

The data for the study was collected from both primary and secondary sources. For primary data, household survey was made by using structured questionnaires. For this end, a sample size of 120 hhs were proportionally selected from these four kebeles. Key informant interview, FGDs, and observation were also used for primary data collection. The secondary data also acquired from various documents. Descriptive statistics like percentage, frequency, correlation etc. were used to analyze the data.

Result revealed that, livestock production and management system affect environmental resources: with increase in number of households, demand for cropland and animal products increases. As result the livestock size at community level increases, while the pasture land decrease or remain unchanged. This causes serious animal feed shortage, and forced most households, mainly those with small land size, to feed on forest land, crop land and other marginal lands as alternative sources. These, coupled with other variables, like grazing system, drought, as well as poor institutional collaboration and policy measures, resulted in over all resources degradation and reduce the positive role of livestock in resources management and agricultural production in the area, with varying in degree of serious across various agro-ecologies in which each studied kebele fall.

Hence, it is recommended that, for a livestock to play a more positive role in promoting agricultural productivity and ecological sustainability in the area and to control its negative impacts, several intervention are needed. Increasing the productivity of croplands, pastureland as well as livestock from smaller size through material provision and professional support, is needed from government side. Participatory (community based) and inter- sectoral planning and working habit is needed for land resource development and management considering livestock as integral component of production in the area.

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

Although the environment may previously have been hostile it is only in recent times that it has become necessary to consider how to satisfy human needs for food without destroying the environment in which that food production must take place (FAO, 1996). The domestication of animals and their integration with crop agriculture have provided the main avenue for agricultural intensification and thus intern has allowed for unprecedented environmental and human population growth.

Large land areas have already been degraded due to overgrazing and deforestation because of ranching (deHaan et al, 1997): Biodiversity is affected by extensive as well as intensive livestock production (Jahnke, 1982). Where animal's concentrations are high, land and water may be polluted through waste from animal production and processing (Hendy et al, 1995). Livestock are an important source of gaseous emission, contributing to global warming (Houghton et al, 1995).

The world's livestock sector is growing at unprecedented rate and this growth is only taking in developing countries (FAO, 2006). Livestock are not only important as producers of milk, meat and eggs, which are part of modern food chain, but other non-food functions, although of declining in importance, still provide the rationale for keeping the majority of the world's livestock (FAO, 1996) .For millions of small holder farmers, animal draught power and nutrient recycling through manure compensate for lack of access to modern inputs as tractor and fertilizer, and help to maintain the viability and environmental sustainability of production (FAO, 1997). Often livestock constitute the main if not the only, capital reserve of farming households, serving as strategic reserve that reduce risk and adds stability to the overall farming system (FAO, 1995). As such livestock can satisfy a large variety of human needs. However, in many places, livestock production is not balance with environment or denied access to traditional key resources and degradation is the result.

Other studies state that, the earlier miss conception of the role of livestock in sustainable development influence global think about the sub sector. After 1992, Rio summit on the Environment and Development, a multi lateral livestock environment initiative was formed to address the role of livestock in the food security, poverty alleviation and environmental protection (Sida, 2010).

In Ethiopia, livestock sub sector is the integral components of the agriculture on which 85% of the population depends. Livestock supply drought power to cultivation, food and income and insurance against risk for households. However, the contribution of livestock to the economy of the country is small due to feed shortage, environmental degradation and management problem (Berhanu et al, 2002).

Land degradation in many parts of Ethiopia caused by complex sets of factors involving man and his stock. Crop encroachment in marginal areas and fuel wood collection, land tenure, settlement and incentive policies have undermined traditional land use practice and contribute to degradation through overgrazing (Aynalem, 2000). Livestock follows deforestation, where ranching pushes in to the remaining forest and wood lands. Significant biodiversity losses are associated such deforestation including loss of wild life. In many highland areas of the country, high human population densities are traditionally sustained by complex mixed farming system (Bojo and classelli, 1995).Continuing human population pressure lead to decreasing farm size to a point where the system disintegrates.

The concerns over environmental effects of livestock production, in Ethiopia, are of relatively recent origin. It is generally considered that, the impact of livestock production in the country have more positive implication than negative ones, as the production system is still largely predominated by rural based crop livestock integrated small holders mixed farming system (Aynalem, 2000). Increasing in population, declining grazing resource base, increasing in demand for animal products, etc are important around livestock production in the context of sustainability.

In many parts of Ethiopia, communal grazing lands are patrons of mixed farming directly influencing the livestock sector and indirectly the crop production through their

influence on the soil productivity (Abera, 2006). To produce good yield it require organic matter. The soil of most parts of the highland region is reddish clay, which is nitrogen deficient (Jackson et al, 1968). Because of the need for manure livestock and grazing lands on which they mainly depend are essential parts of crop production in the areas. Teshome (1999) indicates, the shortage of livestock feed to be one of the major problems of enset production which is permanent staple food of the whole southern Ethiopian.

FARM Africa (1998), in its field research, identified that with frames shortage of livestock feed to be one of the major problems of Agricultural production of South Western highlands.

In these contexts, this paper analyses the woredas livestock production system and its interaction with some environmental elements in traditional but changing mixed farming system.

1.2 Statement of the Research Problem

In mixed- production system of Seka chekorsa wereda, cattle play an important role by supplying draught, while equines are the highland beats of burden, small ruminants and poultry are the main source of cash and family consumption . However, in this area, high stocking density and intensity of cultivation is not of proportion to carrying capacity. Currently due to demand for food, grazing land are steadily shrinking being converted to arable lands, and restricted to areas that have little value of farming potential such as hill tops, swampy areas, roadsides and other marginal lands, particularly in mixed farming of highlands and mid altitude. This trends causes serious environmental degradation and adversely affect livestock production.

Despite the Conesus on the regions high ecological potential for livestock production, the study woreda is seen one that still in crisis today mostly due to pressure on the communal grazing land by high population growth rates, increasing in land under crop specially cash crop production etc .

A study on watershed management in the woreda, shows that, the gradual encroachment of cultivation in to grazing land is found to be the major factors for areas ecological

deterioration. This mainly because, though pasture land is declining, the farmers still continue in keeping more livestock size which exceeding the carrying capacity of the area. The remaining natural grazing land is deteriorating rapidly due to lack of attention from both formal and informal institutions. Marginal lands like near water points are generally the most affected, soils are under risk of degradation, especially when cattle feed in crop lands. Erosion due to overgrazing, plants is affected when they feed on forestland as alternative sources.

The market oriented program that push the farmers to specialize on cash crop like coffee , in the area aggravated the problem since most households are converted their pasture land to such crops by giving less priority for fodder resources. Feeding in such plant as alternative, however, affect the resource itself.

As study by Ayalew (2009), in the woreda, in most of the kebeles, free and uncontrolled grazing is the dominant grazing system. Most of grazing lands are grazed and trampled the whole year round without any resting period, resulting in depletion of palatable species and invasion by less palatable or unpalatable one. Moreover, grazing on crop land contribute to soil compaction and the need for frequent tillage to prepare field for crops, making practices such as reduced tillage less feasible.

In addition to its contribution to the grazing lands, the grazing system has negative effects on the conservation efforts underway on the region. Physical conservation structure such as stone terraces and soil bunds etc. are damaged by freely roaming livestock. Biological conservation practices such as grass strip, tree plantation, mulching and fallowing also being destroyed or trampled, are reducing the chance of establishment and regeneration Ayalew, 2009).

The free grazing system results in externality costs to those who do not own livestock. Fallow lands and cultivated lands after harvest are considered as grazing lands without access restriction. Free grazing reduces vegetation cover thus contribute to saleroom reduction of soil fertility, decrease in soil organic matter, and deterioration of soil structure (Ayalew, 2009). The problem aggravated by poor collaboration among different departments.

Uncontrolled traditional livestock production and management system in this sense was resulting in poor agricultural productivity, food insecurity and poverty among rural communities in the study area.

The livestock- environment interaction became even worst with current changing in climate (Vander, 1991). That result in frequent drought and rainfall variability's in all parts of the country with varying in degree of serious.

1.3 Objective of the Study

The overall objective of this study is to assess the relationship between livestock production system and environmental resources in mixed farming system of the woreda.

Specific objective

- To assess the effect of livestock production and management system on some environmental resource (specifically, grazing land, croplands, forest and woodland, etc.) and its causes in the woreda.
- To assess some socio – economic, policy and institutional contexts that influence livestock management practices and its contribution in natural resource management in the area.
- To indicate ways forwarded to maintaining harmony between livestock production and environmental resources in study area.

1.4 Research Questions

- What are the major environmental factors affecting livestock production in the area?
- How and to what extent the livestock production system affect the grazing land resources in study area?
- How the livestock affect forest resources?
- How the livestock are interacting with crop lands and what are their livelihood implications?
- What is the role of livestock in integrated land resource managements in the study area?
- What are the major socio - economic and technical constraints that determine the link between livestock production and natural resource managements in the study area?

1.5 Significance of the Study

Generally, the impacts of livestock production system on environmental resources, in the study area do not well know. Livestock have been criticized for damaging the environment in many ways (FAO, 2005).

Increase attention to livestock - environment interaction is therefore of critical importance in sustaining the areas resource base. Finding the balance between and among human people and livestock population growth and environmental resource base, by investigating their degree of interaction and its consequences on socio- economic of the community across different farming Zone in the woreda is necessary to suggest the way how to control the negative environmental impacts of livestock production and management system and the way how to drive livestock production through environmentally conscious growth path so as to sustain the livelihood contribution of livestock in mixed farming system of the area. So this study helps to:-

- Enabling planners to understand how livestock sector are threatening the environment or being threatened in the woreda and would contributing to the design of more effective intervention.
- Address the role aid (like technical, economic and institutional etc) can play in balancing both elements.
- The study will serve as document for extension workers, researchers, and academicians etc who are interested in this issue.

1.6 Limitation of the Study

The study was conducted to assess the environmental impacts of livestock production. However, the study get difficulty of quantifying the extent of land degradation associated with variables like overgrazing because of its complexity and lack of measurable land quality indicators. This also requires very expensive instrument and ample time that make it impossible at this level. The other limitation of this study, as indicated in conceptual framework, variables like source of income, transportation and cultural value of livestock

CHAPTER TWO: LITRATURE REVEIWS

2.1 Livestock and Environment

Livestock can damage land and vegetation in a number of different ways but there are also many example of environmental balance and positive contribution. Livestock interact with land /which includes soil and vegetation/, water, air, and plant and animal biodiversity (FAO, 2006).

About 34 million km^2 or 26 percent of the world's land area is used for grazing livestock. In addition, 3 million km^2 or about 12 percent of the world's arable areas is used for livestock feed production. A large part is recycled but, where animal concentrations are high, it poses an enormous environmental hazard. Livestock grazing can affect the water balance in certain areas. Livestock interact directly and indirectly with biodiversity, while often biodiversity is compromised there are also examples of mutual benefit. Livestock and livestock wastes cause gaseous emission with important local and global impact on the environment (Heing Steinfled et al ,2003, FAO, 1996).

2.2 Critical Areas of Livestock – Environment Interaction

2.2.1 Grazing and Overgrazing

Grazing animal can improve soil cover by dispersing seeds with their hoots and through manure, while controlling shrubs growth, breaking up soil crust and removing biomass which other wise might provide fuel for bush fires. All these impacts stimulate grass tillering, improve seed germination and thus improve land and vegetation. On the other hand , heavy grazing causes soil compaction and contribute to erosion, and decreases soil fertility, organic matter content and water infiltration and storage (Sere and Stein feld, 1996).

Many of the worlds grazing areas are threatened with degradation especially in semi- arid and sub humid zones. Increased population pressure coupled with miss guided policies that favors cropping rather than livestock have led to much of the best pasture being turned over to crops.

Tropical rain forest covers about 720 million ha and contains approximately 50% of the world biodiversity. Since 1950 more than 200 million ha of tropical rainforest were lost with various combination factors including ranching and crop cultivation and forest exploitations. Ranching induced deforestation is one of the main causes of loss of some unique plant and animal species in the tropical rainforest, one of the world's richest source of biodiversity (FAO, 1996).

2.2.2 Crop-livestock Interaction: Intensification and Involution.

The integration of crops and livestock still represents the main avenue for food production. Mixed farming provides farmers with an opportunities to diversify risk from single crop or livestock production, to use labor more efficiently, to haves source of cash and to add value to low value or surplus feed. To varying extent, mixed farming system allows the use of waste products of one enterprise (crop byproducts, manure) as input to the other enterprises as (feed or fertilizer). Mixed farming is in principle beneficial for land quality in terms of maintaining soil fertility (Thomas and Barton, 1995).

Adding manure to the soil increases the nutrient retention capacity, improve the physical condition by increasing the water holding capacity and improve soil structure stability. However, mixed crop livestock neither generate new nutrient, nor reduce nutrient surplus (without nitrogen fixation by leguminous plants). But livestock even in situation of low technological levels allow for,

1) the spatial and temporal allocation of nutrient from areas of lower returns from cropping to those with higher returns.
2) the acceleration of nutrient turnover in the production cycle and
3) the reduction of nutrient losses with in the cycle compared to agricultural production with out livestock

Thus, the key issue is the nutrient balance. Most mixed farming system of the developing world has a negative nutrient balance. Deficits are partially covered by a flow of nutrient from (often communal) grazing area to crop land. As population pressure changes the crop/ grazing land ratio, and if other sources are not available, fertility gaps widen.

This is typically the case of many mixed farming systems in the tropics reported deficit ranged from about 15kg N/Ha/year in Mali to more than 100kg N/ha/year in highland of Ethiopia (de wit et al, 1996). The result is that crop yields continue to decline. This can leads to increased competition for land and grazing resource or of the rangeland. Resource degradation, property and population pressure can be a high risk of conflicts as these event in Rwanda have proven.

For the mixed farming system, livestock provides the economic justification for maintaining a mosaic of land use pattern. Past policies have often limited the synergistic effect of crops and livestock in nutrient deficient situation. Imposing high import duties to protect domestic cereal production pushed cropping into marginal areas and upset the equilibrium between crops and livestock. Poor land tenure security, especially in rain fed mixed farming system of the developing world has provided a disincentive for investment in long-term soil fertility improvement such use of inorganic fertilizers and the use of green manure and leguminous fodder crops in the crop rotation.

In many places of the world subsistence farms with crops, livestock and household closely inter linked (closed circuit farms) have developed and continue to be predominant feature. With human population pressures increasing further, the needs for intensification bring livestock more and more into cropping area and interrogate the main nutrient and energy cycles. Two major features emerge one scenario leads to specialization where market forces and technological requirements force mixed farming system to grow to unit size and to specialize. With specialization their are fewer opportunity for on farm crop- livestock integration. Another significant trend is what has been described as "involution" or collapse of the mixed farming system. In virtually all tropical highland areas, the relatively high human population densities are traditionally sustained by rather complex mixed farming system. Population pressure may decrease farm size to a point where associated land pressure are no longer compensated .By commensurate land productivity increase resulting in the disintegration of the system. Livestock often large ruminants can no longer be maintained on the farm. This results in greater deficit of nutrients and energy and leads to natural resource degradation and loss of investment. There is mounting evidence that human population pressure, poverty and resource degradation aggravated

by lack of access to markets and employment opportunities are cause and effect factors of the involution.

This involution of previously well integrated mixed farming is to be seen as another livestock environment "hot spots". Here is not the interaction between livestock and natural resource that create a degradation problem but rather the socio- economic contexts that lead to a diminishing interaction which eventually ceases altogether (English et al, 1992).

2.3 The Ethiopian Population, Livestock and Environment

Ethiopia is one of the poorest countries in the world. The Agricultural sector including livestock raring, contributes disproportional much to the national economy. It accounts for some 50% employment, 85% of exports revenue and 45% of the GDP (FAO, 1993). Most of total national agricultural produce is generated by the subsistence oriented farms, who are cultivating micro-holding with impoverished soils on sloping and marginal land. These smallholders constitute the poorest and largest segment of the population whose livelihoods directly depends on the exploitation of natural resources. They operate with obsolete agricultural technologies and with livestock playing the key role in the production process. The basic nature of the agricultural production is thus exploitative without sufficient use of ameliorative inputs, which is undermining the sustainability of the life support system (Woldeamlack, 2003).

The pressure on the land resource is more severe in the highland (1500m.a.s.l) of the country, constituting some 45% of the total area. The highlands accommodate some 88% of the human and 75% of the livestock population, and constitute about 95% of the regularly cultivated lands (FAO, 1986). These highlands have in deed been settled for millennia, and agriculture has a matching history. Currently the highlands farming population growth with rate of around 3% per annum and correspondingly the livestock population is increasing. These place more demand on more marginal lands for cultivation and grazing uses, leading to more devegetation and degradation. The devegetation and degradation of the grazing land create shortage of fuel wood and animal feed forcing the rural poor to divert dung and crop resides from their traditional role as soil nutrient to burning for fuel and feeding livestock respectively. Coupled with many other

physical, socio- economic and political factors, these conditions are leading to degradation of natural resources base (Woldeamlak , 2003) .

A recent study cast an interesting light on a possible effect solution to the environmental puzzle; solution that is nevertheless impossible to implementing. It promised that, regeneration of ecosystem to a much healthier form in the hills and slopes of Ethiopia highlands is possible if these area can be kept free of human and animal intervention. Some practical examples have also been offered the Gunano community & other in southern who Ethiopian have reduced the number of cattle per family and have witnessed some environmental healing. Others have done the same but in response to force not entirely with in their control. A recent study of a community in the southern region showed that, in the mid 1980's the average household kept 7-8 heads of cattle, but this has since declined to 1-2 head per household, because of shortage of feed, the conversion of grazing land areas to farmland, they forced sale of livestock to pay off taxes and depts. and losses from diseases.

A more recent research focused on the Adwa area of northern Ethiopia came up with the suggestion that matching the human and livestock densities with the carrying capacity of the land through recruitment of the surplus labor force for a modern economy, resettlement, off-farm employment and intensification of agriculture are the long and short- term action that may contribute to the rehabilitation of the degraded areas.

