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DEMOGRAPHIC DYNAMICS AND SUSTAINABLE RURAL LIVELIHOODS IN JIMMA ARJO DISTRICT, EAST WOLLEGA OF OROMIA, ETHIOPIA

A THESIS SUBMITTED TO SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN POPULATION STUDIES (POPULATION, ENVIRONMENT, AND DEVELOPMENT)

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Demographic Dynamics and Sustainable Rural Livelihoods in Jimma Arjo District, East Wollega of Oromia, Ethiopia

By

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DEDICATION

To My Father Ato Etana Gebremariyam
And
My Mother W/o Sukare Guyassa

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Above all I commend the Almighty God for his compassion for all what I have ever achieved.

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ACRONYMS AND ABBREVIATIONS

AE	Adult Equivalent
CPRs	Common Property Resources
CSA	Central Statistical Authority
df	Degree of Freedom
DFID	Department for International Development
FGD	Focus Group Discussion
Ha	Hectare
ICPD	International Conference on Population and Development
IHHD	Inverse Herfindahl Hirschman Diversity Index
IUCN	International Union for Conservation of Nature
KAs	*Kebele* Administrations
MoFED	Ministry of Finance and Economic Development
MOI	Ministry of Information
NAS	National Academy of Science
OSG	Oromia State Government
PPE	Population-Poverty-Environment
SLF	Sustainable Livelihoods Framework
TGE	Transitional Government of Ethiopia
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNECA	United Nations Economic Commission of Africa
UNFPA	United Nations Fund for Population Activities
USD	United States Dollar
WB	World Bank
WCED	World Commission on Environment and Development
WoARD	*Woreda* Office of Agriculture and Rural Development

ABSTRACT

Ethiopia is one of the countries with rapid population growth, dense settlement in the highland areas, inexorable environmental degradation, and insidious poverty. The intensity of the problem is high in rural areas where the majority of the population lives and their livelihood directly or indirectly depend on the natural resource. The current situation of the country shows that the rapidly growing rural population is exerting pressure on the environment to secure its livelihood. The short-term decision of rural households on the environment to secure their means of living affects the sustainability of their livelihood in the long run. In the light of this problem, this study was conducted with an objective of analyzing the role of demographic dynamics and changes in livelihood assets in sustaining livelihood. Primary data obtained from 390 households randomly selected from three kebele administrations of Jimma Arjo District were used for the study. Both descriptive statistics and econometric model were used to analyze the data. The results of descriptive statistics showed significant mean difference in dependency ratio, labor force size, and livestock ownership. It was, however, insignificant for family size and land size. Households headed by females and younger persons were found to have limited access to livelihood assets. The households had limited access to credit services and saving. Most households live at reasonably shorter distance from main road. Given the livelihood assets they have, farming is the main source of livelihood and the contribution of diversification of activities to rural livelihood was limited. Non-farm income contributed only 8.8 % to their income. The multivariate analysis showed decreasing probability of livelihood sustainability with increasing family size and dependency ratio. The livelihood of households headed by females, illiterates, persons of low decision making power in local organizations, and households with limited access to credit service was found to be less sustainable than their counterparts. At 5 % significance level, age group of household head, land size, labor force size, health status of households, saving, and participation in CBOs were found to be insignificantly related to sustainable livelihood. Based on the findings, the following points of recommendations are stated: increasing awareness of people about the disadvantages of large family size, improving households' access to livelihood assets, affirmative action for disadvantaged groups, and strengthening of rural local institutions.

Key Words: Demographic Dynamics, Livelihood Assets, Sustainable Livelihoods

CHAPTER ONE: INTRODUCTION

1.1. Background

One of the striking events of the 20th century was the unprecedented population growth, economic development, and environmental change. The growth of population and economic development, however, has occurred with increasingly unsustainable utilization of the earth's physical environment (UN, 2001). Such economic development at the expense of the natural resource base of an area has been challenged since 1970's with the movement of environmentalists, which led to the emergence of the concept of sustainable development. Though there are different views on the concept of sustainable development, it is generally about reconciling development with the protection of the environment (Elliott, 1994). The World Commission on Environment and Development (WCED, 1987) defined sustainable development as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

The United Nations Conference on Environment and Development (UNCED, 1992), also called Earth Summit, held in Rio de Janeiro, Brazil, was a landmark in the evolution of an international consensus on the relationships between population, environment and development, based on the concept of sustainable development (UN, 2001). The conference stated that the growth of world population and production combined with unsustainable consumption patterns places increasingly severe stress on the life supporting capacities of our planet; and recommended the promotion of appropriate demographic policies and reduction and elimination of unsustainable patterns of production and consumption.

In 1994, the International Conference on Population and Development (ICPD) held in Cairo, Egypt, further revisited the issue of sustainable development in relation to population growth. The Program of Action of the ICPD stated that demographic factors, combined with poverty and lack of access to resources, cause or exacerbate the problems of environmental degradation and resource depletion and thus inhibit sustainable development. All these issues mainstream the importance of demographic factors in the context of sustainability.

Ethiopia is one of the developing countries known for its rapid population growth. It is the second populous country in sub-saharan Africa next to Nigeria. Agriculture is the most important source of livelihood for more than 80 % of the population. In addition, agriculture provides about 45% of the Gross Domestic Product (GDP), 90% of the country's foreign earning, and 70% of the raw materials required by industries (MOI, 2004). Nevertheless, the production level of agricultural sector is subsistence in nature, which is attributed, among other things, to rapidly growing population of the country (Ibid). That is, the rapidly growing population exerts pressure on natural resources leading to land degradation, land fragmentation, etc; which affects both the livelihood of the people and their environment.

The contrasting situation of population growth and environmental degradation in Ethiopia has resulted in the prevalence of poverty, particularly in rural areas. According to the estimate of the Ministry of Finance and Economic Development (MoFED, 2005), about 31 million people (44 %) of the country's population live below the poverty line equivalent to US$ 0.45 per person a day. It means that those people are unable to meet their basic needs. The percentage of the population living below poverty line is relatively higher in rural areas.

Cognizant of this, the country approved its Population Policy in 1993 and Environmental Policy in 1997. The overall policy goal of the national population policy of the country is harmonization of the rate of population growth and the capacity of the country for the development and rational utilization of natural resources so that the level of welfare of the population is maximized over time (TGE, 1993). Similarly, the overall policy goal of the environmental policy of the country is to improve and enhance social and economic development through sound management and use of natural, human- made, and cultural resources and the environment as a whole, so as to meet the needs of the present generation without compromising the ability of future generations to meet their own needs.

Given the aforementioned sustainable development agenda of the time and the current situation in Ethiopia, this thesis, therefore, attempted to explain the relationship between demographic dynamics and sustainable rural livelihood on the basis of data collected from Jimma Arjo District, East Wollega Zone of Oromia National Regional State, Ethiopia.

1.2 Statement of the Problem

Ethiopian population was estimated to be 11.8 million at the beginning of the 20th century and its growth rate was only 0.2 percent per year. It reached 42.6 million and 53.5 million in 1984 and 1994, respectively (CSA,1998), and is estimated to surpass 77 million in 2006 with a growth rate of greater than 2.7 percent per annum, making Ethiopia the second most populous country in sub-saharan Africa and the third in Africa. Regarding spatial distribution, there is high concentration of population in rural areas (85%) and in the highlands where large agricultural production potential exists (Belay, 1996).

Environmental degradation in the country, on the other hand, is reported to be severe (Ayalneh, 2002; Singh, 1998) as the country is one of the most degraded countries in Africa (Constable, 1984 cited in Terefe, 2003). According to UNECA (2002), Ethiopia loses 1.9 billion tones of top soil each year from its highlands. This loss of soil exceeds the rate of soil formation by a factor of six on cultivated land and by a factor of 1.5 to 2 on pasture land (Kifle, 1999). It is also stated that rate of deforestation ranges from 80,000 to 200,000 hectares (ha) per annum (Gedion, 2001) while the rate of afforestation was estimated at 6,000 hectares a year. Such a problem of environmental degradation is prevalent in rural areas where the majority of the population lives and whose livelihood depends on agriculture and related activities (Getachew and Demele, 2001).

This incongruous situation of population dynamics of the country and the trend of environmental degradation poses serious problem on the livelihood of rural people in general and on the poor in particular. As the rural people rely on the environmental resources for their survival (Rogers, 1996), the degradation of the environment adversely affects their livelihood. The cumulative effect of rapid population growth, concentration of population in few areas of the highlands, severe environmental degradation and deep-rooted poverty in rural areas inauspiciously affects the sustainability of rural peoples' livelihood. In this regard, Mulunesh (2001) stated that rural people could not maintain their livelihoods due to the deterioration of natural resources. The lack of access to resources to diversify livelihood further increases pressure on the natural resource bases of a given area, which in turn worsens the severity of poverty and environmental protection.

The problem of high population growth, environmental degradation, and poverty is menacing the sustainability of the livelihood of rural households in the country. People living in absolute poverty are forced to use short term survival strategies rather than sustainable use of natural resources. These people, instead of maintaining their basic requirements on permanent and continuous basis, they are adversely affecting the environment and being affected by it in their efforts to secure subsistence, which imperils both the livelihood of the people and their environment. This challenges the effort of poverty alleviation and environmental protection. To put more starkly, 'Ethiopia is confronted with the dilemma of producing enough food for its rapidly growing population on the one hand, and protecting the resource base upon which this is dependent on the other' (Melaku, 2001:10).

Demographic variables are considered to have complex relationships with rural livelihood and environment. Though environmental degradation is the result of a number of factors such as poverty, institutional problems, tenure insecurity and so on, population pressure is considered as one of the major factors (Seyoum, 1996; Belay, 1996; Ermias, 2003). It results in declining per capita assets (Masfield, 2001), landlessness, unemployment and underemployment, abandonment of traditional fallowing practices, decline of crop rotation practice, and expansion of farming land to marginal land and natural forests (Tesfaye, 2003). Moreover, the demographic characteristics of households determine access to resources and utilization of those resources to achieve certain desired livelihood outcome.

Jimma Arjo District, the study area, is characterized by relatively high population density. The population density of the district is 123.3 people per square kilometer, which is grater than the Zone average (81.4 people/ km^2) (CSA, 2005). The vast majority of the people are rural dwellers engaged in agriculture. On the other hand, agricultural productivity in the area has been declining in the area during the last few years. East Wollega Zone in general and Jimma Arjo District in particular, which was once surplus producing area, is now hit by declining productivity due to population pressure, land degradation, land shortage, exotic weeds, etc (Dechasa, 2003).

As the wellbeing of the people by and large depends on the wellbeing of the natural environment (Gedion, 2003), this paradox of protecting the environment and alleviating poverty is the challenge of developing countries in general and Ethiopia in particular. Filling the gap between environmental degradation and human wellbeing requires identifying where the problem lies, which enables to achieve sustainable development. In this vein, this study was conducted to examine factors that promote or inhibit the simultaneous achievement of economic prosperity and natural resource protection in the study area.

1.3 Research Questions

In view of the problems mentioned above, the research attempted to answer the following questions:

1. What changes have taken place in the study area with regard to household demographics and livelihood assets?
2. What differences exist among rural households in accessing livelihood assets?
3. What kind of livelihood strategies do the households employ to transform livelihood assets into certain desired livelihood outcomes?
4. What are the correlates of sustainable rural livelihoods in the study area?

1.4 Objectives of the Study

The general objective of the study was to analyze the relationship between demographic dynamics and changes in livelihood assets of households and sustainable livelihoods. The specific objectives were:

1. to analyze demographic dynamics;
2. to investigate changes in livelihood assets;
3. to examine household's differential access to livelihood assets;
4. to analyze the livelihood strategies of the sample households; and
5. to identify the correlates of sustainable rural livelihoods in the study area.

1.5 Significance of the Study

Increasing awareness about the relationship between demographic dynamics and sustainability was one of the points of emphasis of ICPD. Demographic dynamics is related to sustainable livelihood through production activities which is the function of human labor, natural resources, and capital. Production is affected by demographic characteristics of a household such as dependency ratio and family size. The role that demography plays in sustainable livelihood is also related to the assets of rural households.

In assessing the relationship between demographic dynamics and changes in livelihood assets and livelihood sustainability, this study is different from studies conducted so far for two reasons. The first is, most studies considered environmental problems and poverty separately. This study, however, attempted to address both issues simultaneously. Secondly, the study employed retrospective method to examine demographic dynamics and changes in livelihood assets and their influence on the sustainability of livelihoods. Thus, though the study was confined to a single district, its findings will be helpful for better understanding of the correlates of sustainable livelihood of rural households of the country in general and of the study region in particular. It sheds some light on the nature and extent of the problem of the livelihood of rural people in relation to their demographic characteristics and access to livelihood assets. The result is also expected to be helpful for the formulation of policies and strategies that facilitate the improvement of the means of living of rural people and natural resource management, the outcome of which is achieving development that is sustainable.

1.6 Limitations of the Study

In spite of the fact that efforts have been made to control the quality of data, the following major limitations have been encountered:

1. Households' livelihood analysis is a complex activity as it is the collective effect of a number of quantified and non-quantified factors that have direct and indirect influences. Households are also heterogeneous in the assets they have, strategies they employ, and outcome they want to achieve. This requires the consideration of large sample size. However, due to limited resources, the study was restricted to only 390 households though

it can show the livelihood situation of the area and serve as a stepping stone for further investigation.

2. Due to memory lapse, some respondents provided mere estimation of figures for quantitative questions about their livelihood assets before five years. This possibly affected the quality of the data.
3. In order to analyze the demographic dynamics and changes in livelihood assets, the relevant questions were asked for two points of time: 2001/02 and 2006/07. This gap of five years was found to be short to show the changes that had taken place in relation to some variables. But, reasonably, the results can reflect the general picture of the dynamism of household demographic characteristics and livelihood assets.

1.7 Organization of the Thesis

The thesis is classified into six chapters. The first chapter is an introductory part which incorporates statement of the problem, research questions, objectives, significance of the study, and limitations of the study. The second chapter is devoted to literature review and formulation of analytical framework of the study. In this chapter, theoretical explanations of people – environment interactions and other empirical reviews related to sustainable livelihoods are presented. Based on the theoretical explanations and empirical reviews, analytical framework of the study is also established under this chapter. The research methodology is explained under the third chapter where data set of the study, methods of analysis, and variables to be analyzed are explained. Chapter four presents the general background of the study area and the sample households. Chapter five discusses the results of the study. The final section is devoted to summary of the study, conclusive remarks, and recommendations.

CHAPTER TWO: REVIEW OF THE LITERATURE AND CONCEPTUAL FRAMEWORK

2.1 Theoretical Basis for People – Environment Interactions

In developing countries where the majority of the population lives in rural areas, there is high interaction between people and the environment. However, the nature, direction, and extent of people-environment interaction and relationship and its implication for sustainable livelihood is an area of contention since ancient times. Given the complexity and diversity of the impact of rapid demographic change (Birdsall and Sinding, 1991), different theories and models have been developed ranging from optimistic to catastrophic (Martine, 1996). This section, thus, reviews some of the theories by conventionally classifying them into three thematic areas.

1. Pessimistic Scenario: According to this scenario, population growth is considered as a threat to environment, poverty and economic development. It includes the following:

i/ The Malthusian Perspective: Thomas Robert Malthus, in his book *Essay on the Political Economy of Population* first published in 1798, stated that population grows geometrically while agricultural production grows arithmetically. This imbalance between the two leads to declining productive capabilities of natural resources (particularly land). Thus, the limited resource, which is independent variable for him, restricts population growth, the dependent variable, through positive and negative checks. Though the work of Malthus doesn't specifically address population-environment linkages (Marquette, 1997), as can be inferred from his exposition, population growth is a major threat to environment and development.

The work of Malthus later led to the development of the concept of carrying capacity, which is defined as the maximum number of people that the environment can support without being adversely affected. Since the carrying capacity of the environment cannot be exceeded without negative consequences (Orians and Skumanich, 1997), outstrip of population size beyond the carrying capacity of the environment results in environmental degradation. Hence, environmental degradation in general and declining land productivity in particular due to population growth adversely affects the sustainability of people's livelihood through increasing poverty. For Malthus and neo-malthusians, population growth induces

environmental degradation, land fragmentation and poverty (MacDonald, 1989 cited in Muluneh, 2003).

This Malthusian perspective is, however, widely criticized for not considering the role of technological change (Boserup, 1965). In addition for Sen (1981), famine, which is positive check for Malthus, is not the result of population growth rather food entitlement

ii/ The Multiplicative Perspective: According to this perspective (Ehrlich and Holden, 1971; Ehrlich and Ehrlich, 1990), the problem of environmental degradation is the result of population and economic growth, which is summarized in the following equation: I=PAT. That is, impact on the environment (I) is the multiplicative effect of population growth (P), per capita affluence (A) measured by consumption, and damage due to changes in technology (T). Thus, others being constant, doubling of population size will double its impact on the environment. This in turn affects the sustainability of natural resource base and the livelihood of the people who depend on it.

However, the model is criticized for the following two reasons: i) the impact of population on the environment is different based up on its structure and dynamism, which the model does not take into account; ii) the model ignores difference of culture and environment. Given the same size of population, different cultures respond to environment differently; and the sensitivity of different environments to the same human impact is different (Orians and Skumanich, 1997).

iii/ The Limits to Growth Perspective: It is based on the premise that population grows exponentially and correspondingly the demand for and consumption of resources continue to grow exponentially. However, the ability of the earth to meet the demand of the ever increasing population and of the ecology to absorb the polluting effect of man is limited. Growing population requires more food and increment of food production is based on growth of capital. As more capital requires more resources, discarded resources increase pollution which in turn interferes with the growth of population and food. Thus, growing population in a finite world can overshoot the limit of the environment and decrease the ultimate carrying capacity by consuming non-renewable resources (Meadows *et al.*, 1972).

Generally, 'if the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached some times within the next one hundred years'(Meadows *et al.*, 1972:23).

iv/ Tragedy of the Commons: It was developed by Garrett Hardin. His work mainly refers to the common property resources (CPRs). There exists harmonious relationship between people and their environment. But, such relationship may be disrupted due to population pressure and economic marginalization (poverty). Poverty and fragmentation of land due to population growth induces the poor to unsustainably use CPRs which leads to environmental degradation (Hardin, 1968).