2.4 Limitation of Pasture and Forage Resources in Ethiopia.

Feed quality and quantity:-Natural grazing is the major source of livestock feed and in both highland and lowland of the country. However, grazing lands do not fulfill the national requirements of animals feed, particularly in the dry season, due to poor management and their inherent low productivity and poor quality. In the highlands with rapid increase of human population and high demand for food, pastures are steadily being converted to farmlands. Marginal lands unsuitable for cultivation such as water logged, flooded soils and steep lands are left for grazing and their productivity is very low. Another population associated problem is

environmental degradation due to deforestation and overgrazing which have substantively reduced soil fertility and further reduced productivity (Alemayhu, 2002).

Ecological deterioration: Gradual encroachment of cultivation into grazing lands is common in both highland and mid-altitude areas. So many meadows in the flood plains have been converted into croplands. Due to vegetation clearance many steep areas have became vulnerable to wind and water erosion. Important brows that was dry season forge has been wiped out to supply fuel and construction wood. Natural grazing land is deteriorating rapidly due to lack of attention and its carrying capacity declining due to high stocking and declining in pasture land.

Overgrazing: Grazing and browsing animals overstock natural pasture: areas near water point are generally the most affected and grazing lands are dominated by palatable plants. In many rural areas, since the number of stock has socio-cultural value, it has a synergistic effect with the diminishing grazing lands. Soil is under risk of degradation with reducing infiltration, low permeability and a reduction in the water holding capacity. The result is decrease in the ability of the soil to support plant production (Alemayhu, 2002).

Land Tenure /change of ownership: In Ethiopia land, ownership is thought to be communal, where ethnic groups used to manage grazing lands. However, the federal or regional state can allow private investment in pastoral land. In such case, the tragedy of common will became real-unless some adjustment is made. The theory argue that as animals are held individually while range is owned in common , herders will always invest in more animals because benefit accurse to individuals. It assumes that, if everybody follows the same strategy; there is a tragic movement towards over-exploiting the resource. As the herders are aware of the decline of pasture, but self interest will prevent them doing anything about it. The theory directly links resources degradation to a common system and suggest that sustainable environmental policy will only come about through the promotion of private property and or will come about through coercive measures (Alemayhu, 2002).

Drought: One of the most unfortunate characters of Ethiopians climate is great variability of rainfall from year to year. Ethiopia is known for recurrent drought and famine (Alemayhu,2002).

Weed and Bush Encroachment: As a result of overgrazing, many natural grazing lands are invaded by palatable weeds and woody plants. In most rural areas misunderstanding the traditional knowledge has lead to restriction of management with fire is a natural components of tropical ecosystem; its absence have created bush encroachment (Alemayehu ,2002).

Soil Fertility: The annual food and livestock feed deficit of the country is attributed directly to soil erosion and for water erosion and the remainder has been cultivated without conservation measures for thousands of years.

Lack of Seed and Planting Materials: The absence of quantity and quality seed and seeding production limits the vast expansion of improved pasture and forge development (especially around the dairy farming and fattening).

2.5 Socio-Economic Constraints in livestock production system in Ethiopia.

The limitation to increasing livestock development (increasing production and productivity), without harming the environment in Ethiopia are multidimensional. Socio-economic constraints include policy issue, land tenure, institutional, marketing and budgetary (Alemayhu, 2002).

There is a need for an environmental policy for nature resource to be used in way which allows sustainable production in the long term (Berhanu et al, 2002). Livestock and natural resources management are influenced by many aspects of government policy ranging from economic and social to political. The major policy issues that are relevant to livestock production are: Absence of livestock policy, pricing policy, community organization and participation and land tenure (Alemayehu, 2002).

Inadequate input distribution system and credit facility contribute to the poor performance of livestock sector. Lack of educational infrastructure for training and extension is another important issues that needs to be addressed.

Inadequate services and livestock technology packages emanating from the weak link between extension and research, absences of beneficiary participatory planning and agricultural training to the changing needs of the country are some of the major institutional constraints (Alemayehu, 2002).

The marketing process is generally follow a three-tier system with primary intermediate and terminal market through which marketable animal and animal products pass from producers to small traders and on to large traders and or butchers. However, most producers sell their stock and livestock products at local market directly to the consumers or small traders at relatively low prices (Alemayehu, 2002).

2.6 Conceptual Framework for the Study

Schematic representation of conceptual frame work on livestock and environmental interaction in mixed farming system and its socio-economic implication is presented in figure one. Livestock- environment interaction can be both positive and negative and the result can also be both adverse and beneficial for livelihood. There are interaction between the farming practices adapted by farmers in particular locality and the degree of interaction between livestock and environmental resources as well as their effects on the livelihood of respective community.

According to FAO (1995), livestock production both traditional and industrial have contributed to the worlds most pressing environmental problems including global warming, land degradation and air and water pollution .

There are several environmental 'hotspots' where livestock- environment iterations are particularly critical (AGAP,1998). These include grazing lands (overgrazing and degradation), forest and wood lands, wildlife and biodiversity, water resource, croplands etc, The interaction on these points are more critical in Ethiopia highlands based on other land use related policies, land management practices, settlement etc (Bojo and Classelli , 1995) .

Abera (2006) and Jacson et al (1965) explained, vicious circle of land mismanagement when ever grazing land shrinks like less grazing land means either fewer cattle or overgrazing which

affect erosion and which later leads to eventually fewer cattle, fewer cattle means less manure, less manure means more arable land requirement, more arable land means less pasture etc.

Degree of livestock- environment interaction is also determined by number of livestock per land, types of livestock, grazing system, market etc.

Ethiopia natural resource base (land, water, and biodiversity) etc, are the foundation of economic development, food security and other basic necessities of the people. These resources are under intense pressure from population growth and inappropriate traditional farming (crop production & livestock raring), and management practices. There is also widespread problem related to extensive cultivation, overgrazing and deforestation, and consequential soil erosion and soil fertility decline, water scarcity, livestock feed and fuel wood crisis. The quality and management of land resource has become and increasing matter of concern due to additional stress of climate change (Belay, 2010). Adverse livestock- environment interaction problems are likely to be exacerbated by arise in the frequency of extreme weather events (Hurni, 2003). As mitigation option to climate change NAMA planned for instance to composting 80, 000km^2 of agricultural lands and 26, and 1840 km^2 practicing agro-forestry in coming five years (EPA, 2010). But both of these practices require effective livestock management practices.

The central roles of livestock in natural resource based livelihood strategy, particularly which of poor women and men in rainfed regions of Ethiopia are well acknowledged. It contributes for the livelihood of the community in many ways- income from products, insurance against drought, emergency cash requirements, tenancy for share cropping, household nutrition, fuel for cooking, manure for crops, draught power for farming etc. With positive or negative interaction of the sector with environmental resources, this livelihood would either adversely or beneficiary affected (Alemayehu et al , 2002).

The issue related with livestock, livelihood and natural environmental resource fall under the preview of different line departments that have limited mechanisms for collective planning (ILRI, 2003). The key facts that, departments looking after livestock development have no control on land resources, and that department owning and managing land resources have no

direct connection with livestock, are often neglected. On grazing lands particularly communal grazing land, the policy-based problem have been common (Alemayehu et al, 2002). The first is land tenure insecurity:- lack of confidence in secure title to range land has been shown to reduce the incentive to manage the land sustainability. Many national governments have either implicitly or explicitly claimed ownership of range and ignore traditional or customary claims. The second is *privatization* of communal resources, which affect the normal trend of this resource management and lead to environment degradation. there is a need for an environmental policy for natural recourse to be used in ways which allow sustained production in the long run term (Berhanu et al , 2002).Livestock and natural recourse management are influenced by many aspects of government policy ranging from economic and social to political. The major policy issues that relevant to livestock production are absence of livestock policy, pricing policy, community organization and participation and land tenure as above (Alemayehu et al, 2002).

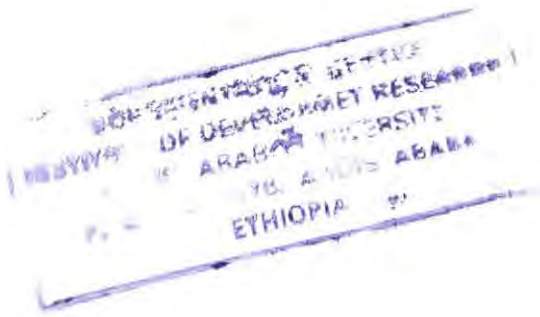
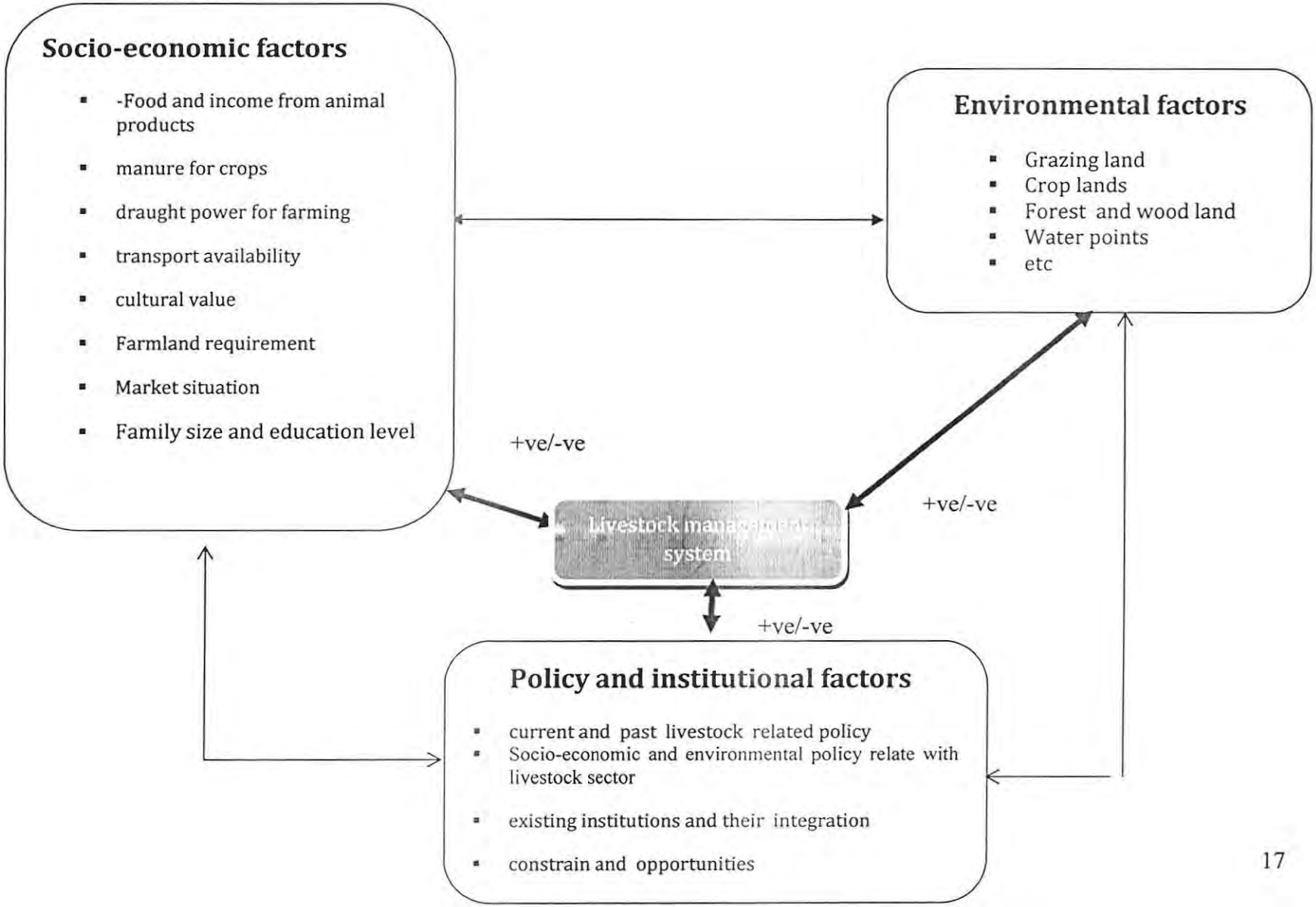


Figure-1: schematic representation of livestock management system and its interaction with socio-economic and environmental elements in the study area.



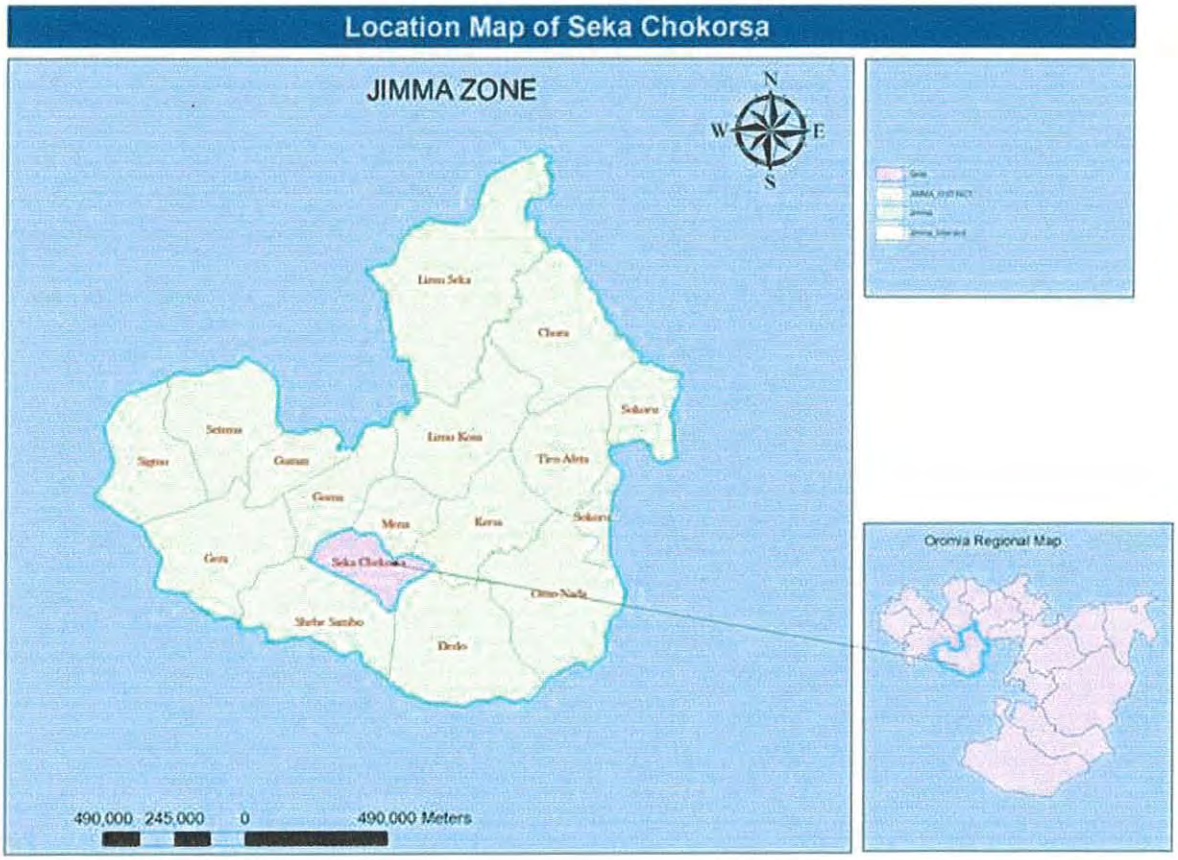
CHAPTER THREE: METHEDOLOGY

3.1 Description of the Study Area

3.1.1 Location:

Seka chekorsa woreda is one of the woreda's found in Jimma zone of Oromia regional state. Geographically it is located between 36^0 33' 53" to the E and $7^0$20' to 7^0 45' to the N. It is bounded by Gomma and Manna woreda in the north, Gera woreda in the south, Dedo and Jimma Town in the East and Shabe Sombo woreda in the west. Currently, the woreda covers an estimated area of 455km^2 and divided in to 36 rural kebeles and 1 urban (town) kebele.

Figure 2: The relative location of the study Area.



Source :Ethio-GIS

The elevation of the woreda ranges from 1560 masl to 3000 masl. The woreda, mainly falls with in Ghibe watershed. The woreda is divided in to two agro- ecological zones; Dega and woinadga, accounting for about 19% and 81% of the total area respectively. The climate condition is generally humid. The rainfall pattern is unimodal, with arising limb starting in March to April and reaching into peak in between July and September. It is this season that the major agricultural activities such as ploughing, sowing and weeding are carried out in the study area. The dry months are November, December, January and February. The mean annual rainfall of the woreda, is between 900 mm to 1400 mm. And the maximum and minimum temperature recorded of the area varying between 7-11c^0 and 18-28 c^0 respectively (WARDO, 2010).

The soil of the study area can be classified into two groups on color:- reddish soil and grayish soils. The reddish soil occurs on steeper slopes, mainly in dry woinadega area of the woreda. These soils have been deeply leached and are moderate to low in natural fertility and with some level of acidity. The reddish brown color, cover mostly the area from moist woinadega to Dega zone of the woreda and they are moderately better in fertility. The very shallow and unproductive, lithosols, are confined to the severely eroded steeper part of the woreda (WARDO, 2010).

The grayish soil occupy river valley floors, these are deep grey to dark in color and largely fluvial sediments. They are apparently fertile soil. The remaining is clay type and mostly used as grazing land. The nature and properties of the soils such as texture, aggregate, stability shear, strength, infiltration, capacity, and organic matter and chemical components, which are interacting in complex manner, constitute an important factor affecting the susceptibility to detachment and transport (erodability of the soils by the forces of erosion (WoldeAmlak, 2005, Morgan 1998). Organic matter content and texture composition can be considered the most important, as these influence another soil properties.

Though the woreda located in naturally green part of the country, the natural forest decreasing in recent time due to population pressure that cause increasing demand for arable land, fuel wood and other uses, specially in Dega agro ecological zones. However, in woinadega area, one can see a very dense forest covered which is coffee forest. Some can also see here and there patches

of natural forest area in some pocket places. Recently, as informant explained it, forest lands in the woreda increased significantly but almost all of eucalyptus afforestations and agro - forestry. It explained that, people are increasingly dependent on eucalyptus trees for fuel, and construction, even for sell especially for those near main road and towns. These agro forestry and eucalyptus increases at expense of pasture land both private and communal which shows a tremendous decline (WARDO, 2010).