Nowadays, though this view is criticized due to the existence of institutions that regulate the use of CPRs, it is still believed that poverty and inequality among the users of CPRs can result in the breakdown of the traditional environmental management arrangements (Forsyth *et al.*, 1998).

2. Optimistic Scenario: For the proponents of this scenario, problems of environmental degradation are attributed to reasons such as technology and market failure rather than population growth.

i/ The Boserupian Perspective: In response to Malthus's overlook of the role of technology, Boserup (1965) proposed an optimistic idea. For her, the limit to agricultural production due to population growth is solved by technological changes. Hence, population growth is the major factor that determines technological progress and agricultural development.

What can be inferred from the work of Boserup is that population growth, as an independent variable, influences agricultural development which, in turn, shapes the productive capacity of resources (Marquette, 1997). The growth of population, instead of adversely affecting the environment in an effort to produce food, maintains sustainable livelihood through the process of agricultural intensification.

Nevertheless, the Boserupian perspective is criticized by different scholars. According to Grigg (1980), the process of agricultural intensification is not caused only by population growth. Moreover, agricultural intensification is not the only response to population growth as people may shift their livelihood strategies such as livelihood diversification and migration (Scoones, 1998). This reduces impact on the environment and facilitates the achievement of sustainable livelihood.

ii/ The Neoclassical Economics Perspective: For neo-classical economists population pressure is not the cause of environmental degradation. Rather, economic inefficiencies and market distortions are found to be responsible (Orians and Skumanich, 1997). The failure of market to properly function leads the people to misuse resources. Thus, allowing market to function properly ensures environmental protection. Population growth, on the other hand, is important to increase innovation, which, in turn, minimizes the impact of humans on the environment (Ibid).

iii/ People- the Ultimate Resource: Julian Simon was one of the proponents of the cornucopian belief. For Simon, agricultural land is not a fixed resource; natural resources are not finite in any economic sense; and per capita income is likely to be higher with a growing population (Simon, 1981). These infinite resources and rapidly growing population are empowered by technological progress. He argued that people are the ultimate resources who can solve environmental resources. Thus, 'population growth is likely to have a long term beneficial impact on the natural resource situation' (Simon, 1981:5).

3/ Revisionist Scenario: This scenario, which reflects the dominant perspective of economic-demographers, neither considers population growth as a cause of environmental degradation and the resulting poverty nor they attribute development to rapid population growth. Rather they place the issue of population with other equally or more important factors (Kelley, 2001). The revisionists also claimed that the consequences of population growth have to be assessed over a long period of time and its direct and indirect feedbacks have to be taken into account within economic, political and social systems (Ibid).

Based on the 1986 summary assessment report of National Academy of Sciences (NAS) entitled *Population Growth and Economic Development: Policy Questions*, Kelley (2001: 25-26) identified the following attributes of revisionism: 1/ there are both positive and negative impacts of population growth; 2/ the actual size of the net impact and whether it is strong or weak cannot be determined given the existing evidence; and 3/ the net impact varies from country to country, in most cases negative impact, in some cases positive impact, and in others little impact.

The revisionist thinking of population is observed in different publications. The 1953 United Nations (UN) report emphasized both positive and negative impacts of population growth that are direct and indirect and identified in the short and long run (UN, 1953). The World Bank's (WB, 1984) *World Development Report* also falls in to the revisionism scenario as, based up on different experiences, it arrived at conclusion of adverse impact of population growth on poverty in some cases and rapid population growth enhances prosperity in other cases (Kelley, 2001). Similarly, for Shaw (1989), rapid population growth is not the ultimate cause of environmental degradation. Rather, it is a confounding factor which is situation specific and triggers problem of environmental degradation. Like Shaw, the reports of WB and NAS emphasized the contributory, not causal, role of demography in the development problems attributed to population growth (Kelley, 2001).

None of the aforementioned theories can fully explain the people- environment interaction in the pursuit of earning livelihood. The criticisms that are raised against some of the theories invalidate their universal applicability. The empirical evidence from different areas also confirms this. For instance, in support of the optimistic scenario, population growth is found to be linked to improvement in the environment in the Machakos district of Kenya (Tiffen *et al.*, 1994) and the Northern Nigerian Sahel (Adams and Mortimore, 1997 cited in Forsyth *et al.*, 1998). On the other hand, growth in population size was found to be responsible for deforestation and expansion of agriculture into marginal land in others like in Tumkur district, Karnataka state of India. There are also evidences that show situation specific consequences of rapid population growth (McNicoll, 1984; Srinivasan, 1988 cited in Kelley, 2001) in support of the revisionist scenario. This study is, therefore, to be placed within these divergent views of the roles of population in environmental degradation in the pursuit of livelihood.

2.2 Population, Poverty, and Environment Nexus

The time that is considered as a point of departure for the growing attention about population-poverty-environment (PPE) linkages is the 1970's. From then onwards, including the United Nations Conference on Environment and Development, a number of international conferences have been held to raise awareness about the challenges facing the world due to interactive linkages between population growth, increasing poverty and environmental degradation, particularly in developing countries. These conferences mainstreamed concerns of the nexus in to the global development agenda.

Though the relationship between them is unclear and clouded by misleading assumptions (Forsyth *et al.*, 1998); complex and varies according to the local socio-economic and larger macro economic policy contexts (UNFPA, 2002), it is generally agreed that poverty and environmental degradation are inextricably linked. According to WCED (1987), poverty is the major cause and effect of global environmental problems. Poor people, being constrained by lack of options, inflict serious damage on resources and degrade the environment at incompatible rates with long term sustainability. Demographic factors, coupled with poverty and inability to intensify production, cause or exacerbate environmental degradation through over exploitation of available natural resources and expansion of marginal lands (Ibid).

The poverty-environment linkage is also reinforcing, as environmental degradation further impoverishes the poor. Since their living conditions may offer them little or no protection from environmental degradation-induced problems (Dasgupta *et al.*, 2003), the impoverishment of the environment further impoverishes the poor, making their survival more difficult and uncertain (WCED, 1987). The economic dependence of the poor on natural resources makes their vulnerability to environmental degradation worse (Cavendish, 1999).

The available empirical evidence on the prevalence and importance of the PPE nexus and the extent to which they are related is inadequate (Dasgupta *et al.*, 2003). However, the international workshop on the linkages between population, poverty and environment identified the following characteristics exhibited by countries where PPE nexus is most pronounced:

> *'there is high dependence on natural resources for subsistence livelihoods; a scarcity of the most basic renewable resources; degradation of soil over a critical threshold beyond which rehabilitation is costly; low indicators of human and social development; inequitable access to natural resources; and women with negligible role in social and economic decision-making'* (UNFPA *et al.*, 1998: 6).

On the basis of these characteristics, Ethiopia, Madagascar, Somalia, Tanzania, and Zaire from sub-saharan Africa; Guatemala and the Caribbean Coast from Central America; and Pakistan, Iraq, the Syrian Arab Republic from Asia were reported to be "severely stressed" or areas where PPE linkages are most in evidence (PPE hot spots) (Ibid).

Vicious downward spiral of need is the dominant view point that explains the PPE linkages given above. According to this view point

> *'there is an aggregate population which interacts with an aggregate environment; people's livelihoods are based more or less exclusively on the use and management of environmental resources; poverty and environmental change have a direct causal relationship and can feed each other in some kind of cumulative causation process; and poverty is the principal or only cause of environmental change and vice versa'* (Forsyth *et al.*, 1998: 11).

However, this conventional view of vicious downward spiral paradigm has been criticized due to changing concepts of poverty and environment. The traditional income and consumption based definition of poverty now encompasses vulnerability, wellbeing, access to resources, etc. Likewise, new thinking on environment emphasizes the spatially and culturally different environment and environmental problems.

In an effort to overcome the shortcomings of downward spiral of need, environmental entitlements approach was developed (Leach *et al.*, 1997) based on the work of Amarthya Sen on entitlement in the context of famine (Sen, 1981). The key issue raised by this approach is that the links between environmental change and impoverishment are not direct, as poor peoples' interaction with particular environment is mediated by institutions (Leach *et al.*, 1997). The aim of environmental entitlements approach is, therefore, to enable the poor people achieve sustainable livelihoods and minimize poverty through increased access to resources (Forsyth *et al.*, 1998).

The difference between the two approaches (vicious downward spiral and entitlement) is that the former considers poverty as a core element that mediates the people – environment interaction, while the latter emphasizes access to resources and the role of institutions as a mediating factor. This study analyzed the people – environment interaction using the sustainable livelihoods framework which incorporates access to resources and institutions, which are the key elements of the entitlement approach.

2.3 The Sustainable Livelihoods Framework

The Sustainable Livelihoods Framework (SLF) is developed by the Department for International Development (DFID) to understand and analyze the livelihoods of the people (DFID, 2000), in which the debate about rural development, poverty reduction and environmental management is central to the concept (Scoones, 1998). The framework shows how, in a particular context, livelihood resources are combined and transformed into certain desired outcomes by using one or the combination of livelihood strategies (Ibid).

The SLF is based upon the following core principles:

People Centered: The main concern of the framework is analyzing the livelihood of people and their dynamics over time rather than their resources. This shows that sustainable livelihood can be achieved when development programs are targeted to people on the basis of their capabilities and livelihood strategies.

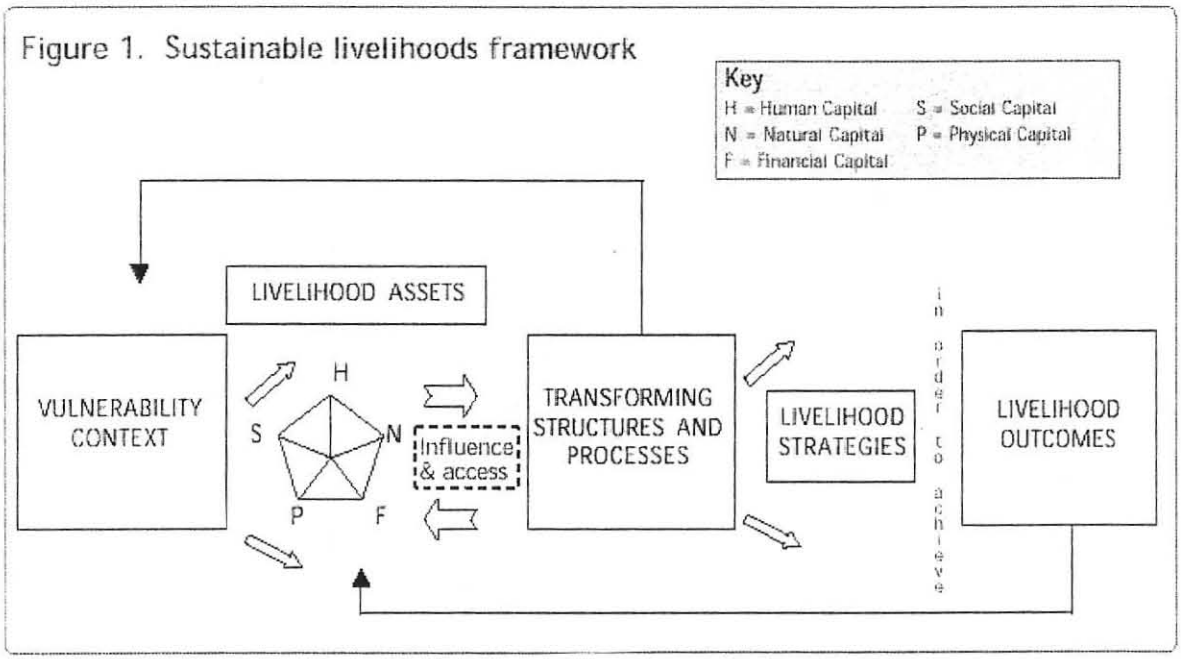
Holistic: It emphasizes understanding the livelihood of people as a whole with all its facets. In the SLF emphasis is given to analyze the various factors which constrain or provide opportunities and to show how these relate to each other (DFID, 2000). It recognizes multiple influences on people; it acknowledges the multiple livelihood strategies that people adopt to achieve multiple livelihood outcomes.

Dynamic: Based up on the dynamic nature of the livelihood of people and the institutions that shape them, the livelihoods approach is also dynamic to understand change so as to support positive patterns of change and help mitigate negative impacts.

Building on Strengths: The livelihoods approach starts with the analysis of strengths, which is also described as assets or capitals. It stresses the inherent potential of individuals in terms of access to resources and the ability to influence different factors with the aim of achieving their own livelihood objectives.

Sustainability: As its name implies, the SLF aims for outcomes that are sustainable.

Figure 1. Sustainable livelihoods framework



Source: DFID (2000)

As can be seen from figure 1, the SLF incorporates the following five elements: vulnerability context, livelihood assets, transforming structures and processes, livelihood strategies, and livelihood outcomes. These elements of SLF are explained below.

Vulnerability Context

According to Devereux (2001), vulnerability context refers to the external environment in which people exist and gain importance through direct impacts up on people's asset status. Vulnerability context comprises trends (of demography, resources), shocks (such as human health shocks, natural shocks, crop/livestock health shock), and seasonality (of rainfall, prices, production, employment opportunities etc). The most important characteristic of these factors is that they are not susceptible to control by local people themselves, at least in the short and medium term (DFID, 2000).

Livelihood Assets

One aspect of livelihood analysis is examining range of resources that people utilize to achieve certain desired livelihood outcomes (Bebbington, 1999). These resources, which are conventionally called as capitals or assets in the SLF, are generally categorized in to five.

*1. **Natural Capital***: The natural resource stocks and environmental services determine the resource flows and services useful for deriving livelihoods (Scoones, 1998). This capital is particularly important for individuals or households whose livelihood is totally or partly dependent up on the natural resource base (Kollmair and Gamper, 2002). There is also close relationship between natural capital and the vulnerability context as the later positively or negatively affects the former (Ibid).

*2. **Human Capital***: Human capital represents the skills, knowledge, ability to labor and good health that together enable people to pursue different livelihood strategies and achieve livelihood objectives (DFID, 2000). This capital is important for the successful pursuit of different livelihood strategies (Scoones, 1998) and it varies according to household size, skill levels, health status, etc (DFID, 2000).

*3. **Financial Capital***: It denotes the financial resources that people use to achieve their livelihood objectives. According to Kollmair and Gamper (2002), there are two sources of financial resources: an available stock which comprises cash, savings and liquid assets, and regular inflows of money such as labor income, remittances and so on. They also stated that this capital is the least available and the most versatile as it can be converted in to other types of capital.

*4. **Physical Capital***: It comprises the basic infrastructure and producer goods needed to support livelihoods. Tools and equipment that people use to function more productively are categorized under producer goods while infrastructure refers to changes to the physical environment that help people to meet their basic needs and to be more productive (DFID, 2000). Physical capital 'influences the sustainability of livelihood system through the notion of

opportunity costs or trade-offs, as a poor infrastructure can preclude education, access to health services and income generation' (Kollmair and Gamper, 2002: 7).

*5. **Social Capital***: Social capital include networks, social claims, social relations, affiliations, and associations upon which people draw when pursuing different livelihood strategies requiring coordinated actions (Scoones, 1998).

Transforming Structures and Processes

It refers to institutions, organizations, policies and legislation that shape the livelihood of people (Twigg, 2001). These structures operate at all levels from micro to macro, and from private to public. They determine access to the five different types of assets, livelihood strategies, terms of exchange between the five types of capital, and economic and other returns from livelihood strategies (Ibid).

Livelihood Strategies

Livelihood strategies show one or a combination of activities that are used by households to generate means of survival (Ellis, 2000). Households use different livelihood strategies based upon the vulnerability context in which they operate, the assets they have, and institutions and organizations that impact on them. Different scholars use different terms to identify these strategies. Scoones (1998) identified four types of strategies: extensification, intensification, diversification, and migration; Ellis (2000) identified two types of strategies: natural resource based and non- natural resource based strategies; Dorward *et al.* (2004) pointed out three types of livelihood strategies: hanging in, stepping up, and stepping out strategies.

Livelihood outcomes

It refers to the outputs or achievements derived from the available assets using one or a combination of livelihood strategies. It includes more income, increased wellbeing, reduced vulnerability, improved food security, and a more sustainable use of natural resources.

Sustainability of a livelihood is a key point in the SLF. According to DFID (2000), livelihood is considered as sustainable when it is resilient in the face of external shocks and stresses, not dependent upon external support (or dependent upon economically and institutionally

sustainable support), maintain the long term productivity of natural resources, and does not undermine the livelihoods of, or compromise the livelihood options open to, others.

Ahmed and Lipton (1997) identified two types of sustainability. These are static and dynamic sustainability. Static sustainability refers to situations in which livelihoods persist over time yielding a non-declining output; whereas dynamic sustainability shows the capability to increase productivity at a satisfactory rate given the growth rate of population.

The concept of sustainability encompasses a number of issues. Campell (1999) and DFID (2000) identified the following four elements of sustainability.

a) *Economic sustainability*: is achieved if a baseline level of economic welfare can be achieved and sustained. The baseline is, however, location specific and dynamic.
b) *Environmental sustainability*: is achieved when the productivity of key resources is conserved or enhanced for future generation.
c) *Social sustainability*: is achieved when social exclusion is minimized and social equity is maximized.
d) *Institutional sustainability*: is achieved when prevailing structures and processes have the capacity to continue to perform their functions over the long term.

2.4 Empirical Review of Correlates of Sustainable Rural Livelihoods

As presented in the theoretical explanation of people – environment interaction and the SLF, the sustainability of rural households' livelihoods is a function, among other things, of household level demographic dynamics and changes in livelihood assets of the households. This section, therefore, presents the existing empirical evidences of these factors as correlates of sustainable livelihoods. Besides, literatures related to livelihood strategies and institutions are also reviewed.

2.4.1 Demographic Factors

Age of household head is one of the demographic variables that are related to the sustainability of rural livelihood. The relationship is, however, complex due to the influence of confounding variables. Some of these confounding variables are family size, access to livelihood assets, main occupation of the head, and education of the head. As indicated by Lipton (1983), age of the head and poverty have inverse U shaped relationship being confounded by family size. That is, at young age due to limited family size; and at old age of the head since children reach productive age group, the risk of poverty is low. Households headed by heads in the middle age group have large family size and dependency ratio, which increases the risk of poverty. On the other hand, when the relation between the two is analyzed based on access to livelihood assets, the opposite will be true. That is, households headed by younger heads have limited portfolio of livelihood diversification since it is the time when they start accumulation of assets. Similarly, at older ages, due to the reason that resources are bequeathed, diversification of livelihood is limited (Vildivia and Quiroz, 2001).