The woreda has many types of water sources: - Rivers, Streams, Ponds (permanent), and springs as well as ground water well.

3.1. 2 Land Use /Cover

Much of the weredas land area is under crop cultivation both annual and permanent crops (70%). The table 3.1 shows land use/land cover in the woreda. Out of the total area only 2% is under grazing (communal grazing land). The disturbed natural forest accounts for about 13% of the woredas territory.

Table 3.1 land use/cover of Seka Chekorsa woreda

Land use	in hectare	percent
Crop lands	59,994	70
Wet land (perennial marsh)	628	0.7
Grazing land	1477	2
Reverian forest	268	0.3
Disturbed natural forest	10, 933	13
Bush land	1922	2.2
Community woodlots	461	0.5
Coffee forest	3293	3.8
Reverian grass	6099	7
Private (Investors farm land)	450	0.5
Others	300	0.3
Total	**85825ha**	**100**

Source; Woreda Agriculture and Rural Development main coordination office (2010).

3.1.3 Population and Socio- Economic Conditions

According to the Rural Development Office, the woreda has 455km^{2}area with 36 rural kebeles. There are about 31, 563 households, from these 27, 527 are male headed while the remaining 4,036 are female headed. 95% of them are based on agriculture for livelihood. The total population of the woreda in 2007 was 206, 427 (CSA, 2007), out of this 103,895 are male and 102 532 are female. The crude density is thus 382 persons/km^{2,} and therefore, the woreda is among the most densely populated area in Oromia Region.

Agriculture is the mainstay of the population of the woreda, 95% of the total population driven its livelihood from Agriculture. In addition Artisan and petty trading are supplementary activities exercised by many households in the woreda. The farming system of Sekachekorsa woreda is mixed farming, compromising both cropping and livestock rare. Enset is staple crop in the particular woreda. Other main crops grown in the woreda are maize, potatoes, Barley, wheat, teff, sorghum, sweet potatoes, etc. In the mixed farming system, livestock are important for draught power. They are main source of cash income to cover household's expense and supplement their diet. The woreda also known by its cash crop mainly coffee and chat especially in dry and moist woinadega area of the woreda. Recently the woreda also began to produce the highland fruit like Apple, as well as vegetable production. Despite all these products, the woreda economic condition of the people still so miserable and it is said to be one of the food unsecured area in the Jimma zone of Oromia region.

The woreda has considerable size of livestock, although the yield is low due to feed shortage, prevalence of disease and mismanagement. The livestock composition includes 60% cattle, 31% sheep, 5.4% Goats and 2.2% horses out of woredas total livestock.

Table 3.2: Size of livestock owned by 31, 563 households.

Livestock type	Total	Per HH	Woredas % out of total livestock
Cattle	171869	5.4	60
Sheep	88596	3	31
Goats	15492	0.5	5.4
Horses	6306	0.21	2.2
mules	1995	0.06	0.7
Assess	3414	0.2	1.2

Source: CSA (2007)

Regarding the availability of feed sources, natural pasture is the dominated feed sources which accounts for about (85%). From this private pasture accounts 70% and communal grazing land cover the remaining 15%. The second feed sources are crop residue, (10%), hay and stall-feed as well as improved feed also used at insignificant level (WARDO, 2010).

3.2 Methods

3.2.1 Sampling Methods

The Seka Chekorsa Woreda comprises 36 rural kebeles (WARDO, 2006). Among these rural kbeles, 4 sample kebeles, was proportionally selected for this study, by using *stratified random sampling*. Kebeles was stratified based on agro- ecological zones. According to MOA (1998), South Western highlands fall within two major agro- ecological zones; Wet dega (2300-3200m) and woinadega (1500-2300m). But, the woinadega is further subdivided in to three i.e. wet woinadega, moist woinadega and dry woinadega, with varying in amount of rainfall received (<900mm, 900-1400mm and > 1400mm) respectively. Dominant soil types, vegetation and livestock composition also expected to vary. Since this woreda, fits these division, I preferred to use it as stratification. One kebele from each stratum (ie, wet dega, wet woinadega, moist woinadega and dry woinadega) was selected.

From four selected kebeles, total sample sizes of 120 households were proportionally selected. The total HHs sizes of four kebele were about 3,740. By using the statistical formula

$n = N/1(N\ (e)\ 2$

At 95% level of confidence, and

0.05 error terms, Where

n=the sampled population

N= the whole population of the study area of four kebeles

e= error terms (source Glenn. D. Israel, April; 2009), the sample size of 400 HHs was calculated. But due to time and financial constraints, the sample size of 120hhs where taken for interview (study) proportionally with equal representation from each sub villages. These sample size is assumed to be sufficient representative of the total population as kebeles and villages and in turn households were categorized into homogeneous agro- ecological groups. The sample households were chosen by using *simple random sampling* (lottery method). To this end, lists of households were obtained from respective administrative offices.

Table 3.3 kebeles selected from Sekachekorsa woreda for the study

Kebeles	Agro-ecologies	Total households	Sample size
Allagahandode	Dry woinadega	850	27
Gesheluchine	Wet dega	1315	42
Shashamane	Moist woinadega	750	24
Ushanekoche	Wet woinadega	825	27
Total		3740	120

3.2.2Method of Data Collection

3.2.2.1 Primary Data Collection

Primary data were generated through a variety of techniques, including household interviews, key informant interviews, Focus group discussions and Observation. Both quantitative and qualitative method was used.

Household survey

To collect primary data on the general socio - economic situation, livestock production and management system, problem of animals feed over time , land tenure, manure management system, land degradation, climate variability and change, types and number of livestock they own over time, role of livestock in agricultural production and other livelihood, livestock related environmental resource problem, soil fertility trend and management overtime etc. were collected by using Structured interview questionnaire. To try to make the interviewees talking freely and openly, the necessary interviewer's code of conduct and guiding principles was strictly followed. The interview questionnaire that were prepared for household survey was pre tested and the question was refined by rewording, incorporating some relevant and discarding the irrelevant ones. In conducting the interviews, four enumerators who have knowledge about the area well acquainted with culture and language were recruited and trained before commencing the work of filling questionnaires.

Key informants interview (KII)

Interview using scheduled interview was carried out with five, five selected key informants in each kebeles . The informants for the researcher were from village leaders, local elders, and knowledgeable person in each kebeles. Focusing on issues like:- village history, resource availability in the village overtime, role of livestock in socio- economic activity and its environmental impacts and causes, perception to climate change and variability and its impact on livestock production etc. Experts from agriculture and rural development office, development agents (DA), kebele administrators, and other NGOs, and CBOs were interviewed in detail- to collect such data as livestock related resource availability, management practices and challenges, deferent land use types , institutional relation and interaction among themselves and with village

communities, the trends of mixed farming, wealth ranking to determine various economic groups, problems that are faced institution for collective resource management etc.

Focus Group Discussion (FGD)

FGD, was made by using semi structured interview questionnaire. Four groups from each village with size of 8-10 were taken. While one group comprise of economically better - off households, the second group were include the poorest. Size of land holding and ownership of livestock number are main aspect of differentiating wealth status in the economic strata of south western Ethiopian people (Olmenstead, 1973). Women and youngsters were another group used for this purpose. Assuming that the response varies according to geographical location, focus group discussion was held in each kebeles located in different agro – ecologies in study area.

Observation

For further information, on land use/cover, land degradation, overgrazing, deforestation and other environmental problems *physical observation* (structured) was also used.

3.2.2.2 Secondary data collection

Secondary data were collected from deferent sources including literature, survey data and document such sources as government and non-government organization/agencies and private sector in localities.

3.2.3 Method of Data Analysis

The study involves both quantitative and qualitative data analysis techniques. The quantitative data were analyzed using various statistical techniques such as means, frequencies, percentages, correlations, tables, and figures. To calculate the livestock / pasture land ratio (carrying capacity) of each kebeles , the cattle size each kebeles was converted to Tropical Livestock Unit (TLU) based on the conversion factors as used by (Strock et al, 1995) and cited by (Mulu, 2008). To ease the computations of quantitative data, the Statistical Package for Social Scientist (**SPSS**) was employed. While the qualitative data were analyzed, using deceptive framework. Pressure State Response (PSR/ DPSIR) table was used to reflect the environmental impacts of livestock in brief.

CHAPTER FOUR: RESULT AND DISCUSSIONS

4.1 Sampled Households Characteristics

4.1.1 Demographic Situations

As indicated in Table 4.1, 61.7% of sampled households have their family size within the range of 4 to 8 while, 23.3% of them have greater than 8. Among the studied kebeles, AllagaHandode and Gesheluchine have larger family size with average value of 8 and 7.3 respectively. The overall average family size of the studied Kebele is 7, which is greater than the regional average of 5.1 (CSA, 2007). Apparently, most of the study area is densely populated and the population pressure is a threat to the fragile high land environment.

According to the Key Informant held with elders in Allaga Handode Kebele, "*arable land which were used to be cultivated by single person in the past are being divided into descendents and source of animals feed is decreasing from time to time and land under fallowing decline as a result.*" Jimma zone in general and Sekachekorsa Woreda in particular, is one of the densely populated areas of the region. In this zone, one can observe the pattern of dense settlement structure that indicates per capita resource shortage (CSA, 2007). The family size of respondents covered by the study also signifies that, there is heavy population pressure.

Table 4.1: patterns of family size distribution in study area (abbreviations: AH"Allagahandode", GL"Gesheluchine", SH"Shashamanne", UK"Ushanekoche").

Categories of family size	Frequency & Percentage	Study Kebeles				Total
		AH	GL	SH	UK	
≤4	F	3	5	8	2	18
	%	2.5	4.2	6.7	1.7	15.0
4 to 8	F	17	27	11	19	74
	%	14.2	22.5	9.2	15.8	61.7
>8	F	7	10	5	6	28
	%	5.8	8.3	4.2	5.0	23.3
Total	F	27	42	24	27	**120**
	%	22.5	35.0	20.0	22.5	100.0
Average of each size		8	7.3	6.2	6	7

Source: field survey (2010)

With regarding to the relationship between households' family size and livestock size, there is a positive relationship between the two variables. Those households with larger family size were found to own large livestock size, though the relationship was stronger to cattle. As indicated in Table 4.2, from 69 HHs, who own cattle size between 1 and 5, 45 of them own family size less than or equal to 4. But from 11 HHs who own cattle greater than 10, 6 households own family size members greater than 8. The Pearson chi-square test also shows that, the association between households family size and cattle size households own were statistically significant at $P<0.1$.

Table 4.2 family size and cattle size of respondents cross tabulation

Family size		Cattle Size						Total
		1 - 5		6 - 10		>10		
		N	%	N	%	N	%	
≤4		45	37.5	7	5.8	0	0	43.3
4- 8		13	10.8	9	7.5	5	4.2	22.5
>8		11	9.2	24	20	6	5	34.2
Total		69	57.5	40	33.3	11	9.2	120
$\chi 2$ -value			7.68					

Source: field survey (2010)

The total family size of the sampled households was 869, of which 388 were male and 471 were females. The female population outnumbered the male population giving a sex ratio of 82.4%. The overwhelming majority of the population was young. The population segment under the age of 15 years was around 56% of the total. The number of individuals whose age was above 64 was only 20. The age dependency ratio was 41.3%.

Table 4.3 :Age and Gender characteristics of population, in sampled households.

Types	Division	Frequency	Percent
Gender	Male	388	44.6
	Female	471	55.4
Age	0 - 14	487	56
	15 - 64	362	41.7
	> 65	20	2.3

Source: field survey (2010)

The fact that, majority of the population was young implied that the pressure on environmental resources is on the increasing and that effective measure are required to control the problem. Having more children, also have contribution to keep more livestock as labor is very important. Viewing it from another angle, it may perhaps be stated that it is also a force that can be deployed for environmental rehabilitation and conservation work. Better environmental conditions were observed in some places with growth in population numbers (eg. In Kenyan district as reported by Tiffen, Mortimer and Gichucki, 1994).

4.1.2 Education level of households

About 61 % of the respondents are illiterates with no formal education as indicated in Table 4.4.

Table 4.4 Number of respondents by level of education in the study Kebeles (for abbreviations, see Table 4.1)

Education	AH	GL	SH	UK	Total	
Illiterates	14	28	15	16	73	61%
Primary education	9	8	8	5	30	25%
Secondary education	3	5	1	6	15	12.5%
Territory(post secondary	1	1	0	0	2	1.5%
Total	27	42	24	27	120	100

Source field survey (2010)

Evaluation of the relationship between household's educational level and livestock in Table 4.5 shows that, households with better education level have likely owned less cattle size than those with no any formal education. Out of 73 households who are illiterate, 40 (33.3%) had the cattle

size greater than ten. While out 30HHs who have primary education about 20 (18.5 %) have cattle size between 0 and 5. The Pearson chi-square test also shows that the association between households education level and cattle size owned is statistically significant at P<0.040.

Table 4.5 Household's education level and cattle size cross tabulation in the study Kebeles

Cattle size	Educational level of household head								Total %
	Illiterate		Primary		Secondary		Post secondary		
	N	%	N	%	N	%	N	%	
0-5	6	4.7	20	18.5	8	1.7	2	0.8	25.5
6-10	27	22.3	8	8.5	5	4.2	0	0	35
>10	40	33	2	3	2	2.5	0	0	38.5
Total	73	64	30	27	15	8.3	2	0.8	120
$\chi 2$ -value		13.224							

Source: field survey (2010)

As indicated by key informants, literate households have a better chance in communicating the development practitioners. Hence, they focus on quality than large size. A study's by FAO in Kenya, also shows that majority of the farmers who engaged in modern animal production are those who have better education than who have not.

4.1.3 Economic conditions

The major occupation of people at the wereda level is agriculture i.e. mainly mixed farming. As indicates in Table 4.5, 67% of the respondents have reported that, they directly drive their livelihood from crop cultivation and livestock rearing. Off- farm activities are mainly handled by women. For example, petty trading. About 13% of the household reported that, they practice various artisans as source of income in addition to farming. These include basket making as case in the Gesheluchine, weaving, carpenter, tannery etc. At Kebeles levels, 21.5%, 18%, 16.5% and 15% of GesheLuchine, Ushanekoche, Shashamanne and AllagaHandode respectively, were practice off-farm activities.

Table: 4.6 Distributions of Respondents by Occupation in the study area in percent (for abbreviations, see Table 4.1)

Economic activity	AH	GL	SH	UK	Total	
Farming only	78	59.5	75	67	80	67.5%
Farming and artisans	7.4	16.5	2.5	55	15	13.3%
Farming and petty trading	15	25.	16.5	18	23	57.5
Others	3.6	2.5	0	0	2	5.7
					120	**100**

Source: field survey (2010)

Major sources of cash income of rural people, by which they cover their household expenses including land taxes, come from sale of livestock (Abera, 2006). In the study area also, about 35% of respondent derive their annual income from sale of livestock. The ratio is even larger in Gesheluchine kebele (83.3%) which depend on livestock for expense, because in this Wet Dega kebele most farmers oriented towards livestock production, than crop production, mainly due to land shortage and degradation. Table 4.7 indicates major sources of annual income by respondents.

Table4.7: Respondents primary sources of income in study area in percent (for abbreviations, see Table 4.1)

Types of sources	AH	GL	SH	UK	Total
Cereal	0	11.5	31.6	54	54
Coffee	45	0	29	7	20.5
Chat	41	13	13	5	17
Livestock	2.5	50.5	21	19.5	27
others	1(2.5%)	1522%)	2(5.4%)	6(14.5%)	24(12.5%)

Source: field survey (2010)

Hence, the livestock are seen by all respondents and informants as their deposits and insurance that can be used in times of economic trouble in addition to their draught purpose, manure and direct animal products. However, their importance as cash income varies among kebeles , since each located in various agro- ecologies.

4.1.4 Land holding size

The smallness of land holding and the shortage of pasture for the livestock are reported as to be factors in deteriorating the sustainability of the people in mixed farming system of the study area. Average land holding in the woreda is less 0.5ha/household; however, this result slightly varies from one kebele to another as indicated in Table 4.8.

Many households (12%) in Ushanekoche, (16%) in Gesheluchine and (7%) in Shashamanne and 7% in Allagahandode have land holding size between one and two and half of hectares.

Table 4.8: Sizes of land holdings of the respondents in the study area in number (for abbreviations, see Table 4.1)

Land holding	AH	GL	SH	UK	Total	
<0.5-1.5	12	20	11	7	50	42
1.5-2.5	7	16	7	12	42	35
2.5-3.5	5		5	5	20	17
3.5->4.5	3	1	1	3	8	6
Total	27	42	24	27	120	100

Source: field survey (2010)

As indicated in Table 4.17, the total land owned by the respondents have positively correlated with the size of pasture lands they left for animal feed and the size of livestock they owned. The detail was discussed in next section.

4.2 Livestock production and Environmental Resources in Study Area

According to the key informant interview in the study area, livestock have been kept for various reasons. The main reason is livelihood security. In addition to this, livestock also serve for various social functions, such as dowry payment and as symbols prestige. Livestock are also the only sources of milk, meat and manure, the sale of animals and their products are important source of income. Moreover, equines are useful for transportation of farm product to the market especially in GesheLuchine which have no all weathered roads and also for draft animals too. Goats and sheep are kept in order for support the livelihood of the owner by way of cash and food. Other types of livestock, particularly chickens are often kept as a source of income and food. Ownership of livestock is logically regarded as risk compensation when arable crops do not perform well mainly due to the current change in climate which results in rain fall variability and drought. Under such condition, they are to provide food for the household, sold for cash or exchange for foodstuff. In addition the farmers use the livestock to adapt towards crop failure due to rainfall uncertainty. They replied, intensifying livestock production system, by using various compositions, based on fodder resources they have, so that can be used as compensation in such critical period. Other also reported the role of manure to produce various types of crop varieties, rather than depending on single crop, so that one can be used while the others failed due to drought or storms etc.

Thus livestock size basically measures economic status of oneself in all of the communities Table 4.9 shows, the number and types of farm animals kept by the surveyed households.