Sex of household head is the other demographic factor that is also related to livelihood sustainability. The livelihood situation of female headed households is at disadvantage when compared with their male counterparts. As indicated in numerous literatures, this is due to their limited access to livelihood assets. For instance, female headed households have limited access to land (Hoben, 2001), less household size (Tiruwork, 1998; Addis *et al.*, 1999), low literacy status (Addis *et al.*, 1999), low social capital (Grootaert, 1999), low saving rate (Masika and Joekes, 1997), less number of labor force and oxen (draught power) and other livestock (Addis *et al.*, 1999; Tiruwork, 1998), and limited access to credit.

The number of dependents in the household determines the extent of participation in productive activities. According to Lipton (1983), poor households have high dependency ratio when compared with the better off households. The participation of households with high dependency ratio in environmental conservation activities is also low (Chalachew, 2004). The pursuing of different combinations of strategies also depends on changes in dependency ratios (Scoones, 1998). Thus, increased dependency ratio is assumed to be negatively related to sustainable livelihood.

2.4.2 Livelihood Assets

In countries like Ethiopia where the livelihood of large proportion of population depends on agriculture, land is an indispensable resource. Given the level of agricultural technology, certain minimum landholding size is required to produce sufficient product. For instance, 6.5 ha and 5.37 ha of land is economically viable size under low and moderate input levels of technologies, respectively (Gizachew, 1994 cited in Yigremew, 1999). Although the severity of shortage varies from place to place, access to land is a key factor that determines the livelihood of rural people, as it has become a scarce resource in the country (Degefa, 2001). Though the relationship between per capita land holding and its productivity depends on factors such as land use intensity, soil fertility, and quantity of labor used (Workneh, 2001), diminished land holding size increases the pressure on land through reduction of fallow periods and expansion of farming into fragile environment. This adversely affects the sustainability of the livelihood of people through land degradation and fragmentation.

Human capital, which can be seen in terms of educational level, size of labor force, and health status, is one of the livelihood assets that is related to the sustainability of rural livelihood. Education provides access to different livelihood assets such as social, natural and physical capitals (DFID, 2002). Literate households have high social capital as they are motivated to participate in public decision making. Labor force size can also affect economic status and productivity. Degefa (2005) identified three ways of labor contribution to rural households' livelihood. These are, carrying out agricultural operations at appropriate time, exchange of labor with other inputs of production in cases of scarcity, and generation of cash income from non-farm activities. A study by Yared (1999) in Wogda *woreda* noted that labor availability is perceived to produce substantial differences in productivity by determining the extent to which land improvement practices are completed. Similarly, based on data collected from Alemaya district, the logistic regression result showed positive relationship between labor force size and application of soil and water conservation activities (Chalachew, 2004). Poor health caused by inadequate diet, inadequate health services and others also cause loss of fitness and energy for farm operations (Kidane, 1999). Generally, high educational level, labor force size and health status are positively related to the sustainability of rural livelihood.

Farm equipments and basic infrastructure are among the physical capitals that influence the day to day activities of rural households as producers and consumers. Given low level of advanced technology used by farm households in Ethiopia, the importance of farm equipments is seldom questioned. Jansen *et al.* (2006) stated that ownership of machinery and equipment enables households to raise labor and land productivity and is especially helpful for households with relatively high opportunity costs for labor, such as those pursuing off-farm employments. Differential access to farm equipments also contributes to low labor productivity (Degefa, 2005).

Livestock ownership plays significant role to sustain livelihood. Dorward *et al.* (2004) identified the following functions of livestock: production, consumption, buffering, saving, and insurance. Livestock ownership contributes to sustainable livelihood as cash income may be obtained from the sales of livestock products (milk, eggs, meat, etc), services (work, transport etc), and live animals. Livestock have buffering (consumption smoothing) function. That is, investments are made in livestock when production exceeds consumption. Such an investment supports consumption later when production and income is not sufficient. Keeping animals is also saving as it may cover some major expenditure of households and provide insurance against unexpected event. Animals can also be used as collateral for borrowing. Empirical studies related to livestock ownership also confirm this explanation. For instance, as shown in study conducted by Yared (1999) in Wogda *woreda*, North Shoa, the grain output for households with tropical livestock unit of less than 2.19 was 543 kg while it was 1328 kg for households with tropical livestock unit of greater than 4.21.

Access to infrastructure such as market center and road promote livelihood diversification and agricultural intensification. The closer the location to market centers and main roads, the higher is the number of people engaged in non-farm activities (Muluneh, 2003). Proximity also increases access to farm inputs such as fertilizers and improved seeds (Ghiorgis, 1989). It is also found that spatial accessibility of rural households is related to the pattern of land use (Chisholm, 1976 cited in Ghiorgis, 1989). According to Chisholm, long distance plots give rise to the fragmentation of holdings.

Financial capital such as access to credit, remittance and saving is crucial for sustainable livelihood. Access to such assets is found to play imperative role in technology dissemination, increasing rural employment, and smoothing the consumption and investment gaps of households. For Barrett and Swallow (2005:26), 'if poorer households could freely draw cash savings or takeout loans at reasonable interest rates or receive insurance payments on extraordinary losses, most problems of persistent poverty would vanish'.

By referring to the works of different researchers (Zeller *et al.*, 1994; Zeller *et al.*, 1998; Schrieder and Sharma, 1999), Bekele (2002) elaborated the importance of financial capital as follows. Access to financial capital enabled farmers in rural Madagascar to invest in agricultural intensification strategies; it also reduces pressure on resources by easing the household's labor and diversifying income generation; and micro finance interventions enable households to invest in human capital such as education and training of household members. A study conducted by Khandker (2003) in Bangladesh also shows that micro finance improves the life of the poor by reducing poverty. Regarding remittance, studies show that it contributes to livelihood improvement by encouraging investment in agricultural implements, education, and in assets permitting local non-farm income to be generated (Ellis and Freeman, 2005).

Like all other capitals, access to social capital is indispensable to sustain livelihood. A study conducted in Tanzania (Narayan and Pritchett, 1997) showed that access to social capital has strong effects on the welfare of households. Similarly, based on the data collected from three rural provinces of Indonesia, the regression result shows that households with higher social capital have higher household expenditure per capita, more assets, better access to credit and more likely to have increased their savings (Grootaert, 1999). However, ownership of this capital is not the same for different households due to differences in assets, gender, level of education, and income (Ibid).

2.4.3 Livelihood Strategies

Households employ different strategies to achieve their desired livelihood outcome and also cope with negative situations. As pointed out by Ellis (2000), this study explains the livelihood

strategies of the study sample by classifying them in to four: agricultural extensification, agricultural intensification, livelihood diversification, and migration.

i. Extensification: Extensification of agriculture is the first response of households to rural population growth, which is conditioned by low population density and availability of adequate open access land with relatively good quality and spatial accessibility (Boserup, 1965). However, as noted by Pender (2001), expansion of agricultural land is limited even when the population density is low. This happens when accessible land is owned by large farmers and when the existing open access land is not suitable for agriculture (like in humid tropical Africa) and remote (as in the Amazon region of Latin America).

In most of the cases, extensification of agricultural land has little impact on agricultural productivity per unit of land, income per capita, but negative impact on the natural resource conditions of a given area (Pender, 2001). This is because expansion of agricultural land into forest areas and other marginal lands takes place leading to depletion of forest resources and increased soil erosion which endangers the sustainability of rural households' livelihoods.

Generally, though the adverse impact of extensification in terms of depletion of natural resources is high, it is the least cost response to rural population growth from farmer's point of view so long as open access land of better quality and accessibility is available.

ii. Intensification: When rural population density continues to increase, the cost of expanding agriculture into marginal areas will get higher and higher than intensively cultivating the available land of relatively better quality (Pender, 2001). Thus, agricultural intensification replaces extensification. According to Tiffen *et al.* (1994:23), agricultural intensification is defined as 'increased average inputs of labor or capital on a small holding, either cultivated land alone or on cultivated and grazing land, for the purpose of increasing the value of output per hectare'.

The process of agricultural intensification includes increased frequency of cultivation (shortening of the fallow cycle) and an increase in inputs (labor, capital). The increased uses of fertilizers, improved seeds, irrigation, soil conservation measures, therefore, show the

occurrence of intensification (Carswell, 1997). The extent of agricultural intensification in a given area is also measured by the frequency of cultivation and increased inputs per unit of land (Binswanger *et al.*, 1993 cited in Carswell, 1997).

Pender (2001) identified the following intensification based household level responses to rural population growth: i) increasing labor per unit of land through traditional methods (example, short fallow period); ii) using labor intensive methods of production (example hand hoeing, weeding); iii) labor intensive investment in land (example soil and water conservation measures); and iv) using capital intensive methods (example draught animals, equipment, agricultural inputs).

iii. Livelihood Diversification: One of the strategies that rural households use to achieve their desired livelihood outcome is diversifying their activities. Ellis (2000) defined livelihood diversification as the process by which rural families construct a diverse portfolio of activities and social support capabilities in order to survive and to improve standard of living.

In recent years, the role of livelihood diversification to improve the standard of living of people is well documented. For instance, non-farm activities contribute 45 % to household's income in Colombia (Deininger and Olinto, 2001), 51 % in Peru (Escobal, 2001), and 18 % in West Gurage land of Ethiopia (Muluneh, 2003).

Ellis (2000) identified two factors that derive households to diversify their activities. These are necessity and choice. Necessity as a factor of diversification shows that households participate in non-farm activities as a means of survival during the time of stress. A study by Reardon and others in Burkina Faso and Guinea, in support of the necessity hypothesis, found that harvest shortfalls and terms of trade drive diversification in to non-farm activities (Reardon *et al.*, 1992). While the choice factor shows that it is return to labor in the labor market that determines livelihood diversification. In general, it has a considerable importance in providing security against seasonality, coping strategies, and generating additional income (Ellis, 2000; Anderson and Deshingkar, 2005), contributing to rural employment and poverty reduction (Lanjouw and Lanjouw, 2001).

Though studies in developing countries found significant contribution of diversification of activities to livelihood security, the degree of participation depends on livelihood assets. The study by Dercon and Krishnan (1996) in rural Ethiopia and Tanzania shows that there is difference in livelihood diversification due to differential access to credit. Anderson and Deshingkar (2005) in their study in rural Andra Pradesh state of India found an inverse - U shaped relationship between the amount of assets a household owns per adult member and livelihood diversification. This shows that diversification is high among households with moderate amounts of income generating assets.

iv. Migration: Migration from one area to other area is another strategy that households use to achieve certain desired livelihood outcomes. In much of Africa and Asia migration is found to be both a strategy of survival and livelihood (McDowell and Haan, 1997). Migration of individuals from one area to another is conditioned by a number of push and pull factors at areas of origin and destination, respectively. The importance of migration as a livelihood strategy is documented in different studies. For instance, a study in Machakos district of Kenya shows that remittance from migrants improved resource conservation (Tiffen *et al.*, 1994).

2.4.4 Institutions

One of the important elements of environmental entitlement and sustainable livelihood approach is the role of institutions in the lives of rural people. Gidden (1979) as cited in Scoones (1998:12) defined institutions as 'regularized practices (or patterns of behavior) structured by rules and norms of society which have persistent and widespread use'.

Yigremew (2000) identified the following roles that rural institutions play in the process of rural development: resource mobilization, resource management, service provision, information exchange, enhancing popular participation, protecting peasant interest and enhancing their claim making power, and conflict resolution. Similarly, Scoones (1998) pointed out that institutions (formal and informal) mediate access to livelihood assets through labor sharing systems, market networks and credit arrangements. These livelihood assets,

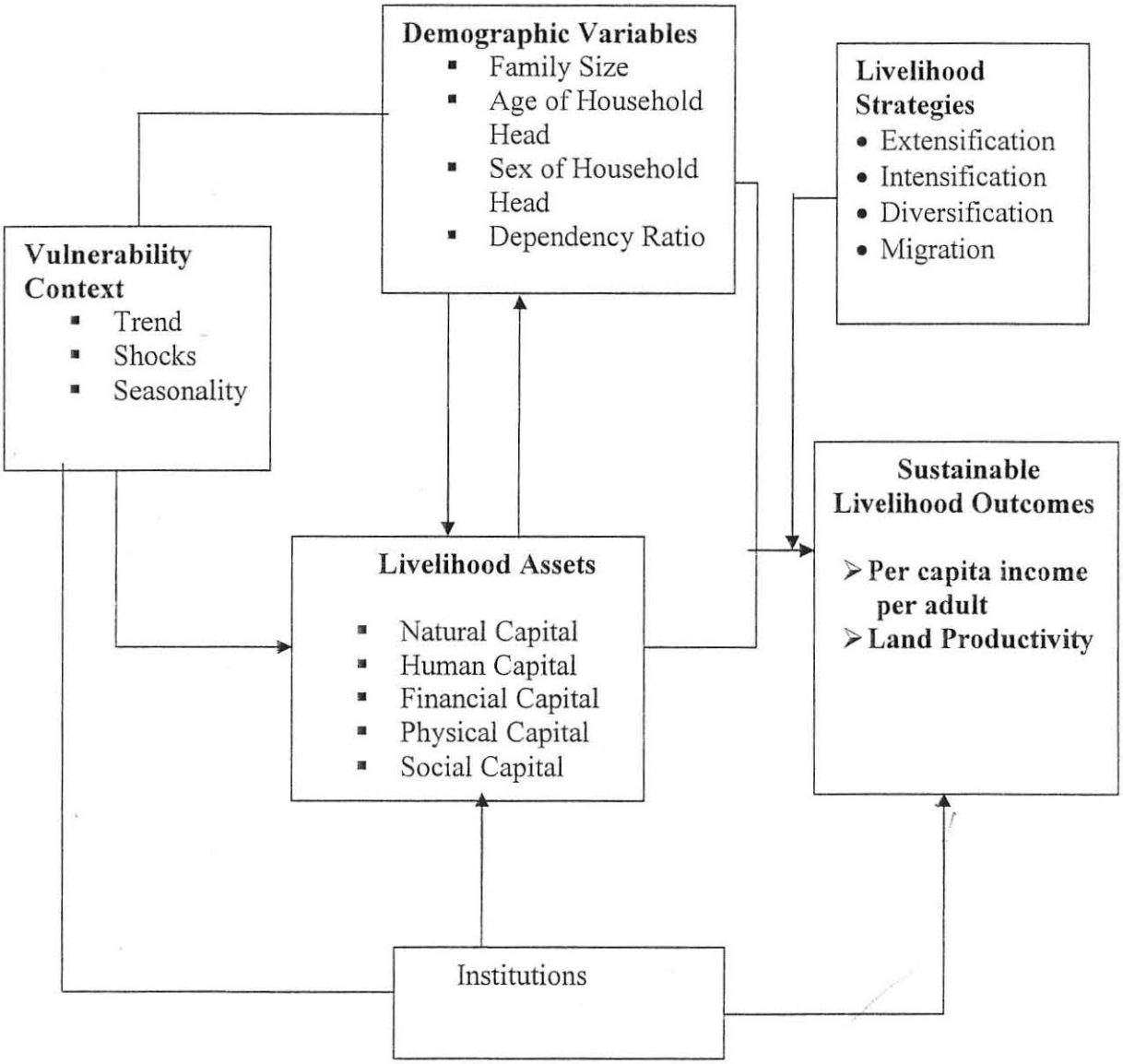
which are mediated by local institutions, affect the portfolios of livelihood strategies to be pursued by rural households to achieve sustainable livelihood outcomes. Studies in different areas such as in two rural communities of West Gojjam zone (Yigremew, 2000), in Beles Valley of Metekel Zone in Benishangul Gumuz National Regional state (Woldeselassie, 2001) revealed these fundamental roles of rural institutions in the pursuit of livelihood sustainability.

2.5 Conceptual Framework of the Study

The SLF discussed in section 2.3 can be flexibly adapted to many settings and to different extents associated to development research (DFID, 2000). Nevertheless, the use of this approach has got a limitation. Kollmair and Gamper (2002:10) stated the problem as 'the claim to be holistic leads to a consideration of very many aspects, what inevitably delivers a flood of information hardly possible to cope with'. Similarly Tesfaye (2003:55) pointed out the problem as 'if application of SLF is attempted in the research context without any adaptation, it makes the research agenda open-ended and the research costly and unmanageable'. Therefore, the framework was operationalized for this research as shown in figure 2.2.

This analysis incorporates six elements of the sustainable livelihood framework: vulnerability context, demographic variables, livelihood assets, livelihood strategies, institutions, and livelihood outcomes. Under the vulnerability context, trends, shocks, and seasonality that are assumed to be beyond the control of households are described. Changes in demographic characteristics and livelihood assets of households are variables that are assumed to influence the sustainability of rural livelihood. Hence, their role in sustaining livelihood is examined. Under livelihood strategies, the activities that households use to transform livelihood assets to livelihood outcomes are analyzed. In livelihood outcome, the outcomes that are indicators of sustainable rural livelihoods were examined in relation to demographic dynamics and changes in livelihood assets.

Figure 2.2 Analytical Framework of the Study



Source: Adapted from figure 1.

CHAPTER THREE: METHODOLOGY

3.1 Sampling Design

i) Sample Size: The sample size was calculated using the following formula of sample size determination (Kothari, 1990). The formula is given as:

$$n = \frac{Z^2\alpha/2 * P(1-P)}{e^2}$$

Where, n- sample size

Z- Value of standard variate at 95 percent confidence interval (Z=1.96).

P- Estimated proportion of households with sustainable livelihood outcome. As the proportion was not known, 0.5 was used as P value to obtain maximum number of households (Ibid).

e- Acceptable error

$$n = \frac{1.96^2 * 0.5(1-0.5)}{0.05^2} + 5\ \%\ \text{contingency}$$

$n = 384 + 19.2 =$ **403**

Among 403 households, the survey questionnaire was effectively administered to 390 household heads, with non-response rate of 3.22 %. The remaining 13 households were either not willing to give information at all or absent during the time of data collection.

ii) Sampling Procedure

The sampling frame was the rural households that are found in three agro – ecologies of the study area. A multistage sampling technique was employed to identify the respondents. First, three rural *Kebele* Administrations (KAs) were selected, one from each agro-ecological zone, based on discussion made with officials of the *Woreda* Agricultural and Rural Development office, about population density, problem of environmental degradation, and spatial accessibility to easily organize field work. Secondly, *gotts*[1] were identified using simple random sampling technique.