Table 4.9 :Total number of livestock owned per Kebeles (for abbreviations, see Table 4.1)

Livestock number per Kebeles						
Livestock types	AH	GL	SH	UK	Total	Percentage
Cattle	162	289	116	138	705	42
Shoats	86	165	65	78	394	23.5
Equines	26	54	7	1	98	6
poultries	107	229	6	131	473	28.5
Total	**381**	**737**	**194**	**348**	**1629**	**100**

Source: field survey (2010)

As depicted in Table 4.9, cattle accounted for 42%, sheep and goats for 23.5% and horses, mules and donkeys for 6%, while chicken cover the remaining 28.5% of the total farm animals of the surveyed households in four kebeles .As discussed earlier the studied kebeles located in somewhat different agro ecologies. The impact of this location also reflected in livestock distribution and composition as did on other resources. Households in Gesheluchine , which located in wet dega agro ecology , relatively have larger livestock size , but goats and mule less adapted to this climate. While the size of horses and sheep decreases among households as agro ecologies varies from wet dega of Gesheluchine to dry woinadega of Allagahandode.

Although the study area has a considerable size of livestock, it was explained by informants as average size of ownership and the yield per animal is dwindling through time mainly due to shortage of pasture area. Table 4.10 shows the patterns of livestock population in the past three years in the studied kebles.

Table 4.10: Perceptions of respondents on trend of their livestock size in the last three years In percent. (For abbreviations, see Table 4.1).

Responses	AH	GL	SH	UK	Total
Decreasing	14.3	70.3	29	37	35
Increasing	81	18.5	54	55.5	56
No change	4.7	11.2	17	7.4	9
total	100	100	100	100	100

Source: field survey (2010)

Despite the woreda average decline in size of livestock, about 56% of the respondents replied that, their livestock size shows an increasing trend. This is mainly in Gesheluchine as reported by (81%) of respondents. Among the four Kebeles, 35% of respondents face a decreasing trend in their livestock size, 70.3% in Allagahandode which located in dry woinadega area. 11% of the respondents however do not observe any change on their stock size in the past three years. The major perceived factors for the decline of livestock size in study area.

Table 4.11: Responses to factors causing the decline of livestock size in last years in percent (for abbreviations, see Table 4.1)

Reasons for declined of -stock	AH	GL	SH	UK	All villages
Absence of pasture land	60	10	40	50	48.6
Disappearance of CGLs	27	30	10	20	36.4
Disease	6	15	30	20	13
Predated by wild Animals	1	2	2	1	2
Sold (for livelihood security)	2	40	16	8	15
Leased	4	3	2	1	5
total	100	100	100	100	100

Source: field survey (2010)

As indicated in Table 4.11, the major perceived factors that accelerated the decline in livestock size in the study area are, absence of pasture land due to crop expansion, accounting for about 48%. But, as in the case of Gesheluchine which found in wet dega agro-ecology, 40% of respondent replied that, their livestock size decline not due to pasture shortage, it is rather due to selling for livelihood security. As indicated the communities depend on livestock as major source of income than crops. Animal death due to disease also accounts for about 53% in all villages. The major type of death for their livestock mainly cattle is **fashola disease** /locally, 'Ballc' since their pasture land is mostly wetland (caffe), especially in Shashamane and Ushanekoche. But as woreda level, last year there was an epidemic new disease that cause for death of many cattle. Insignificant, (2%) also lost their livestock due to wild life predation. This is mainly serious problem on small ruminants than large. Generally, more than 50% of households, responded a decrease in their livestock size due to feed problem.

Table 4.12: Perceived major problems of livestock productivity as reported by respondents (ranks)

Kebeles site	Rank	Types of problems			
		Feed shortage	Prevalence of disease	Mismanagement	Market
Allaga handode	1	22	2	3	0
	2	5	3	19	0
	3	0	19	5	3
	4	0	3	0	24
Gesheluchine	1	29	2	8	1
	2	3	9	26	2
	3	4	21	3	7
	4	2	5	5	26
Shashamane	1	15	2	7	0
	2	5	9	8	1
	3	2	8	8	1
	4	1	5	1	22
Ushanekoche	1	17	3	9	0
	2	7	11	7	2
	3	3	9	8	2
	4	0	2	0	52
Percent rank	1	67	7.5	22.5	0.8
	2	17	27	50	4.2
	3	7.5	47.5	20	50.2
	4	2.5	12.5	5	70

Source: Field survey (2010)

About 67% of the sample households described that the poor livestock productivity is primarily due to feed shortage including its nutritional value. The next reason is the problem that related with traditional management system. Prevalence of disease and market situation also mentioned as third and fourth problem respectively. Berhanu et al (2002) said that, though the country has large livestock size, their contribution to the economy of the country is small due to feed shortage, disease and the management problem.

It is obvious that the availability of feed resources for households, differs at extent they owned lands and pasture fields. As elders noted, decade before many households had fodder-growing parcels near to streams or homestead and that pieces of plots would not be cultivated, in addition to communal grazing land. But these plots of land have now become cultivated, while communal grazing land in most sub village also encroached by crops. Hence, the land use points that feed sources of animals are diminishing, the pressure of livestock became increasing on other environmental resources that can be used as alternative feed.

Table 4.13 presents how plots of pasture land have disappeared being converted to croplands. In 2000, 35% of respondents had privately used pasture fields which are used for cutting grass or outdoor grazing, which ranges between 0.125 to 0.25 ha. While about 57% of respondents, had owned, up to two (timad) or half of a hectare. But this figure lowered to 17% after ten years. At specific community level, out of respondents of Allagahandode, only 3 households had small plots of fodder land that is less than 0.125 to 0.25ha, while 20 households own better plots of pasture land greater than 0.25 to 0.5ha in 2000 .By 2010, the number of HHs with pasture land, less than 0.25 ha increase to 16 HHs while the households with plot greater than or equal to 0.25ha significantly decrease to only 3 HH_s.

It is only in Gesheluchine that households who had own pasture plot show increase from $10HH_s$ who had less than 0.75ha in 2000 to 18HHs in 2010. As mentioned above this mainly happened as people orient towards livestock (especially cattle and shoat) production as major activity than crop production. Again it is reported that 12 in 2000 and 6 in 2010 in Shashamanne and 18 and 9 in Ushanekoche respectively.

Table 4.13: The changes in size of grazing land in the study are (for abbreviations see , Table 4.1)

Size of land under private pasture land (in Hectars)	AH		GL		SH		UK		Total	
	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010
≤0.125-0.25	3	16	20	11	3	16	4	18	35	65
0.25-0.375	4	8	15	18	12	6	2	6	28	38
0.375-≥0.625	20	3	7	13	9	2	21	2	57	17

Source: field survey (2010)

In the study area, all households grow different root crops such as enset, garlics, cabbage and other vegetables, and this day Apple, Avocado, chat etc. These all crop highly require manure and the declining trend of livestock feed sources are a threat to agricultural productivity as adequacy feed affects the rise and condition of the livestock which are source of manure in all kebeles. Most of the communities' members have tradition of growing indigenous fodder like bamboo groves along rivers or fences and use it for different purposes. But recently eucalyptus tree plantation has become dominant business and among the households, and widely planted even in the homestead. From this tree, people would earn some cash income by selling the wood. It is expanding at the expense of the good soil for cultivations and pasture land.

It seems that, sources of livestock feed are declining from time to time due to land use change. But even within this situation, it would be very logical to think about the exact source of grazing in all communities.

As stated by informants, many households had communal grazing lands, but now due to encroachment and privatization of communal grazing lands, people with small plots of land being face problem of animal feed. After crop harvest, private fallow lands and cultivated lands are considered as communal grazing land. That is why, many respondents have reported that, they face problem of grazing areas in the rainy season when many people enclose their holdings.

Indoor feed of the livestock are done using enset leaves, banana stem, crop residue and hay. But these feed have had been concentrated on draught animals and milking cows to keep them in good condition. Those which have their own fodder field of grass and feed their cattle as supplement to other sources. In some households, women go to distance place in search for fodder from inside of natural forest and rugged lands. As in the case of Allagahandode, and Shashamanne feeding in coffee forest is also common mainly in dry seasons.

Table 4.14: Primary Feed Source for the study area in percent (for abbreviations, see Table 4.1)

Feed source	AH	GL	SH	UK	Total
CGLs	0	20	25	33	19
Fallow land	78	75	58	55.5	67
Cut and carry(hay)	7.5	0	4	4	3
Other open space	13.5	5	13	7.5	9

Source: Field survey (2010)

From Table 4.14, the first source of green fodder is private fallow land (67%), and CGL (19%) of respondent in four kebeles. The least primary feed sources for households, mentioned are cut and carry (only 4%). Gesheluchine households have used fallow land as pasture fields as they relatively have better average land holding. In all cases, available indoor and outdoor feed resources for livestock are inadequate and hence shortage of livestock feed is a basic factor minimizing livestock productivity and maximizing their impact on other environmental resources

Development agents explained that, there has been some effort to improve feed production by introducing some improved varieties (like clatonia, mukinia, lucinia etc.). But most respondents perceive it as ineffective and the technical advice they get form DA is not adequate to produce the required livestock feed.

4.2.1 Livestock and Grazing lands

From Table 4.14, 86% of animal feed source comes from natural pasture (communal grazing land and private pasture land, 19% and 67% respectively). As land use cover data from kebel's agricultural office indicates, in Allagahandode, total pasture land in 2009/10 was about 120 ha,

while per household share was 0.14ha. In Gesheluchine 130 ha of their total land is under pasture field with 0.095 ha per households. It account for 245 ha and 121ha in Shashamanne and Ushankoche with per households share of 0.33ha and 0.148ha respectively. Based on general livestock data of each four kebeles, the overall carrying capacity of their grazing land was calculated based on Tropical Livestock Unit (TLU) which equals to 250 kg live Weight or 1.3 cattle head (Strock et al, 1995). Accordingly, based on the 2009/10 data, the current stocking rate for Allagahandode, was 20.7 TLU/ha, for Gesheluchine it was 21.1 TLU/ha ,while it accounts for about 4.5 TLU/ha and 10.5 TLU/ha in Shashamane and Ushanekoche respectively. So, the latter two kebeles, have relatively smaller cattle size in relation to their pasture land carrying capacity than the former two kebels. As respondents indicated, grazing land highly shrinking in AllagaHandode and Gesheluchine mainly due to the disappearance of communal grazing lands. Therefore, it is logical to expect high overgrazing in high cattle population area. Generally the average stocking rate (carrying capacity) in the four kebels studied is 14 (TLU/ha). Against the permitted rate of 1 TLU/ha in rain fed areas (Schelecht et al ,1998) .

As discussed in Table 4.14, from 86% of natural pasture used as primary animal feed, 19% accounts for CGLs. As observed in study area this resource is the place where serious land degradation has been occurred. Land tenure insecurity is reported as the major factors. As reported by 25% of respondents in Allagahandode , privatization of CGLs resulted the land to be envaded by exotic tree species locally called 'zeytuna' .As kebeles land resource experts indicates , approximately about 10% of kebeles land area is now covered by the tree, though all were under communal grazing land in the past .

What had happened on grazing land in Allagahandode, disprove the tragedy of common theory (by Hardin (1968).According to this theory, the occurrence of resources degradation in common property resource is directly linked to common system. And suggest that, sustainable environmental resources management only come about through the promotion of privatization and or will come through coercive measures. The logic that follows is that resource will never be rationally used unless those who benefit individually have also to pay the cost of their action. As informants responded in Allogahandode, most CGLs are already managed in common, and used in common under indigenous institutional rule. However, after privatization of this land, except

few which converted to crop lands, the remaining still exist open and converted to woodlots and invaded by 'zeytuna'. The problem is most of these area still grazed by every communities, without contributing in its management. As Lane et al (1994), under Property Right Theory, if people are excluded from using resource in privatized area, they will increase the pressure on communal area as else where. Here, the resource will be depicted faster and became more difficult to obtain. Therefore, a mere change towards private tenure does not necessarily solve the problem of proper management of environmental resources. In the field observations, even on privately owned pasture land, one can see more bushes, shrubs, that not used by stock. So, large concentration of cattle on small remaining open spaces, much greater than the carrying capacity of the land.

From three kebeles, who have CGLs, Gesheluchine, is the one with small plots of it, as above only 20% of respondents use communal grazing land as primary feed sources. As respondents said, before ten to fifty years, at least one CGLs exist in each sub village but now it limited to only three sub villages. The major factor for disappearance of communal grazing land in Gesheluchine is the poor attention given for common resources by local development practitioners, who propose the land to be converted to crop lands and hence distribute it to land less peoples. The remaining CGLs in the kebele also faces serious degradation .As informants reported, the major factor for degradation is absence of well defined rule since the traditional system of resource use and management became eroded.

As indicated in FGD by an elder man belongs to better - off HHs, in 'Busase' sub village of Gesheluchine,

> *"...in the past we used CGLs under traditional rule called 'ulee'. This rule had a leader called 'Aba ulee' who define the boundary of CGLs, livestock type to be graze on, and all rule of management. But now with population pressure and declining size of CGLs, many households who have their own pasture land stopped to use CGLs and the system disintegrated. Therefore, with absence of 'ulee' system, any person, who wants can go and use it but not collective action for its management. No defined regular way of enclosure period, all can graze throughout the year with any kinds of stock they like".*

That is why almost all respondents who have been using CGLs replied, they faced overgrazing and erosion in the field. As Laban (1995) states,the break down of common property management has adverse effect on both social equity and ecological sustainability, such a case observed in the study area of Gesheluchine and Allagahandode.

As described above, the communal grazing land situation in Shashamanne and Ushanekoche, are relatively on its better state. As field observation, almost all CGLs, in these two kebele are in the riparian (wet land) locally "caffe". Due to this topography of land, and the existence of 'ulee' system (traditional using system), this resource exposed to lesser degradation (lands slide, erosion) etc. However, overgrazing here also described as a major problem in both kebeles. As key informant indicated, as population pressure increase, new HHs member added, while the resource shrinks or remain unchanged. This causes increasing in cattle size, which results exceeding in carrying capacity of the resource. So, overgrazing is an avoidable. Another cause of overgrazing is lack of enclosure system, as informant said, due to shortage of lands they graze on the same land throughout the year, even though much of CGLs get water during rainy summer season. At this time, they forced to feed on small dry plots of land which remain on the side of their CGLs. This causes high concentration of cattle on small area of land which resulted in todegradation.

Major challenges for communal grazing land in both kebeles, as informant replied are lack of attention from both user and government. Encroachment increases to the resource, because there is no defined demarcation. The nearby HHs take it bit by bit. The other challenge is, the current market oriented crop production plan to change this CGL to vegetable and dry season small scale irrigation to produce maize and vegetable. As key informant replied in Ushanekoche, Development Agents and kebeles administrators organizes land less people and gave them two hectares of land and they began to farm to produce vegetables. The same things have been planned on CGLs in Shashamanne also. But this plan as informed is highly being opposed by user communities. Therefore, a combinations of external threat (shortage of private farmlands, distance of some households from CGLs, less attention from formal institutions) and internal (erosion of traditional system that give attention for both cattle and CGLs etc) has caused the CGLs to be encroached or converted or shrink or degrade through time in study areas.

Table 4.15: Different factors considered by the local community to cause deterioration of pasture land in CGLs in percent (for abbreviations see,Table 4.1)

Perceived causes	AH	GL	SH	UK	Total%
High population growth	20	25	21.6	20	86.6
Expansion of settlement	16	7	8	6.5	33.2
Expansion of cultivation	19	9	9.5	9.3	46.8
Privatization of CGLs	25	29	25.4	22.5	102
Erosion(intensive rainstorms)	10	28	28.5	25	91.5
Afforestation program	2.0	0.9	2	2.5	7.4
Bush encroachment due to poor management	6	0	0	6.5	12.5
Others	1	5.3	6	6.5	18.5

Source: field survey (2010)

As in the Table 4.15, increasing population growth is the main factor contributing to declining of grazing lands, as shown by more than 86% of respondents from four kebeles. This high growth in population, raise high demand for farm land against grazing lands. At the same time, with increase in number of population, livestock population may also increase with households and caused high pressure on grazing land unless new pasture land discovered.

Expansion of settlement is another factor that has been mentioned as responsible for the decline or degradation of grazing land. This is mainly the case in Allagahandode (16%) and in Shashamanne (8%). New settlement have take place by government on CGLs in Andode area of AllagaHandode and sufa and Olme yabbo area of Shashamanne. The new settlers as key informant in both kebeles replied, converted most grazing and forest land to cultivatable lands there by reducing the net acreage that could be used as grazing land.

Key informants replied that, due to increase in population and decline in average farm land and fertility of lands, people began to expand cultivation at expense of grazing land and hence grazing land confined to marginal lands like hill tops and water logged land as in the case of Ushanekoche and Shashamann

Privatization of CGLs reported as serious factor mainly in Allagahandode and Gesheluchine as reported by 25% and 29% respectively.

As indicated in Table 4.16, 67% of respondents in four kebeles responded that they use private fallow lands as primary feed sources. However, about 82% of respondent in four kebeles, indicated that their private pasture land is not enough in relation to their livestock size.

Table 4.16: perception of respondent on whether their private pasture land enough in relation to their livestock size (for abbreviations, see Table 4.1) .

	AH		GL		SH		UK		Total	
Perception	N	%	N	%	N	%	N	%	N	%
Yes	7	26	3	9	7	42	9	33.2	26	21.5
No	20	74	30	81	14	58	18	66.8	82	78.5

Sauce: field survey (2010)

Here only 21.5 % of respondents in four kebeles have pasture land that can feed their livestock.As informant indicated in Shashamanne and Ushanekoche most hhs use CGLs, specially for cows, calves etc, and only use their own pasture land for oxen, shoats, equines, etc. while in Allagahandode and Gesheluchine most respondents have no enough pasture land. Table 4.17 also shows the relationship between land sizes a household own and livestock size and type they have.

Table 4.17: Correlation result of livestock size with private land holding and grazing land only (for abbreviations, see Table 4.1).

Livestock type	AH	GL	SH	UK
Correlation with private total land holding				
Grazing land	0.77	0.78	0.53	0.432
size of cattle	0.552	0.63	0.465	0.441
Size of shoats	0.544	0.601	0.501	0.553
Size of equine	0.114	0.423	0.228	0.154
Correlation with privately used grazing land only				
Size of cattle	0.532	0.75	0.521	0.653
Size of shoats	0.087	0.64	0.63	0.52
Size of equines	0	0.432	0.510	0.508

*correlation is significant at the 0.05 error term and 95% level of confidence

Source: field survey (2010)

Total size of land owned and the size of private pasture lands are positively correlated. In Allagahandode and Gesheluchine, these are highly Correlated with the value of 0.77 and 0.78

respectively, which means, those households with large size of land have propensity to allocate a piece of land for growing fodder or to be grazed by their own livestock. In the other two kebeles households that have relatively large size also left some patches for private pasture; despite some of them use CGLs.

Livestock ownership also depends on size of ones self-grazing land. The correlation result is positive in all kebeles as indicated in Table 4.17. Though positive however, we cannot observe strong correlation between private pasture land and livestock size they own. As results of coefficient of determination indicates, for instance in Allagahandode, only 27% change in cattle size (ownership) is determined by private pasture land, while the remaining 73% determined by other variables with out CGLs. The ownership of shoat is much lesser relate with ones own pasture land, while there is no relation with equines in this kebeles. As key informants indicated, one can haves 1 or 2 equines without owning any small plots of pasture land, because they simply feed on roads side or any open spaces. The shoats also feed on bushes, shrubs near fences or weeds on croplands etc. In Gesheluchine also since there is small CGL, there is strong positive correlation between cattle, shoats, and equines ownership and private pasture lands (0.77, 0.64 and 0.43) respectively. But, if we consider coefficient of determination, (56% for cattle, 40% for shoats, 20% for equines). Hence, one can conclude that still the correlation is not stronger or perfect. And this means that, a household to own any kinds of livestock, it is necessary to have at least small plots of pasture land. But, the size and composition of livestock he/she has do not strongly determined by the size of private pasture land owned. Most households own large stock size of 6-11, while, majority of them own private pasture land which is less than <0.25 hectares. In the remaining two kebeles, almost the same trend followed. The correlation value for Gesheluchine are (0.65, 042 and 0.5) respectively. In the case of shashamanne, the correlation for cattle, shoat and equines are (0.52, 0.63, and 0.11) respectively which shows the size of cattle is less correlated with private pasture, than shoats. This is mainly because, shoat and equines not graze on CGLs. In Ushanekoche, though about 33% feed on CGLs, 42% (CD) of change in cattle size, determined by private Pastureland. This indicates that, the impact is less on shoats and equines. From this, an important idea can be drawn is, though 80% of feed sources driven from private pastureland, its average influence on size of livestock household own is insignificant. People who have meager plot size would own large size of livestock, even with absence of CGLs. Here it is also possible to raise the issue of carrying

capacity. As dealt above, the average households, in four kebeles own <l or 0.25 ha of pasture land, while the average cattle owned by respondent in four kebeles are 6 TLU/ha (6 TLU/ 0.25 ha) while the normal in mixed area is 1 TLU/1 ha. So, we can expect large degradation. However the pressure on pasture land also determined by other alternative feed sources they use, grazing system, topography of land, type of grass and time of enclosure (Abera, 2006) .

As Table 4.18 above shows, about 75% of respondent indicated that. their land not enough for their livestock. They also asked what alternative they have used and they replied as feeding them on other open spaces, like road side, in forest, stream side, crop residue and home feed during critical period.

Table 4.18: whether respondents use separate land or not (for abbreviations see Table 4.1)

Question	**Do you have separate lands to different types of livestock?**									
	AH		GL		SH		UK		Total	
	N	%	N	%	N	%	N	%	N	%
Yes	1	3.2	8	19	4	19	5	19	18	15
No	26	96	34	81	14	80	22	81	82	85

Source: field survey (2010)

Only 15% of respondents have separate pasture lands to various stock compositions. As Abera (2006) said, since different livestock have different feeding preference, and so have various pressure on land, it would be logical to consider kind of roaming animals grazing in the field for sustainability of the resources. Informants indicated that overgrazing is mainly occurred when all kinds of animals feed on the same land. Overgrazing leads to depletion of the palatable species and cause invasion of the field by less palatable and less nutrient species of grasses (Berhanu et al 2002).

The studies taken in Gesheluchine, by Ayyalew (2009) also shows that, most of their grass species are the one with poor nutritional value. There are three kinds of pasture forage; decreasers, increasers and invaders. Decreases are superior forage grasses that decrease under frequent grazing, because animal prefer them. Increasers are those that tend to increases even under intensive grazing but are inferior in quality and quantity of yield than decreasers. This is what happens in Gesheluchine. In this kebele therefore grasses on their lands are highly dominated by increasers while decreasers gradually disappeared with heavy grazing. The third

type is invaders, are likely weeds generally not palatable. As Abera (2006), the enclosure during rainy season may improve decreasers to grow. It is also sometimes good to feed all composition on same land if their preference varies among the above, three species, but based on different time period. Unless, the three can be destroyed together, as did in Allagahandode. Among the livestock, shoats have relatively lesser impact on grass lands, than cattle and equines. As indicated in focus group discussion in Gesheluchine, Cows, and female horses have larger grazing pressure than oxen and male horses because ,such animals stay on the field for longer time per day, while oxen spend half of day on farm while male horses mostly off to market for petty trading. Some of them also, blame sheep for heavy grazing if concentrated at specific places.

An inquire concerning the landscape of their grazing area was also made among the respondents and they responded that their livestock are grazing in almost all parts of land escapes including lowland, upland as well as post harvest crop fields .

Table 4.19: percentage of respondents grazing their livestock in deferent land escapes (for abbreviations see Table 4.1).

Land escape unit	**Percentage of respondents**				
	AH	GL	SH	UK	All kebeles
Upland	35	49	17.4	22.4	69.1
Lowland	12.5	7.5	42	33.3	40
Post harvest grazing	52.5	43.5	42.6	44.3	90
	100	100	100	100	100

Source; field survey (2010)

About 69% of households graze their animal in uplands. The high number of cattle grazing in the upland may be responsible for the land degradation and erosion that has take place, particularly in the escarpments. Several deep gullies can be seen descending the escarpment in AllagaHandode, in Gesheluchine and also some in UshaneKoche towards the rivers and streams. So far, no realistic estimation exist on the extent of land degradation due to overgrazing as this is difficult to quantify because of its complex and lack of easily measurable land quality indictors. Therefore, the magnitude of livestock associated land degradation is not yet established. However, there is general assumption that, the grazing area if over used would modify the physical and hydraulic properties of soils and ecosystem. When vegetation capacity reduced, soil organic matter content and infiltration will be reduced. When soil layers are

compacted by trampling, porosity and level of infiltration reduced. Compaction occurs particularly in areas where animals concentrate, such as water points, as in the case of Ushanekoche and Shashamanne. Under heavy grazing pressure, plants may not be able to compensate sufficiently for the photomaps removed by grazing animals. As indicated above, all these impact also determined by grazing system used in that specific area. In the study areas as indicated in the Table 4.20, among the respondent in four kebeles, about 12.5% responded that they use free grazing as primary grazing system, while 46.5% of them use it as secondary system. Majority of respondents use it as 3rd option (Mainly during critical dry period).

Table 4.20: Rank of respondents on the basis of livestock feeding regime (for abbreviations, see Table 4.1)

Rank	AH			GL			SH			UK			total			percent		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Free grazing	3	23	1	1	10	7	7	13	0	5	10	0	15	56	8	12.5	26.5	6.5
Zero grazing	23	3	1	27	9	3	17	6	0	15	4	0	52	22	4	68	18	3
stall feeding	1	2	23	0	0	3	0	0	11	0	0	5	1	3	42	0.8	2.5	35

Source: filed survey (2010)

Note: zero grazing is livestock tethering, using long ropes. Bat stall feeding is where animals are housed in door.

As indicate in the Table 4.20, in Gesheluchine only 1HH responded using free range feeding as primary feeding system (he used forest as feed sources in Dakko sub village), 10 HHs use it as secondery option, meaning though no CGLs, they some hour in a day make their cattle free under a children's control. This is common in four communities using their own pasture field. As key informant responded they do this for both livestock to exercise and for land to rest. Relatively, most respondents in Shashamanne and Ushanekoche prefer free grazing than zero grazing, because they have CGLs, on which zero grazing is not allowed. As key informants indicated, cattle (cows, bulls and heifers) are mostly feed free while oxen, calves, shoats etc are mostly feed in zero system. The types of grazing system, is highly related with specific feed sources used by particular communities. In the four kebeles, about 68% also practice zero grazing as primary feeding system.

Different feeding regime has different environmental impact. For instance, as Abera (2006) indicated, free grazing methods of feeding livestock cause environmental degradation, in Gamo highland where traditional management systems disintegrate. key informants also explained that as decreasing in size of CGLs and increasing in size of stock, free grazing causes serous erosion in grazing field, specially during rainy season. From households, who use zero grazing as primary grazing system, about 64% practice rotational systems. While 46% do not, mainly due to shortage of pasture land they have. Table 4.21 shows percentage responses of households using or not using rotation system.

Table 4.21: Their perception regarding practicing rotation system, on their own land in percent (for abbreviations, see Table 4.1)

Responses	AH	GL	SH	UK	Total
Do you practice rotational grazing systems?					
Yes	43.4	76.2	41	47	64
No	57.6	23.8	59	53	46
What is the Advantage of using rotation system?					**% Total**
Allow land to be grazed continuously the year round					29
It vary grazing pressure, so less degraded					30
No need of large lands so less pressure on other resources					45

Source: field survey (2010)

As indicated in Table 4.21, majority of respondent practice rotation on their own pasture lands which accounts (43.4%) in Allagahandode, (76.2%) in Gesheluchine, (45%) and (47%) in Shashamanne and Ushanekoche respectively. But (57%) in Allagahandode, (21.8%) of Gesheluchine , (59%) and (53%) of Shshamanne and .Ushanekoche respectively responded not practicing rotational grazing system. Therefore those who do not practice rotation while feeding their cattle do not obtain the above advantages. It's logical to expect high grazing pressure on that land and other resource like crop lands and forest lands. As (41%) of respondents reported, rotation system decreases the pressure of livestock on resource by allowing to feed on small land systematically. As mentioned above in Gesheluchine , most HHs , make fallow their land for livestock rearing and that is why they practice rotation than other three kebeles .They also use fencing system.

Though it environmentally very sound, at the time of this study, only 35% of the respondents, reported practicing stall feeding, mostly as third choice. As key informants explained, stall feeding practices at the time of serious feed shortage, like in summer or extreme drought. To practice it all time it require labor forces, so is difficult to bring fodder from distance places, like harvesting from crop fields. As a person belongs to poorer HHs in Allagahandode said,

> *"...Mostly due to shortage of pasture land, we began to feed stock at home, by owning small number of them. But, we land less, still spend the cost or loss advantages, eg, we feed them either(enset stem or Banana stem) and therefore face food shortage as enset is dominant food in summer or long dry season."*

From this point stall feeding has also its own economic as well as environmental viability, biodiversity loss. Alemayehu (2002) indicated, in the highland of Ethiopia with increasing human population and high demand for food, pastureland are highly being converted to farm land and marginal lands unsuitable for cultivation such as water logged, hillsides steep slopes etc .are left for grazing. As observed in study area, most households feed their cattle on either uplands or valley bottom, near stream etc. As in the case of Ushanekoche and Shshamanne their major grazing lands are water logged plain which water dominate during raining season, while in Gesheluchine of dega area (49%) of respondents feed on steep slope, hilly areas mainly due to the nature of their land escape.

The farmers also asked to rate what problem they considered if graze on such marginal lands as along river, streams, swampy areas, hilly lands etc.

Table 4.22: perceived problem of feeding on marginal lands in percent (for abbreviations see Table 4.1)

Response	AH	GL	SH	UK	Total	
Trampling	28	26	24.4	20	98	82%
Loss of vegetation	28	27	25.6	21	101	84%
Soil disturbance	24	22	28	23	95	79%
Soil erosion	20	25	23	17	76	63%
Others	0	0	0	18	20	17%

Source: filed survey (2010)

The total may not add up to 100%, because some of the responds gave a combination of factors as equality important .

As indicated in Table 4.22, most respondent replied that, grazing livestock on or along stream and wet land result in damage to riparian habitats. Through trampling (82%), soil disturbance (79%), loss of vegetation (84%), and soil compaction and erosion (63%). livestock trampling on the hillsides during wet season, causes soil erosion. As Tsigeweyni (1997) indicates , in Tigray highland, during the rainy season (July-September) when crops cover most arable lands, livestock are confined to grazing on valley bottom, farm sides and steep hillsides (marginal lands).

Most households in rural Ethiopia share the same water point with livestock and to domestic purposes. In the study area of four kebeles, 37% of respondents replied that they do not have separate water point for their livestock and domestic purposes. Among the kebeles, in Shashamane almost equal,(50%) of respondent replied sharing the same water point. 44.5%, 30% and 29.5% in Ushanekoche, Allagahandode, and Gesheluchine respectively also share the same water with livestock . In average 11 households do not have separate water point in each four kebeles. Plan Ethiopia (2010), On its filed work in five kebeles in the sekachekose woreda (from which two of them were, Ushanekoche and Shashamanne), on water sanitations and hygiene, observed major source of water pollution comes from pasture fields. The exact figure still not presented regarding the problem, plan Ethiopia , concluded pollution from pasture filed as major cause for water born disease and include it in its education that have been given for rural societies in the woreda.

One EIA, made on livestock production, in Kenya shows that, livestock's manure contains relatively high concentration of nutrient, solids, enteric bacteria, and other micro organisms or organic materials. This manure if discharged "leaked" in to water point, it can cause eutriphication (rapid plant growth in water bodies), solids can create sedimentation, and organic materials leads to oxygen depletion (BOD) of the water. Manure in mixed farming if applied, in concentrated fashion, can lead to similar problems. In addition to this, if pesticide or other vector control treatment used on livestock, contacted, threat to the health of humans, directly or indirectly through water use. Moreover, high concentrations of nitrate in potable water supplied

present a potential health hazard, especially for children. In study area also 40% of respondents perceived occurrence of disease due to livestock related water pollution.

4.2.2 Livestock and Forest land

In the study area, among the respondents in 4 kebeles, about 49% replied that, there are forest lands in their locality. Regarding the benefit they acquire from forest land, 25% in Allagahandode, 13 % in GesheLuchine, 22 % and 5% in Shashamanne and Ushanekoche respectively, responded as they use the forest for livestock feed at different time occasion.

Almost all respondents, replied that, cattle and sometimes shoats were feed on forest land. Especially bush's and shrubs highly preferable by Goats as some respondents explain during FGD. As key informants in GesheLuchine reported, they went to Xinayyoo natural forest which is found in Dako sub-kebel with their cattle during critical drought year. Like in 2000/1 and 20007/8. But, those who reside nearest to the forest, like Dakkos residents are daily visiting the forest for their animals' feed. Key informant, Jebel Bulgu, a DA in GesheLuchine Kebele said that,

> *"...this Xinayoo forest is one of the pure natural forests found in our woreda, but 5 years ago, it doesn't have the owner who manages it. As it found among three woredas: SekaChekorsa, Goma and Manna, no body give consideration to manage it. Any person from the three woredas' can clear for agriculture or pasture land. But in 2008, experts come from Oromia Forest and Wild life Protection Agency and forced these woreda to take conservation measures, and now the forest is under control of society and governmental However, even though they do not allowed to clear and burn, the surrounding society still use as alternative pasture land."*

In Allagahandode and Shashamanne as indicated above, forest feeding was still common mainly during dry season.

Moreover, 26 % of the sampled households responded that, households located to nearby can use the forest for livestock feed than those located distantly. Therefore distance may have its own influence on the level of the resource utilization as animal feed.

Table 4.23: Locally perceived causes in decline of forest lands in the four kebeles studied (deforestation) in percent (for abbreviations see, Table 4.1).

Responses	AH	GL	SH	UK	Total
Tree extraction for timber	3	0	3	0	1.6
Cultivation (opening farm lands)	53	53.5	42	92.5	66
Charcoal making	13	24	9	0	15
Clearing for pasturelands	24	42.5	30	7.5	35
Grazing livestock	5	3	15.6	0	6.5

Source: filed survey (2010)

As indicated in Table 4.23, 35% respondents perceive clearing for pasture land as the major cause for decline of forest land in their locality, while 6.5 % of the respondents also perceive grazing on forest land as another cause. But 66% of respondents assume that, forest land especially natural forest declined and confined to some specific areas mainly due to opening of farmlands for cultivation as population and demand for arable land increases, except for coffee forest.

Table 4.24: The farmers perception on size of forest in relation to pastureland in the five years in there area in percent (for abbreviations, see Table 4.1)

Responses	AH	GL	SH	UK	total	mean	St.dev
Pasture land increase but grazing lad decrease	85	2	4	37.8	33	10	9.4
Grazing land increase but forest decrease	0	56	92	5	45.7	13.75	14.8
Both decrease due crop land	11.1	11.5	4	25	16.6	5	3.9
Both increase	0	7.5	0	2.5	6.6	1.25	1.8
No change observed	3.5	23	0	7.1	12.5	4	5.4

Source: field survey (2010)

About 33.3% of the respondents' perceived an increase in forest and woodland while grazing land decrease in the past five years. From this, 85% accounts for AllagaHandode, the second is

Ushanekoche with 37.5%. In the AllagaHandode, as respondents said, this happen due to an increase in coffee forest, chat, agro - forestry, zeytuna (the new invasive tree species) as mentioned under grazing lands while in Ushanekoche only due to eucalyptus that highly increasing in recent years. Majority of respondents, (45.7%) however, reported the increasing of grazing land at expense of forest lands. Here the Gesheluchine and Shashamanne cover the lion share, 56% and 92% respectively. In Shashamanne as key informant said, this happen due to the newly settled area, in Olme yabbo area. In Gesheluchine, however, it happens because most households left their land fallow for grazing, by reducing croplands. 16.6% and 6.6% replied as both are decreasing and increasing respectively, while 12.5% perceive no change in the last five years.