[1] *Gott*- It is an administrative unit below *kebele* which consists of 60 to 120 households.

Thus, from each KA two *gotts* were selected. Finally, households were selected using systematic random sampling technique. Since KAs differ in terms of the number of households, probability proportionate to size was used. Moreover, to analyze gender-dimension of livelihood sustainability, special attention was given to female-headed households. Since their number is relatively small, all voluntary female household heads in the selected *gotts* were contacted. The summary of the distribution of the sample is given below.

Table 3.1 Distribution of the Sample Households by Agro-ecological Zone

Agro-ecological Zone	Name of KAs Selected	Total Number of Households*			Number of Households Selected**		
		Male-headed	Female-headed	Total	Male-headed	Female-headed	Total
Kolla	*Luugama*	170	22	192	52	12	64
Woinadega	*Waayyu Warqee*	397	73	470	126	40	166
Dega	*Laaloo Hindhee*	400	75	475	116	44	160
Total		967	170	1137	294	96	390

* Obtained from Woreda capacity building office

** Determined based on the procedure discussed above.

3.2 Data Set

In order to meet the objectives of this study, data on demographic characteristics of households and their livelihood assets that refer to two points of time were collected. The data required for this study were collected from both primary and secondary sources. The primary data were collected from household heads included in the sample, few aged people and experts in the field in the study area, and voluntary discussants.

The primary data were collected using survey questionnaire, focus group discussions, and key informant interview. Structured questionnaire was prepared in English and translated into *Afan*

Oromo to collect the data on demographic characteristics of the sample and their livelihood assets, their perceptions about trends of changes in population size and other natural resources (forest and soil quality). The data collected on demographic characteristics and livelihood assets refer to two points of time to examine the dynamism, that is, before five years (2001/02) and the last twelve months before the survey date (2006/07). The gap of five years was preferred to make allowance for memory lapse.

To collect the data, six high school students who live in the respective *kebeles* (two from each agro-ecology) were recruited and trained for two days on the content of the questionnaire and approach of the data collection. Students from the respective rural *kebeles* were preferred since they know the culture and the language of the study area to collect the necessary data. Moreover, non-response rate due to suspicion of enumerators is less as the respondents know them.

Besides the survey questionnaire, three Focus Group Discussions (FGDs) were made to collect data on vulnerability context and the role of local institutions in the pursuit of peoples' livelihood. One group consisted of five to seven voluntary members from different age groups. Elderly people were also contacted as key informants to collect information regarding their past experience about the general livelihood situation of the area. In addition, expert from agriculture and rural development office was also interviewed about the problems related to the livelihood of the people.

To explain general issues related to rural livelihood, other available documents were used. The secondary data were obtained from literature review (books, research reports, conference proceedings, statistical abstracts, and administrative documents).

3.3 Ethical Consideration

As a tradition in any type of research in general, and the issue to be investigated is related to the multiple facets of the livelihoods of the people in particular, ethical consideration was made in this study. First, letter of support was written by Population Studies and Research Center of Addis Ababa University based on which the office of administration of the district

wrote letter of support for data collectors. Secondly, the sample households were informed before responding to the questions that their response will be kept secret and not used for purposes other than the objectives of the study. They were also informed that they have full right not to participate in the study at all or not to respond to any of the questions. Thus, 390 voluntary household heads have participated in the study and the questionnaires were administered to them based on their verbal consent.

3.4 Methods of Data Analysis

Livelihood sustainability analysis is a complex activity as it is the cumulative effect of a number of factors that can be quantitative or qualitative with direct or indirect influences. Due to this very reason, different techniques of analysis (descriptive statistics and econometric model) were employed in this study to answer the research questions set in chapter one.

3.4.1 Descriptive Statistics

Descriptive statistics such as frequency, percentage, mean were used to explain some important variables. The pattern of changes in demographic characteristics of households and their livelihood assets were tested using paired sample t-test. The differences between independent groups in terms of demographic and livelihood variables were analyzed using independent sample t-test. For categorical variables, chi square test was used to analyze their association.

3.4.2 Econometric Model

The main focus of this study was to examine correlates of sustainable rural livelihoods. But, the sustainability of the livelihood of people can not be examined from cross-sectional data, as it requires investigation of changes that had taken place at more than two periods of time. In this study, therefore, data on demographic characteristics of households and their livelihood assets that refer to two points of time (2001/02 and 2006/07) were collected to identify sustainability of their livelihood and its correlates over time.

The dependent variable of the study was dichotomous (yes or no type). For such variables with binary responses, binary logistic regression model is proposed (Gujarati, 1988). Unlike linear regression analysis in which the outcome variable is continuous, linearly related to a set of predictors and error, and are estimated using least squares, the outcome variable of logistic regression model is dichotomous which takes the value of 1 for success and 0 for failure. Besides, the parameters of logistic regression model are estimated using maximum likelihood method. That is, coefficients that make the observed results most "likely" will be selected.

The logistic regression function for livelihood sustainability can generally be given as

$$Pi = \frac{1}{(1+e^{-Zi})} = \frac{e^{Zi}}{(1+e^{Zi})}$$

Where P_i: is a probability that the livelihood of i^{th} household is sustainable.

e^{Zi}: stands for the irrational number e to the power of Zi

Z_i : is a function of N-predictor variables which is also expressed as:

$$Zi = \beta_0 + \beta_1 X + \beta_2 X_{2i} + ... + \beta_n X_{ni} + u_i$$

Where $X_1, X_2, \ldots, X_n$ = Predictor variables

βo - is the intercept

$\beta_1, \beta_2, ---, \beta_n$ are the logit parameters (slopes) of the equation in the model.

The coefficients show how the log-odds in favor of sustainable livelihood change as the value of predictor variables change. The value of P_i (the probability that the livelihood is sustainable) ranges between 0 and 1 and it is also non-linearly related to the predictor variables.

The probability that the livelihood of a household is not sustainable $(1 - P_i)$ is given as

$$1 - P_i = \frac{1}{1+e^{Z}}$$

Therefore, the odds ratio can be written as:

$$\frac{P_i}{1-P_i} = \frac{1+e^{Z_i}}{1+e^{-Z_i}} = e^{Z_i}$$

Now $\frac{P_i}{1-P_i}$ is the odds ratio, which is the ratio of the probability that the livelihood of household i is sustainable to the probability that the livelihood of the household is not sustainable. When the odds ratio is expressed in terms of log of the odds, it is expressed as

$$\log \frac{\Pr ob(sustainability)}{\Pr ob(unsustainability)} = \beta_0 + \beta_1 X + \beta_2 X_{2i} + ... + \beta_n X_{ni} + u_i$$

Based on log odds, logistic regression can be interpreted as the change in log odds due to one unit change in the predictor variables. When log odds is expressed in odds (e^{Z_i}), it shows the factor by which the odds change when the predictor variable changes by one unit. Thus, positive, negative, and zero values of the odds show that the odds have increased, decreased, and unchanged, respectively.

Before using the model, in order to examine whether the model fits the data, different methods such as the classification table, Hosmer and Lemeshow test, histogram of estimated probabilities, and goodness of fit of the model can be used. In this study, classification table and Hosmer and Lemeshow test were used to assess whether the model fits the data. Multi-collinearity among predictor variables was examined using coefficient of contingency.

3.5 Definition of Variables and Hypotheses Setting

Dependent variable

The dependent variable of the study was sustainability of livelihood outcomes. The study considered economic and environmental sustainability as indicators of sustainable livelihood of rural households. To identify the economic sustainability of households' livelihood, per capita income was calculated for two periods (2001/02 and 2006/07). The livelihood of a household was considered economically sustainable only when the per capita income of that household is greater than or equal to US$ 164.25 during both times. Environmental sustainability is another important element against which sustainability of livelihood is to be

investigated. As environment itself is complex and encompasses different elements, land which is the key element of rural livelihood was considered in the study since the livelihood-environment interaction in rural areas of developing countries like Ethiopia is most pronounced on land. Thus, land productivity was calculated for the same two periods. The livelihood of a household was considered environmentally sustainable when land productivity of the later year was at least equal to that of before five years. Finally, the livelihood of a household was considered sustainable based on the fulfillment of these two definitions of economic and environmental sustainability. Households with sustainable livelihood were given the value of 1, and 0 otherwise.

Predictor Variables

In this study, the predictor variables were demographic dynamics and changes in livelihood assets that are assumed to have relationship with livelihood sustainability.

Demographic Dynamics

Age of household head (X1) –As younger and older household heads have limited access to livelihood assets, it is assumed that the probability of achieving sustainable livelihood is high for household heads in the middle age group. For regression analysis it was categorized into three: ≤ 35, 36 – 54, and 55+. The age groups were given the values of 0, 1, and 2, respectively.

Sex of household head (X2) – It was coded as 1 if the head was male and 0 otherwise. Compared to male headed households, as female headed households have limited access to livelihood assets, the probability that their livelihood is sustainable is assumed to be less.