From this, it can be concluded that, livestock production and forest resources are inter linking, and affect each other. In area where forest and wood land increase, pastureland decreases, so that people again forced to use forest land as alternative feed sources. In other area, again pasture land increase at expense of forest lands. Aynalem (2000) said, the major cause of deforestation in Beleta Gera forest of Ethiopia, are coffee production and encroachment to forest land to expand farm and pasture land. One of the key informants from Woredas Agricultural and Rural Development office said, shrink in CGLs are leading to increase in dependence of some, especially landless households on forest land for fodder and grazing. However, forest development project and program even today continue to focus in almost entirely on regeneration and productivity enhancement. Environmental degradation due to deforestation and soil erosion causes for dried up of many water sources, due to deposition which brings scarcity of water resources that affect livestock production system in the study area.

4.2.3 Crop-livestock interaction and livelihood dynamics in study area

The subsistence mixed farming system in the third world countries is sustainable with diversification of agricultural products and reduce the risk of crop failure. The crop production and livestock production are done in integrated way. The availability of livestock is one of the determinants of crop production. That is why it is explained by (79%) of respondents as large size of livestock is very important. However, policy makers and extension planners often assume smallholders in mixed farming system are in capable of evolving fast enough to meet growing food demand and that livestock are relatively unimportant to households food production or

welfare (FDRE, 1994), except for intensive units . The resulting policies permeate substitution of either intensive cropping or livestock production in place of traditional mixed farming. But in the study area, this only reported by (46.5%) of the respondents as if the current government policy not encouraging the traditional mixed farming, rather specialization.

As one of the key informants indicated, although such plan is widely promoted specially in coffee zone of the woreda, however, farmers resist this recommendation in favor of more diverse and integrated system with crops livestock and non agricultural activities. Habtamariam et al (2002) in their study in Harar highland, indicates the contrast between what policy makers and development practitioners think and what farmers do signifies misunderstanding about interaction that govern farmer behavior. They also explained that the evolution and potential impacts of these agricultural systems on human welfare are also poorly understood which precludes effective intervention to help achieve farmer's objective. Understanding the crop - livestock subsystem is an essential part of the bio- economic foundation of rural livelihood. (Habtemariam, 2002) ,Thornton and Herrero(2001), which as they said require accounting its components stock and interactions.

By using field survey information and System Dynamics Model (SDM) method let this paper tried to reflect the complex subsystem interaction and livelihood system in the study area.

In the four communities studied , about 64% of respondents perceive, changes in trend from grain based subsistence production to a market oriented cash crop like coffee, chat (Catha edulis), and livestock mixed farming system. At specific kebele, AllagaHandode, towards chat and coffee/ livestock, Gesheluchine, more cattle plus vegetable and chat, in Shashamanne more coffee/plus livestock, while in Ushanekoche even though it is under cereal zone there was a trend towards, vegetable and chat /plus livestock, as reported by informants.

Table 4.25: perceived change in trend from grain based to cash crop based mixed farming system in percent (for abbreviations see Table 4.1).

question	May you perceived any change on crop production system?				
Response	AH	GL	SH	UK	Total
Yes	78	75.4	66.7	22.2	64
No	22	28.6	33.3	78.8	36
If yes for above question what forced to do so?					**% Total**
Shrink in land holding					85.7
Loss of soil fertility					81.5
Rainfall variability, drought and crop pests					70
Policy uncertainty					27

Source: Field survey (2010)

In such case as depicted in the Table 4.25, people orient towards cash crop not due to the extension effort rather due to environmental factors like shortage of land for cereal crop production as responded by (85.7%), loss of soil fertility (81%), climate change (70%) etc .In such case, crop livestock integration is a common intensification strategy and extension efforts to specialize in cropping or livestock through greater input use are largely ignored. The behavior is often assumed to lead decreased in overall productivity and environmental quality through direct land use competition with cropping .As the key informants from Rural Development Office explained, 2 years ago a plan or program which is called Sector Based Development, regionally called "hula misoma" come to lower level and they try to divide the woreda mainly on the basis of agro ecology and dominant farming system of the area. As he noticed, there were three division:- coffee zone ,cereal zone , vegetable zone .On wet dega area for cattle fattening and they began to supply inputs and professional support assuming the farmers were benefited if would have specialized on locally dominant type of production, focusing on market situation .As informant indicated, while they are doing so, the concept of integrated farming was ignored and the program was failed .In other version, livestock remain a critical livelihood system component with role shifted from providers of food and draft power for tillage, to recourses for cash income ,fertilizer and transport services .In the four studied kebekes more land under such crop like chat, coffee , etc, reduces animal feed and food crops while increasing manure demand as perceived by 16% of the respondents . Abera (2000) indicated that, in Gamo highland, although a household livestock size is said to be low as compared to older times, the total size for

community increases as every body wants to have farm animals as source of cash income, manure and direct products .He also said that market oriented crops such as fruit tree apple need more manure though used as promoting to change the worse economic of the farmers. As reported by 63% of respondents they responded to animal feed shortage by leasing or selling animals, (28.5%) or changing in composition to small ruminants as (26%) responded , instead of over stocking farm stead's.

Table 4.26 : percentage shows how farmers are responding to livestock feed shortage

Response	**%total**
Leasing out livestock	63.5
Selling animals	28.5
Changing the composition	26
If leasing what role it has in livelihood?	**%total**
Distribute wealth and service among households	88
Improve the availability of manure	59
Increase income of poor	79

Source: filed survey (2010)

Since the livestock wealth is largely concentrated among the marginal and smallholders with better landholding, therefore such livestock leasing practices distribute wealth among households by increasing their income and by improving manure availability for the crops

The crop livestock interaction, in mixed farming area shown in figure 3

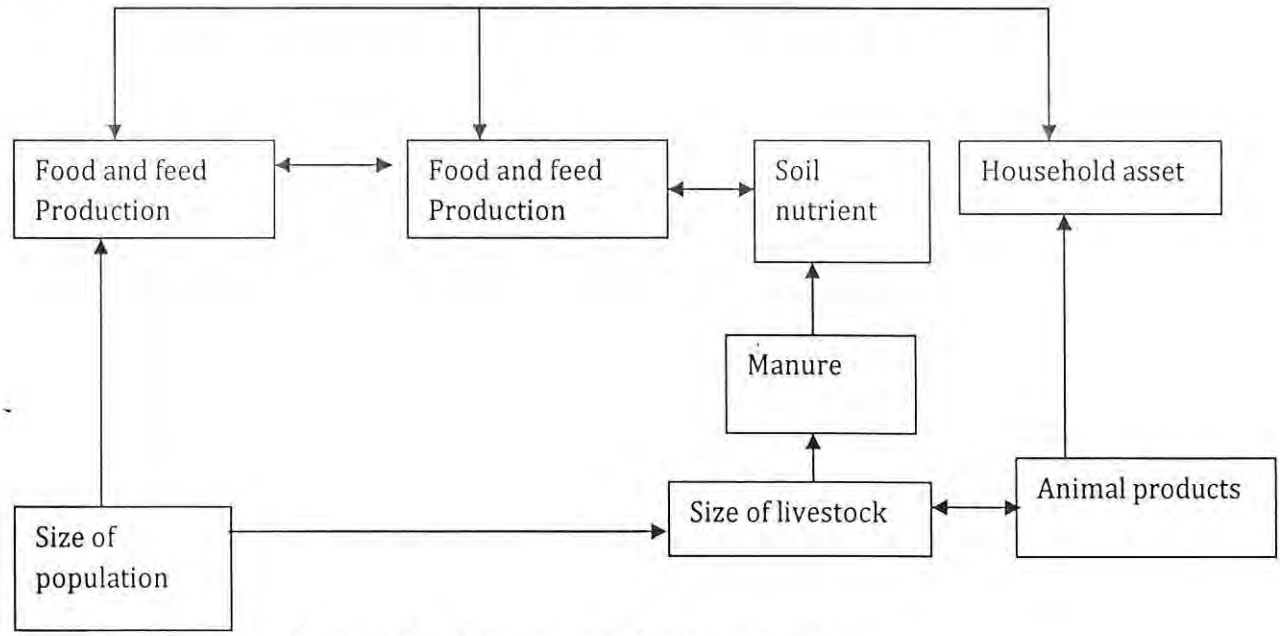


Figure:3 major stock, flow and relationship in livelihood system

Resource competition between crop and livestock production and non- farm activities characterize the livelihood system.

The application of manure and mulching with leave, add organic matter to the soil increasing its permeability and the amount of available nutrient. Manure is the primary source of organic matter in the area. Therefore it is important in crop farming. But as respondents said, poor manure storage and application technique causes unbalanced nutrient: high near homestead, while shortage far in the field. As Ayalew (2009) indicated, in Gesheluchine over nitrification causes soil toxicity and disease on garden plants like enset and cabbage.

The impacts of livestock on crop lands also indicated in the Table 4.27. Accordingly, feeding in post harvest croplands and inter crop feeding is also practiced, as responded by (32%) of the respondents in the four kebeles.

Table 4.27: percentage respondents of inter-cropland feeding practice in the study area (for abbreviations, see Table 4.1).

question	**Do you some times feed in crop or on crop fields?**						
Response	AH	GL	SH	UK	Total	Mean	St d
Yes	55.5	12	37.4	37	32	9.5	4.2
No	45.5	88	66.6	63	68	20.5	11.2
It's problem if yes for above question						**% of Total**	
Soil disturbance and trampling						51.6	
Soil compaction and less workable						78.1	
plant destruction and poor yield						84.6	

Source: field survey (2010)

The total does not add up of 100% because some of the respondents gave a combinations problems as equally occurs

As indicated in Table 4.27, it is highly practiced in Allagal landode accounts for about (55.5%) and shashamanne (37%). Because these two kebeles found in dry woinadega and moist woinadega agro-ecologies respectively and hence have most land covered with such crops (mainly perennial crops) . As a whole, in average, about 9.5 HH practice intercrop feeding and face the above reported environmental problems, like soil and plant destructions. As key

informants explained, the problem on soil became intense in wet season than on dry reason, the inverse for plants.

Regarding the free grazing (post harvest grazing) system in the study area, 37.5% of respondents replied that, the croplands and leftovers open for every body during dry season, while 62.5 % respond it as illegal and highly opposed practice .

Table 4.28: Distribution of respondents on openly grazing on crop fields during dry season (for abbreviations see Table 4.1).

Question	**May croplands and left over open for everybody during dry season?**				
Response	AH	GL	SH	UK	Total
Yes	85	0	50	37	37.5
No	15	100	50	63	62.5
Explained impact if yes for above question					**%Total**
Environnemental Soil ; compaction, disturbance, destruction					60
Plat ; destruction, over consumption					71
Water; over utilization, pollution					40
Social – conflict					91
Economical – extra cost to maintain the resource damaged - Cost for compensation - Property loss including live animals					51.6 46.9 40.6

Source: field survey (2010)

The total does not add up 100% because some of the respondents gave a combinations problem as equally occurs.

As indicated in Table 4. 28, it is in Allagahandode that about 85% of respondents reported the opening of cropland for every body, 50% in shashamanne, and 37% in Ushanekoche. But in Gesheluchine, no HHs responded, opening of once crop land for other stock. As informants indicated, however every body can use his own crop land freely while leaving cattle or any livestock free is illegal due to dry season crop (maize)cultivation in wet dega area.

The farmers also asked to explain the impact of dry season free grazing and environmental, social and economic impacts are reported. Since the grazing is uncontrolled, soil (60%), plant (71%), water (40%) are perceived to be affected by freely roaming livestock in all land escapes. 95% of respondents in the three kebeles located in woinadega agro ecology responded,

conflict commonly raise among neighborhoods, mainly when the livestock destruct the property of others, specially that of the one who do not own such stock type. The community also face economic problem, due to extra costs of maintaining the resource destructed by freely roaming animals, cost for compensation when for instance, cattle (Animal) harm that of the others, as reported by (46.9%), and individual property losses as (40.6%) of them replied. In addition, as key respondents said, such activity, also have negative effects on the conservation efforts under way in the region. Most physical conservation structures, such as soil bunds and stone terraces are damaged by freely roaming livestock. Biological conservation practices such as grass strips, and tree plantation are also being destroyed or trampled, reducing the chance for re establishment and regeneration. Biodiversity losses.

In Shashamanne and Ushanekoche, however, the communities have their own rule and regulations, no body allowed to leave the cattle free, if do so will pay 30 birr/livestock. However, as an informant from Shashamanne describes, still about 25% of HHs in their kebele, let their cattle free especially shoats. The children send them to coffee forest, but the cattle immediately come out from forest and move in the village (homestead in search of better feed). So, there is always conflict. The same trend reported in Ushanekoche. As one person noticed in focus group discussion

> *"...we have our own rule but since the contribution of formal institution (kebele) administrations is low, some HHs not obey to our rule and send their livestock freely so, still there is a problem".*

The impact on soil mainly became serious, when rainy season comes, while still the livestock roam free. As key informant from the office indicated, livestock induced environmental problem during dry season became the major challenge in livelihood , especially in dry woinadega kebekes which farther intensified due to additional stress of climate change that resulted in extended dry season and unseasoned rain fall. Because this causes serious animal feed shortage at specific area so that they forced to leave them free in search of fodder elsewhere. However land owner may also benefit from increased soil fertility due to manure left by grazing animals, while the externality costs out weight the benefits, remains an empirical question (Berhanu et al, 2002)

In general, it can be conclude that based on grazing system used, crop lands are negatively affected by livestock production and management system of a specific area though manure is important in the production.

4.3 The role of livestock in integrated land management in the study area

Due to the earlier misconception of the role of livestock in sustainable development, many GOs and NGOs led land management program given low profile for the livestock (Sida, 2010). It was after 1998 that the World Bank developed livestock environment initiative by showing the importance of livestock in global endeavor to attain food security and protection natural resources. As discussed earlier, in mixed farming system of sekachekorsa wereda, livestock proved to be a crucial link in nutrient cycling on small farms, maintaining viability and environmental sustainability of agricultural production, (though the opposite can occur based on specific management system of an area). Similar observation have made by Shiphered and Soule (1998), who reported the benefits to farm when livestock is used as conduit for nutrient flow on to farm through feed collected else where and brought onto the farm.

Vegetation strips and multi purpose trees and shrubs first, used for soil conservation, in different area, opening the way for livestock intervention in integrated land resource management led by RELMA in south Eastern African countries including Ethiopia. Nitrogen-fixing and fodder trees or shrubs used in agro - forestry were also introduced to improve soil fertility and provided fodder. In Sekachekorsa woreda also, as key informant from Agricultural Bureau notes, the office have introduced few forage species (clatonia, mukinia, lucinia etc) and by now in some area farmers who work on fattening program produce it . Since these plants are planted on terraces, they can prove soil erosion hazards. But in the studied communities, only 6.5% of respondents own such fodder plants which is insignificant. Moreover, in the year 2010/11 for natural resource development and management the office plan to produce and plant vetiver grasses on 4000 m^2 of land at woreda level for both fodder and soil conservation . Such species of plant also enhance the biodiversity in clouding micro fauna and flora.

4.4 Socio-economic and technical constraints in linking livestock production and natural resources management in the study area

It has been long recognized that, the limitation to increasing livestock development (increasing production and productivity) without harming the environment, in Ethiopia, are multi dimensional (Alemayehu (2002). Socio-economic constraints include, policy issue, land tenure, institutional, marketing and budgetary. While technical constraints include health, feed and genetic.

4.4.1 Policy constraints: Alemayehu (2002) said that, livestock is an integral part of national resource, so, there on environment policy for natural resources to be used in ways which allow sustained production in the long term. Livestock and natural resources management are influenced by many aspects of government policy ranging from economic and social to political.

As responded by (86%) of households interviewed in study area , both current and past government did not have an appropriate livestock policy, effectively guided activities especially in mixed farming system of the area. Informants also explained that, none livestock strategy or policy directed at poverty reduction and environmental protection . Several respondents from four kebeles (65%) argued that, Government policies has long concentrated on increasing cereal or cash crop product, leading to focus in regard to livestock, primarily some might say "exclusively" on draught oxen. As key informant explain, this narrow focus has prevented full appreciation of(a) the enormous contribution of livestock make to the livelihood of the poor , (b) the considerable potential for poverty reduction, and (c) the potential role of livestock in environmental protection and over all economic development. Most of the policies and program on natural resources management, like forest, soil and water etc didn't also conceders the livestock sector as crucial issue in the area.

4.4.2 Intuitional constraints: According to Woreda's Agricultural Rural Development Office, the livestock sector is under Agricultural Bureau for many years as one department but starting from 2009/10 it reformed as An Agency (Oromia Livestock Development, Health and Marketing Agency). This is an opportunity for development of the sector. However, regarding the collaborative work with other sector, it is under question. The major factor for livestock related environmental degradation in Ethiopia was due to the fact that, department looking after livestock development have no control on land resources, while departments who manage land

resource have no direct connection to livestock sector (Berhanu, 2002). The absence of a suitable mechanisms to facilitate inter department planning, implementing, etc has resulted in the failure of several fodder regeneration intervention implemented at the village level , rendering farmers incapable of taking up fodder recourses management effective.

Another institutional constraint, in the livestock development, is the weak link between extension and research centers (Alemayehu, 2007). About 71% responded that, there is no any organization working on livestock sector, except weredas Agriculture Bureau. It is only in Geheluchine that, some of the respondents inform Jimma University Agricultural Research Center as working some research in the kebele, mainly on fodder development and some genetic experiment. This institution, also gave training for some selective first level farmers regarding livestock fattening.

One key informant also described that, there were no NGOs working on the sector in the wereda. Inadequate input distribution system and credit facilities, lack of educational infrastructure for training, inadequate staff, frequent shortage of drugs, transportation and road, accompanied by insufficient recurrent expenditure have been reported as critical constraints for development of the sector.

4.4.3 Marketing constraints: As indicated in the earlier discussion, market related problem is mentioned as one of the cause for poor livestock productivity in the woreda; mainly fluctuation of market prices and law local demand for specially, livestock products.

Table 4.29: Response for market related problems in percent (for abbreviations, see Table 4.1)

Responses	AH	GL	SH	UK	Total
Fluctuating of prices	26	3.5	6.25	8.7	11
Distance from cities	7.4	43%	31.25	30.3	34
Low local demand	62.6	53.5	62.5	61	55
Total	100	100	100	100	100

Source : filed survey (2010)

According to Alemayehu (2002), most producers in rural Ethiopia, sell their stock and livestock products at local market directly to consumers or small traders at relatively low prices. According to key informants, marketing information is unreliable and inadequate. That is why,

34% of the respondents replied, the distance that associated with poor trickling routes as major problem. In addition to this, only 37% of respondents reported marketing of livestock in rural kebels, (mostly chickens and shoats) determined on the basis of their weight and quality, while 63% of them responded direct tiresome bargaining between buyers and sellers as dominant marketing systems. Generally, it can be conclude that, due to these unfavorable marketing systems and the discouraging price on the producers' side, they are not encouraged to improve the quality, even though the quantity may increases in the woreda putting more pressure on the environment.

4.4.4 Technical constraints: Here the focus is on genetic and health issues. Regarding to the improvement of genetic resources, 82% of respondents in the four Kebeles responded that, they never own any new breed yet. Key informants indicated that, some of the new breed, that being introduced in the woreda, had unable to adapt to the environment, in addition to this, absence of good quality feed, poor technical advices from experts are reported as major causes of failure. Another problem on livestock production in the study area is the health issue. As indicated above, poor animal health is the major constraints to livestock production in study area. Informants cited that, the most common disease in the area includes; Foot and Mouth Disease, Trypanasomasis , Anaplasmosis, Fashola Disease etc . Most of these are noticed and can be controlled easily. However, as 51.5% of respondents in the four kebeles reported, perceived increasing trend in the occurrence of new livestock disease in their locality. From these, about 52% perceived, rising in average temperature as probably the cause for such disease occurrence. As key informant reported, in recent years some previously unrecognized cattle disease have occurring in almost all of the woreda. Last year an epidemic disease killed many head of cattle in all part of the kebeles under studied. One of my informants, from woreda Livestock Department Offices, explained about this new disease. As he said, the disease is a vector borne disease called Lumpy Skin Diseases (LSD), which already known in other tropical African country like in Kenya, Tanzania, etc. He explained that the insect that, transmit this disease can only live in relatively warmer climate. Therefore, the occurrence of the disease in the woreda, have been assumed, mainly due to the changing in climate that raise the average temperature of the area. As he said, other many new disease have been seen in the woreda, which need intensive vaccination before it became epidemic. To do so, the office however, lack human, material and financial resources.

Finally based on the finding from the study conducted in the four kebeles, the following major problem area of livestock - environment interactions identified and reflected by using PSR/DPSIR/ model (sours; FAO, 2006)

Driving force	Pressure	State	Impact	Response
Socio-economic Population pressure Market	-Number of HHs increase -Demand for arable land increases -Demand for livestock increases. -High market demand for both crop and animals	-More land converted to crops -Decreasing in grazing land-encroachment. -Large flock sizes exceeding land carrying capacity (15 TLU/ha)	High feed shortage -overgrazing	Finding alternative feed sources (Crop residue, forest and any open space) .
Policy	-Cash crop orientation (Crop yield maximization policy). -Absence of pro-poor livestock policy. -Change in land tenure. -Fodder given last priority .	-More land under such crops -More manure demand -Redistribution of communal grazing land -The animal feed decrease in both quantity and quality	-Less fallow land -Large flock size -Livestock confined on small private pasture land degradation	-Inter crop feeding (animal leasing) . -Inorganic fertilizers. -Feed on other resource as alternative. -Stall feeding but very low.
Institutional	Weak collaboration among institutions (departments) -Absence of strong rules that define grazing area and system -No awareness given for the farmers -No collective action to manage CGLs and forest land	-50% not practice rotation system -80% feed animal together -Feeding on marginal lands become common (hill top, swampy area and near water resources) -Free grazing on crop lands -Poor manure application technique. -Wasteland degradation -deforestation.	Overgrazing, --erosion, changing plant species -Feed competition -Soil erosion, trampling, plant destruction -Water pollution -Animal disease -Plant and soil destruction -Conflict, cost -Over nitrification	-training but poor application and follow up. -Training to use composting. -Propose for other land use .

			-Soil toxicity -Poor nutrition ,erosions -Bush encroachment	
Environment -land degradation	-Fertility loss of cropland -Erosion and deposition -Change in climate	-Farm expansion to fallow land -Close water sources -Rise in average temperature -Relatively longer dry season -rainfall variability -new vector born disease	-Pasture decrease -Water shortage for animals -Food and feed crisis -Water shortage -Animal death	-Use marginal lands as alternative feed sources -Use livestock as compensation -Feed on agro plant like (enset, banana etc) -Long distance to search water -Vaccination

The **driving forces**. like change in socio-economic, policy and institution or environmental condition, have created **pressure** on the environment, which then degrade the **state** of the environmental and result in **impact** on, human and eco-system. But society or government **response to** manage or plan to reduce or mitigate the problem or through environmental and socio-economic damage that occurred as a result of the original pressure. Moreover, what used as response against an impact can be a pressure for other damage. For example, feeding on forest land as alternative can cause an other environmental degradation, etc.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1 Conclusion

In the study area, livestock are an integral component of life; cattle play an important role in crop production by supplying draught power and manure which determine the amount of crop yield of a plot, all things being equal. In addition to this, the livestock are contributing to livelihood of the community as main source of cash in come and their direct products. However, strong human population growth that increases the demand for arable lands and cause grazing land steadily shrinks as the case of Allagahandode, Shashamanne and Ushankoche. These population growth also fueling high demand for livestock products, so that livestock size and composition at community level increase (though decrease at some households level), breaking its balance with the land. This high demand of animal feed and decrease in size of pasture land force to graze on marginal land of little value of farming potential such as shill tops,(as the case of Gesheluchine), swampy areas, as in Shashamanne and Ushanekoche), forest land as the case of Allagahandode, Shashamanne, etc), and any open access areas like road side, etc. Coupled with other factors, this trend cause serious environmental degradation, erosion, plant destruction, and deposition, etc in study area .

Both positive and negative interactions of livestock with these resources were highlighted in the study. There are two types of grazing lands used by respondents; communal grazing land and private pasture land. The major factor that cause adverse livestock- grazing land interaction is disappearance of CGLs as indicated in (Allagahandode and some in GesheLuchine) and poor management of the remaining plots of CGLs as indicated (in Shashamanne and Ushanekoche). In the past, CGLs are under traditional resource management system. Due to some socio-economic and political factors this system eroded now. Privatizations of CGLs (AllagaHandode) result in conversion of the resource to other land use, which still some of it used by community with out contributing to its management. This leads to degradation of the resources mainly due to the domination by invasive tree species (zeytuna). This event disproves the theory of common, which said, resource more managed under private ownership than common. The opposite however, observed in Gesheluchine where the remaining communal grazing land found, highly

degraded though it was under common tenure system. The same trend was in Shashamanne and Ushanekoche. Therefore, due to these and others, more than 65% of HHs in the four kebele responded, using private pasture land as primary feed sources. The livelihood of the poor and landless households failed in trouble. Regarding the private pasture land, there was a positive correlation with livestock size households own. However, the correlations Is not a such strong, meaning that though small plots of private pasture is required to own cattle or shoats, some households own more than their size of pasture land. This increase the pressure on both grazing land and other environmental resource like forestland, marginal lands etc. But the degree of degradation in both private and common grazing land determined by topography (upland, low land), grazing system (free grazing or zero grazing) and rotational system, the alternative feed sources, livestock type they grazing on etc. All these with other factors, determined the degree of grazing land degradation and its contribution to livestock production in the study area.The adverse impacts of livestock on land, also determined by season and system of feeding a community uses. For example feeding on crop land in wet season highly affect the land (soil) through compaction and trampling, while dry season have relatively lesser impact as respondents replied. However, the free grazing system, which is reported by 100% in Allagahandode, 25% in Shahsamanne, 15% in Ushankoche as common cause of livelihood problem. As informants said, the freely roaming livestock on post harvest crop lands, affect the environment; soil and plant destruction, this also cause social problem (conflict) and economic problem (like extra cost to maintain the damaged property and food insecurity due to perennial crop losses (like enset, sweet potato, vegetables etc). However, as mixed farming area, there are also high crop-livestock integration on the farmland, manure is reported as a compulsory for crop production. But the current policy pressure the farmers to specialize to dominant cash crops of specific area (like coffee, chat, vegetables etc.) , giving little or no attention for livestock sector. But due to manure demand and extra income, farmers still continues to own livestock, though such crops put pressure on animal feed resources. This miss much create an adverse relation between the crop and livestock, because some people feed in such crop as alterative. In Gesheluchine however, communities oriented towards livestock as primary means of livelihood due to the degradation of their cereal farm land.

The pressure of livestock on forest land is not strongly visible in the study area. But as reported by many respondents, in AllagaHandode, Shashamanne and GesheLuchine, feed on forest land as alternative feed sources .Again, as 66% reported, pasture land expansion as major cause of deforestation in the past. However in recent years, as in the case of Allagahandode and Ushanekoche, forest and wood land increase at expense of grazing land (coffee forest and eucalyptus) are the major factors, respectively.

Swampy areas and lands near to water points now became highly used as feeding area. This cause water pollution through erosion and manure leaking to water points. Since, 37% share the same water points with their livestock for domestic purposes, this may cause water born disease on those households with no clean water (as plan Ethiopia), in Ushonekoche and Shashamanne reported. Serious water shortage during dry season also reported as major challenges for livestock production in specific areas of the study woreda.

The current change in climate conditions is other environmental concerning livestock production in the woreda studied. As informants said, rise in average temperature, extended dry season, drought and storms are the recently recognized events. These have direct impact on livestock production, feed and water shortage, occurrence of new vector born epidemic diseases etc are reported at adverse impact of climate change. But, in wet dega area of Gesheluchine, this change in annual average temperature, make them possible to own Goats, which never resist before. Livestock also reported as an asset, as compensation to crop failure, manure to produce diversified crops, etc used as adaptive capacity to the farmers.

Therefore from these, one can understand that livestock not only the destructor of the environment but based on carry given by households for both livestock and environment it can be harmonize. For example, modern fodder plans like (vetiver grass) can be used for soil and water conservation in addition to feed. Manure if applied in correct manner, enhances soil fertility and increase production. Biodiversity will be kept in a good manner. However, for effective harmonization of the resources, there are some socio- economic and technical constraints like policy, institution, market etc in the study woreda.

5.2 Recommendation

- Researchers like Steinfiled et al (2006) states that, the major factors that enhance adverse livestock-environment interaction in mixed farming area is the decreasing in size of pasture land due to high demand for arable land. Therefore raising the productivity of already cultivated land through balanced crop-livestock interaction will reduces the over all land requirement to meet the demand for food and there by protect other land from being brought in to cultivation. An intervention that increases the livestock productivity from small size (like the introduction of new breed and fodder) also needed.

- Regarding natural resources management including pasture land, the development practitioners needs to use consultation and direct participation of user communities in decision-making. Because, this enables local knowledge, to be harnessed: in identifying problems and finding solutions at kebele level. Any crop based extension program should first identify and consider the role of livestock in the production and livelihood, the extent of pressure on livestock from proposed program, etc at different agro - ecological zone needs to be concerned before implementation.

- For household use their private pasture land, promoting the means to zero grazing or controlled grazing by using rotation system is needed. The fencing system practicing in Gesheluchine, should be encouraged and scaled up to other kebeles if possible. Because, of HH separate his pasture plot, he can feed in shift and also use for various stock composition. Encouraging the cut and carry system of feeding (stall feeding) though it is labor intensive, specially in AllagaHnadode,is needed. Farmers need training and access to forage development around homestead, crop mix fodder farms, and hill sides. Promoting agro-forestry, which also used for other livelihood purpose in addition to forage production, is other area of intervention needed.

- Proper land use plan is need for marginal lands currently used as intensive grazing options. But, the plan should based on strong participation of local communities.

- Local government, NGOs, and CBOs should work hand in hand with farmers to enable them to obtain higher efficiency without concentrating animal size in a given area. This intervention include, good nutrition foraged development, veterinaries services, infrastructure and marketing situation improvements.

- However, as FAO (2006) indicates, livestock extension services in the developing world have traditionally focused on animal health service at expense of production issue and there has been almost complete neglect of the environmental aspect of livestock production. This is also observed in study are, so, thus need a group (collaborative) approach, among different departments. The current ways of interaction, as they reported Subject Matter Specialist (SMS) need to stronger further. Soil and water management department, forestry department, health department; all should work together with livestock producing farmers and supporting departments. Integrated watershed management program that focus on (forest, pasture, soil, water etc.) resources are needed by considering the livestock as core component.

- For intensive mixed farming to reduce over nitrification (like in Gesheluchine), manure control approach that focus on regular management including storage and application techniques needs to apply. As observed in study area, most households do not have regular way of manure management, high concentration in the compound, while high demand on field away from home. So, development agents need to give them training and awareness, about storage and application techniques, including timing and amount per area with strong follow up. This, if applied, will improve the land nutrient accessibility and even may have reduce emission of green house gases the soil type should also be needed to take in to account during manure application .

- To reduce the current impact of climate hazards in livestock production in the area, extension workers, with local farmers, need work in collaboration to pre- adjusting of dry season feed source (storage if possible). Staying on the status of disease, pre identifying the vectors and giving vaccination should be intensifying at each kebele level.

- Finally, there is a need for quantitative inventory of all these conditions (range land, water, soil and biodiversity) that relate with livestock production system, so that the possibility of agricultural intensification and growth and transformation can be achieved. This is to mean there is a need for a more accurate measurement of these issues in the area. So that, the gap between such finding and finding of this paper, which based on the respondents perception, will be identified. Such gap (if any) can be addressed for formulating appropriate solution for the problem.

References

AberaBekele. (2006). The Role of Indigenous Institution in Grazing Land Management. The case of Chencha Woreda of Gamo Highlands South Ethiopia.

Alemayehu Mengistu. (1998). Conservation, Community Based Forage Development.

Alemayehu Mengistu. (2002). Forage production in Ethiopia. A case study with implication for livestock production, Ethiopia society of Animal production (ESAP), Addis Ababa, Ethiopia.

Aynalem Addugna.(2001). The Ethiopian Population and Environment. Ethiopian Demographic and Health Organization, Lesson 4. PP15.

Ayalew Demessie .(2009). Land use change and factors affecting agricultural production in Ghibe water shade. The case of selective woredas. MSc, thesis, Jimma University.

Belay Simane.(2010). Climate change: Impact and responses for carbon Neutral and Climate resilient development in Ethiopia. Feature Article box-3.

Berhanu Gebremariam. J. pender, Girmay Tesfaye. (2002). Collective Action for Grazing land management in mixed crop livestock system. Northern highlands of Ethopia. ILRI Ethiopia, Addis Ababa.

Bojo J and Caselus, D. (1995). Land degradation and Rehabitetation in Ethiopia. A resent AFTES working per 17. WB Washington DC.

Dehanm C.H Steinfed, H. and Black Burn, M. (1991) Livestock Development in Torpical Africa. Germany

Dewit, J. Western, P.T. and Nell, A.J. (1996). Environmental Assessment of land less Ruminant production System, Working Document Livestock and the Environment, Finding a Balance FAO/WB/USAID. Rome.

English. J. Tiffem M. and Morti more, M. (1992). Land Resource Management in the Machokos District , Kenya 1930-1990 world Bank.

Environmental Protections Authority (EPA) (2010). Ethiopia's Program of Adaptation to climate change (draft). Addis Ababa Ethiopia. PPs.

FAO. (1995). Livestock: Recognizing Their Role in Sustainable Agriculture: Livestock Resource Pack, prepared for the Animal production and health division. Rome.

FAO. (2006). Livestock and Environment: Finding a Balance. Rome.

FAO –WAICENT (World Agricultural Information Centre) .(1996).Agricultural Production and Trade Data Rome.

FAO. (1996) cereals: Feed for Animals or Food for people? Fact sheet distributed at world food summit

FAO. (1997). Current World Fertilizer Situation and Outlook, 1994/95-2002/2001. FAO/UN, DD/World Bank Working group on fertilizer- Rome.

FAO, (1993) Ethiopia. The agricultural sector: an overview vols- J and II. Rome. FAO.

GMS. (Grazing Management System. Inc) 1996). Environmental Impact Assessment of livestock production in grass land and Mixed Farming System in Temperate zones and grass land and Mixed farming Systems in humid and sub- humid tropical zones., working document. Livestock and Environment. Finding a balance FAO/WBV/USAID: Rome.

Habtemariam Kasa,Robert W and Charles F (2002),Crop livestock interaction and Livelihood Dynamics in Harar high lands.

Hendym, C R.C. Cleih, V. Grawshaw, R. and Phillip, M. (1995). Interaction between Livestock Production System and the Environment: Impact Domain: Concentrate Feed Demand working document Livestock and the Environment Finding a Balance: FAO/world bank/USAFD. Rome.

Houghton, J.T, Calendar, B.A and varney, S.K (eds) (1995). Inter governmental panel on climate change. Climate change radiative forcing of climate change and an evaluation of the IPCC IS 92 demission scenario, university press, Cambridge, uk.

http/www.Fao.org/WAICENT/FAOINFO/AGRICULT/aga/ISpa/ LXEHTML/policy/refs.htm.

Hurni, H. (2988). Degradation and Conservation of Resource in Ethiopia. Mountain Research and Development, 8(2/3):15-22).

ILRI. (International Livestock Research Institute) (1999). Linking Livestock and Natural Resource Management, ILRI, Nairobi Kenya.

Jahnke, H. E. (1982). Livestock Production System and Livestock Development in Ttropical Africa. Germany.

Kizalyia Muuebaze S. Manuk CM, Mgema. M and Olunga,(2006). The Role of Livestock in Integrated Land Management. RELM's experience in Eastern and Sourthern Africa. ICRAF. Working paper No 25

MOA/National Livestock Development Program(1998), Ethiopia working paper 4- National Resource and the Environment

Pimentel. D. (1991) Energy Inputs in Production Agriculture: Peart, R-M.(ed). Analysis of agricultural energy system. Enrgy in world agriculture. E/Sevier Amastrdam.