Family size (X3): It is the total number of persons living in a household being converted to adult equivalent scale. In order to assess the impacts of family size on livelihood sustainability, it was categorized into < 4.25 and ≥ 4.25. The category was created due to the reason that the change in family size during the five years gap was not statistically significant. Hence, it was assumed that the family sizes of respondents during 12 months before the survey data can fairly represent the trend in the five years. As the distribution of family size was

skewed in which the skewness value is more than twice of the standard error of skewness, the median value (4.25) was used to create the categories. It is hypothesized that large family size decreases the probability of achieving sustainable livelihood.

Change in dependency ratio (X4): It is the ratio of number of economically dependent household members to economically independent members. In households with high dependency ratio, the number of persons that contribute to improvement of livelihood is small. Thus, it is hypothesized that increased dependency ratio decreases the probability of sustaining livelihood. The variable was categorized as decreased, unchanged, and increased.

Changes in livelihood assets

Land size (X5): Given low level of farm inputs, the quantity of yield is positively related to land size. Hence, small land size decreases the probability of sustaining livelihood. Among the study respondents the mean change in land size was not statistically significant. Besides, for about 91 % of the respondents their land holding remained unchanged during the five years. Thus, land size was grouped into two based on mean land size of the sample: < 1ha and ≥ 1 ha.

Education (X6): Education is a key for improvement of rural livelihood. The probability of sustaining livelihood is less for households headed by illiterates compared to households headed by the literates. The variable was given the value of 0 if the head was illiterate and 1 otherwise.

Labor force size (X7): Conversion of livelihood assets into certain desired livelihood outcomes is the function of the labor force size of households. High labor size is associated with high participation in soil and water conservation activities, timely operation of farm activities and so on. It is hypothesized that increased labor force size increases the probability of achieving sustainable livelihood. For the purpose of this study, the variable was categorized into three: decreased, unchanged, and increased.

Health Problem (X8): The over all production activity of a household depends on the health situation of its members. It is expected that the probability of sustaining livelihood is high for households in which the members have no serious health problems. Households were given the value of 0 if no serious health problem had occurred to any of the family members, and 1 otherwise.

Livestock ownership (X9): Livestock ownership as one element of households' assets is indispensable due to its basic functions such as draught power, collateral for borrowing, consumption of its products and so on. It is expected that increased number of livestock ownership increases livelihood sustainability. The variable was categorized as decreased, unchanged, and increased.

Distance from road (X10): Households that are found closer to main road have better access to information and farm inputs such as fertilizers, herbicides, pesticides, and so on. It is, thus, hypothesized that the closer the location of households to main road, the more sustainable their livelihood is. The households were categorized into two based on their location from main road: at less than 20 minutes walking distance which was given the value of 0, and 1 for households that are found at greater or equal to 20 minutes of walking distance from road.

Distance from market center (X11): Households that are found closer to market center have better opportunity for livelihood diversification, selling of farm products etc. This proximity to market center is assumed to increase the probability of sustaining livelihood. Households that are found at less than 2 hours walking distance from market center were given the value of 0, and 1 otherwise.

Ownership of farm equipments (X12): Since the contribution of farming to the livelihood of rural people is high, ownership of equipments compulsory for farm operation is crucial. Lack of such assets may reduce the quality and timing of farm activities. Thus, it is expected that the livelihood of households that have all important farm equipments is more sustainable than their counterparts. Households that have all necessary equipments were given the value of 2; they were given the value of 1 if they have some equipment, and 0 if they did not have at all.

Credit (X13): Different studies confirm the importance of credit services in rural development. Households with better access to credit diversify their livelihood; have better access to other livelihood assets. It is hypothesized that households which borrowed money during both years have higher probability of achieving sustainable livelihood compared to non-borrowers. In the model, households which borrowed money during both years were given the value of 2, 1 if borrowed only once, and 0 if did not borrow at all.

Saving (X14): Saving in cash or kind is crucial to sustain livelihood as for instance it can be used during the time of scarcity and adverse environmental impacts. Thus, the probability of sustaining livelihood is high for savers than non–savers. In the model, households which saved in cash or kind during both times were given the value of 2, 1 if saved only once, and 0 if did not save at all.

Remittance (X15): Income through remittance improves rural livelihood through investment in agriculture and other human capitals, conservation of land etc. It is, thus, hypothesized that the livelihood of households that received remittance is more sustainable than non-receivers. The variable was coded as 1 if the household received remittance, and 0 otherwise.

Participation in CBOs (X16): Participation in local community based organizations is one of the social capitals that are necessary in the pursuit of livelihood. Hence, the livelihood of households in which the heads are members in at least one local CBO is more sustainable than those households in which the heads are not members. If the head was member of certain CBO, the value of 1 was given and 0 otherwise.

Index of decision-making (X17): Households headed by persons of high index of decision making are more benefited from social networks. There exists positive relationship between the probability of sustaining livelihood and index of decision making of the household head. In the model the value of 1 was given for households headed by persons with decision making index of ≥ 0.5, and 0 otherwise.

CHAPTER FOUR: BACKGROUND OF THE STUDY AREA AND THE SAMPLE HOUSEHOLDS

4.1 Physical Setting of the Study Area

4.1.1 Location

The study site is located in East Wollega Zone, Oromia National Regional State, West Ethiopia. Arjo, the district capital, is found at a geographical coordinate of $8^0$45'N and 36^0 29' E. The capital is found at a distance of 379 km from Addis Ababa to the west and 48 km from Nekemte, Zone capital.

In the North, Leka Dulecha District borders the area. In the East, Nunu Kumba District borders it, while Illubabor Zone shares boundary with the area in the South and West. The district covers an area of 75, 812 ha.

4.1.2 Agro Ecology

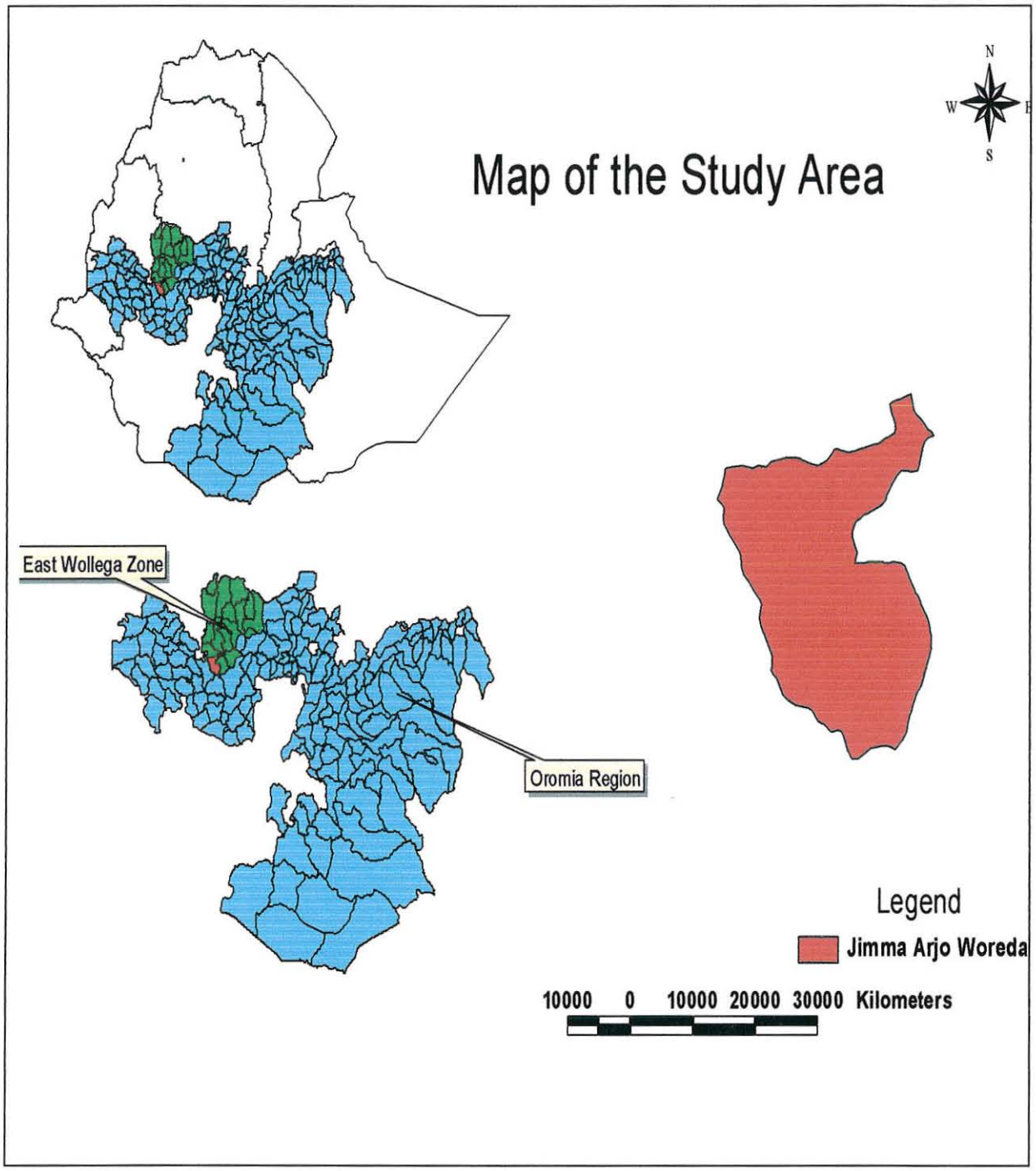
The agro-ecology of the study area includes highland