Sere.C and ste in feld. H. (1996). World Livestock Production System Current Status, Issues and Treds. Animal production and health paper No 127. FAO ROME

Stinfled H. (1988). Livestock Development in Mixed Farming System, Germany

Thomas. D and Barton. D (1995). Interaction Between livestock production system and the environment,. Impact domain, crop-livestock inter action. Working Document Livestock and the Environment. Finding Balance. FAO/MB/USAID. Rome.

United Nation (2006). Millennium Ecosystem Assessment. Ecosystem and human well being- synthesis report.

Winrock international institute .(1992). Assessment of Animal Agriculture in sub- Saharan Africa Morrition, Arkandas, USA.

Woldeamlak Bewket. (2003). Land Degradation and Farmer's Acceptance and Adoption of Conservation Technologies in the Digil watershed, Northwestern Highlands of Ethiopia. Social Science Research Report series no. 29.

Appendix 1

Table 1: conversion factors used to estimate tropical livestock unit

Livestock type	Tropical livestock unit(TLU)
-calf's	0.2
-heifer	0.75
Cows/oxen	1.00
Horse/mule	1.10
Donkey	0.7
Donkey(young)	0.35
Sheep/goat	0.13
Sheep/goat(young)	0.06
Camels	1.25
Chicken	0.013

Source: Strock et al (1995) cited in Mulu(2008)

Table 2: Environmental indicators in livestock production in mixed farming system

	category	Natural resources	livestock	Socio -economic
	Soil	Erosion Nutrient level Capacity	Manure storage and utilization	Rate of integration Land tenure
	Vegetable	Proportion of ground cover Plant species	Forage demand (diet preference)	Crop encroachments Farm income
	Water	Pollution Scarcity	Use requirement (composition)	Market
	Air -	Pollutions Change in state	Number (size)	

Source: FAO (2006)

Appendix 2: Instruments

1. Household survey Questionnaire

Dear respondents, this questionnaire are wanted for the study on livestock production and management system and its interaction with some environmental parameters, in your woreda. The researcher came from Addis Ababa university for fulfillment of Master's Degree in Environment and Development in Development studies. The research is planned to show how your livestock's are affecting the environment and also being affected by it. It also to show its implication in your livelihood and to recommend the better way for you and other concerned bodies. Your information for the questionnaire will determine the quality of the study. Could you please give me the correct information?

Thank you!

Section 1: General information

1.1 Kebele's name (PA)_____sub village(Kebeles) Name_____

1.2 Name of house hold head_____

1.3 House hold size (persons in the household) _____
Male_____ female_____

1.4 Level of education 1. Illiterate 2. primary education
3. Secondary education 4. post secondary

1.5 Occupation
- farming only_____
- farming and vocational work_____
- farming and petty trading _____
- other (specify)_____

1.6 If farming, what kinds of farming system you use?
1. mixed farming
2. mixed cropping
3. livestock only
4. cash crop only

1.7 What is your higher source of annual in come ?
1. cereal 2. Coffee 3. Chat 4. Livestock
5.others (specify)_____

Appendix 1

Table 1: conversion factors used to estimate tropical livestock unit

Livestock type	Tropical livestock unit(TLU)
-calf's	0.2
-heifer	0.75
Cows/oxen	1.00
Horse/mule	1.10
Donkey	0.7
Donkey(young)	0.35
Sheep/goat	0.13
Sheep/goat(young)	0.06
Camels	1.25
Chicken	0.013

Source: Strock et al (1995) cited in Mulu(2008)

Table 2: Environmental indicators in livestock production in mixed farming system

	category	Natural resources	livestock	Socio -economic
	Soil	Erosion Nutrient level Capacity	Manure storage and utilization	Rate of integration Land tenure
	Vegetable	Proportion of ground cover Plant species	Forage demand (diet preference)	Crop encroachments Farm income
	Water	Pollution Scarcity	Use requirement (composition)	Market
	Air -	Pollutions Change in state	Number (size)	

Source: FAO (2006)

Section2- Land use and related questions

2.1 Total land holding (The sum of under different uses).....(timad)

2.2 Types of land uses under your possession(state in timad)

Land size	Size 2000	Size 2010
Land under cereal crops		
Land under perennial crops		
Fallow lands		
Pasture		
Other		

Section 3 ; Lade management and cultivation

3.1 What are the major land use problems in your areas? (Multiple responses are possible)

1. Drought and rain fall variability 2. Insects and crop pest 3. Soil erosion 4. Lack of agricultural input

5. Soil tired or exhausted 6. Livestock grazing on crop field and there by destroying crops
7. Others.....

3.2 could you tell me the fertility trend of your farm land overtime

1. Increasing 2. Decreasing

3.3 If you answer is 2. what is the reason (probe: used for longtime & exhausted 2, degraded, soil types, shortage of manure, etc)

3.4 please tell me, what types of land conservation practices you have been used, commonly to improve soil fertility of land? (Multiple responses are possible) 1. Application of manure
2. Mulching 3. Terracing 4. Others.....5. Fallowing

3.5 have you done any fallowing in the last five years?

1. Yes 2. No

3.6 If no, why?._____

3.7 What do you use to improve soil fertility?

1. Manure 2. Chemical fertilizer

3.8 If your preference is more manure, explain the reason_____

_____

3.9 If no, explain the reason_____

3.10 please tell me some locally perceived causes of soil erosion? (probe: Intensive rainstorms, livestock pressure, poor cultivation technique,
etc)_____

3.11 What varieties of crops you
grow/mention_____

3.12 What is your annual yield per timad? (for cereals_____

_____

3.13 What about the trends of crops yield overtime?

1. Increase 2. Decrease 3. No change

3. 14 if your answer is 2, what causes crop productivity change in your area? Rank the following possible reasons

_____ Shortage of manure----------climate condition

_____Low soil fertility ---------- labor shortage

3.15 What is your main land preparation tools?

1. Ox 2. Hand- Hoe 3. Other

3.176If your answer is 2, explain why? (probe: no ox, small land,
etc)_____

3.17 Do you think that your annual cereal production is enough for your food requirement?

1. Yes 2. No

3.18 If your answer is no, explain how you secure it?

1. from market 2. Enset 3. Other

_____

3.19 If your choice is 1, explain how you get money? _____

_____

_____

3.20 What is your source of compensation, during crop failure (probe: using livestock and its products, petty trade, aid,
etc)_____

Section 4. Livestock (resources)

4.5 composition and size of livestock resources)

Livestock type	Size
Cattle	
Sheep	
Goat	
Equines	
Other	

4.2 could you tell me the reason why you do not own such types of livestock? (probe:-

1. Never own it before, 2 you sell off-it

3. Can't keep it due to absence of pasture land 4. other_____

4.3 Explain The benefits the livestock provide to you? _____

_____

4.4 What has happened to the size of your livestock in the part three years?

1. Decrease 2. Increase 3. No change

4.5 If your answer is 1, why? _____

_____

_____

4.6 Is there any change in the types of livestock do you have in the past five years?
1. Yes 2. No

4.7 If yes, explain Why?_____

4.8 What are the problem of livestock productive ?(rank 1-4)

_____ Shortage of feed _____ prevalence of disease

_____ Mismanagement _____ market

4.9 How is the occurrence of livestock disease overtime?

1. Increasing 2. Decreasing 3. No change 4. Not perceived

4.10 If your answer is 1, please explain? (probe: change in climate, absence of veterinary service, feed shortage etc)_____

_____

4.11 If your answer is 2, explain? _____

_____

4.12 Do you consider the large size of livestock, advantageous /disadvantageous?

Advantageous.....reason_____

Disadvantageous_____ reason_____

Both_____ reason_____

4.13 would you own any kind of modern breed species of livestock?

1. Yes 2. No

4.14 if yes, please, compare them, with indigenous species? (probe: in terms of fodder need, production, number, adaptation to environment,
etc)_____

_____

Section 5. Perception on Feed sources and grazing system

5.1 What is the source of your livestock feed?

1. Communal grazing 2. Individual pasture field 3. Crop residue 4. Other specify

5.2 rank the importance of feed sources (1-4)

CGL's _____Private grazing lands_____

Crop residue_____Other _____

5.3 If you have your own plots of pasture land, how much find_____

5.4 Is it enough in relation to your livestock size ? 1. Yes 2. No

5.5 If no, what alternative you use? _____

5.6 Do you have separate feed sources for different types of livestock?

1. Yes 2. No

5.7 If no, what is the problem, if feed all of them together?_____

_____

5.8 Do you face shortage of grazing field?

1. Yes 2. No

5.9 If yes during which season? _____

_____

5.10 if the source of livestock feed is communal grazing land, to whom it belong?

1. Communal 2. Private 3. State

5.11 Do you face any problem to use CGL?

1. Yes 2. No

5.12 If yes, what problem?

5.13 Is there any erosion (resource degradation) in CGL's? 1. Yes 2. No

5.14 If no, what protect from being degraded? _____

_____

5.15 If yes what problem it brings on livestock feed? _____

_____

5.16 perceived changes since last ten years in use of feed in your area?

1. Decreased significantly 2. Decreased slightly 3. Increased slightly 4. No change

5. Increased significantly

5.17 please tell me, those factors you consider as major cause to decline of pasture land?

1. High population growth increase 2. Expansion of settlement 3. Expansion of cultivation

4. Privatization of communal lands5. Erosion (intensive rainstorms) 6. A forestation program

7. Bush encroachment due to poor management 8. Other specify_____

5.18 What do you perceive between government policy and grazing land in different political regime? Probe: villagelization and A forestation during derg etc)

_____

_____

5.19 Do you think that the size of livestock and size of grazing land balanced? 1. Yes 2. No

5.20 If no, explain its problem on land and livestock productivity _____

_____

5.21 What is your perception concerning the sufficiency of available grazing land?

Very sufficient ----------reason----------

Moderately sufficient----------reason----------

Insufficient----------reason----------

No sure----------reason----------

5.22 What grazing system you commonly use/ probe

1. Free grazing 2. Zero grazing 3. Stall feeding

5.23 rank your preference of grazing system

- Free grazing----------reason----------
- Zero grazing---------- reason----------
- Stall feeding ---------- reason----------

5.24. If you use stall feeding, what is your source of fodder? (Probe: agro plants like banana, enset,.....

5.25 Is there any problem if you use crop residue for animal feed?

1. Yes 2. No

5.26 If yes, explain.....

5.27 Do you some times feed your livestock in the garden like in coffee or chat field, etc?
1. Yes 2. No

5.28 If your answer is yes, explain its problem, on soil and plant_____

_____

5.29 IF free grazing is common during dry season, may crop lands and left over open for every body?
1. yes 2. No

5.30 If yes, explain the environmental impact of freely roaming animals? (Probe: soil, on plant, water, etc)_____

2. Explain its social problem? (Probe: conflict, etc)_____

3. Explain its economic problem? (probe: extra cost of maintaining lands, etc)_____

Section 6: Perception on livestock and other environmental resources

6.1 would you observe any deforestation, to expand pasture land in your locality?
1. Yes 2. No

6.2 If, Yes, explain its problems in livestock production_____
_____

6.3 What you perceive on the size of forest in relation to pasture land in the last 5 years in your area?

1. Forest land increase while grazing land decrease
2. Grazing land increase while forest land decrease
3. Both are decreasing due to agricultural expansion
4. Both are increasing
5. No change observed

6.4 What problem you consider if no graze you some marginal lands like along rivers and streams, swampy area, hilly lands etc(multiple responses are possible)

1. Trampling 2. Loss of vegetation

3. Soil disturbance 4. Soil compaction 5. Soil erosion

6. Others (specify) _____

6.5 Is there any relation between livestock and wild animals?

1. Yes 2. No

6.6 If yes, explain how? (probe: feed competition, predation, disease, etc)
_____

6.7 Do you have separate water points for animals and for domestic purposes? 1. Yes 2. No

6.8 If no, tell me any problem you face of share water with animals? _____
_____

6.9 Do, your near by water point is seasonal? 1. Yes 2. No

6.10 If yes, explain its impact on your livestock during dry season?_____
_____

6.11 Do you perceive any change in climatic condition in the last 10 years in your locality? 1. Yes
2. No

6.12 If yes, tell me the indicators (probe: un seasonality of rainfall, intensive storms, frequent drought etc)_____
_____

6. 13 tell me, its specific implication on livestock production? _____

_____

6. 14- If this change affects your crop production, how can you adapt yourself with such changes? Please tell me the role of livestock _____

6.15 What do you say for the future livestock production in relation to environmental situation?

_____

6.16 What is your perception for sustainability of mixed farming crop and livestock integration on your plots land?

1. Can be sustained----reason_____

2. Can not be sustained ---reason---------- 3. No sure------ ---- reason ----------

2. Key informant interview

Land tenure and land use

1. Please explain the current land use patterns of the area.
2. Explain farming activities, conservation works and settlement patterns of the area.
3. explain the condition of household of the community with regard to land holding and livestock ownership (whether people with large size of land have larger size of livestock) etc?
4. to whom CGL's and other resources belongs?

Livestock and environmental resources

Livestock and grazing land

5. What is the trend of livestock feed overtime?
6. What are the major sources of livestock feed currently?
7. If CGL's are still available, explain its management practices, factor affects its effective management and productivity?
8. what kinds of measure you recommend for sustainable use of CGL's?
9. Compare the current livestock /grazing land ration in the area?
10. Please, explain the major changes on livestock production and management system in relation to fodder availability? What is their major social and economic influence?
11. Explain those common grazing system currently practiced in this area its environmental impacts?
12. What is the major fodder sources during dry season?
13. What are the major environmental factors affecting fodder development and management?
14. What kinds of grazing system you recommend for the future? Why?

Livestock and croplands

15. Explain the importance of manure in agricultural production?
16. Please, explain why the farmers depend on chemical fertilizer, its availability and its production sustainability in relation to manuring?

17. Explain how the livestock affect land conservation practices like fallowing, mulching, terracing etc?
18. What are the major impact of inter crop feeding of animals?
19. Please explain the current trend of mixed farming practices?
20. Explain social, economic and environmental factors that forced the people to specialize to crop or livestock only?

Livestock and forest resources

21. Please, explain the relationship between livestock rearing and forest resource? (probe; if no ox, charcoal for livelihood)
22. Is there any deforestation occurred, due to ranching? Explain

    _____
23. Explain the impact of eucalyptus on grazing land?
24. What types of livestock are more affecting forest and wood land?
25. Explain the relationship between livestock and wild animals?

Livestock and water

26. Please explain the availability and accessibility of water and its relation with livestock management in this woreda? (probe; scarcity, seasonality, pollution,)
27. Explain of there is any human and environmental problem due to livestock and water point interaction?

Livestock and other marginal lands

28. What problem can occur of you graze on hilly areas? explain
29. Please, explain the impact of grazing animals in near by stream, wet lands etc?
30. For what purpose you recommend such areas?

Other points

31. Explain if there is any conflict, due to livestock and other resource interaction?
32. Explain the current trend in importance of livestock in cultural and social setting in the area?
33. how do you perceive and explain the current change in climate?
34. What is the role of livestock during crop failure due to drought and storms?
35. Generally, explain the role of livestock in poverty reduction, food security and environmental; protection ?

3. Interview check lists for officials, experts and development agents

1. Explain the importance of livestock productivity in this woreda?

2. What are the problems of livestock productivity?

3. What are the problems of crop production in this woreda (probe; including the traditional management?)

4. What are the major sources of animal feed in this woreda? (Probe; GGL'S private rangelands, modern fodder<)

5. Compare the current status of resource (CGL's & privation holding) whether degrade or not in relation to livestock size)

6. What are the role of livestock in crop production in the woreda?

7. Please, tell me by comparing artificial fertilizer and traditional manure in terms of sustainable production?

8. Explain deferent grazing system and its role in resource degradation and conservation practices (probe; free grazing)

9. What types of land use do you recommend for the hilly and wet land areas etc currently used as grazing land?

10. What is the current status of crop- livestock integration as mixed farming?

11. What is the role of livestock in integrated land resource management?

12 . Compare the current and past policies, whether it favor or prevent livestock production in the woreda? (probe: land related policy socio- economic and environmental policy? Livestock specific policy)

13. Explain how deferent institutions are working together and with community in managing livestock and livestock related environmental resources? (probe: grazing lands to forest and woodland, wet lands etc)

14. If new species or breeds are being introduced, how is their production complement or conflict with local breeds?

15. How is the market of livestock and livestock products?

16. Are there any epidemic disease is the region such sleeping sickness, in the woreda? How is its chance of occurrence overtime? (probe: due to changing in climate)

17. What has been done to improve the veterinary services?

18. What has been done to improve the productivity of livestock from small number of animals, to reduce the pressure on environment?

19. Please, tell me what going on to improve fodder resources in the woreda?

20. Finally, tell the role of livestock in poverty reduction food security and environmental protection in the area?

4. Focus group discussion

1. Please explain the trend of livestock production and productivity over time?

2 what the major problem affecting livestock production and management (probe: environmental , socio- economic and political)

3. With decrease in grazing land particularly CGL'sis there any problem in the livelihood of the poor? Explain?

4. What role does livestock play in local culture and custom and how is its current status?

5. With difficulty in owning livestock, do you think that the poor depend on other environmental resources like forest for their livelihood (probe: charcoal making, fuel wood setting

6. Please explain the role of manure in production of garden plants and use? What happen with shortage of manure?

7. Please explain how you manage and use animal waste? (probe: collecting in the hole and make composting, directly displaying on the field, etc)

8. What is the impact of free grazing on environmental resources? (Probe: what do you do, when others animal destroy your garden?

9. What kinds of livestock's are currently preferable? And why? (prob: large ruminant, small ruminant)

10. How can you keep livestock if you do not have land?

11. What is the attitude of women and youngsters on the current livestock management system?

12. Please tell me what you do, when the size of your livestock exceeds, the size of land you have? (Probe: selling, share for other, rent)

13. Please explain by comparing, livestock production, resource degradation and poverty, in your local area? How they interact and what to be done to balance it?

Declaration

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

Confirmed by

Declared by: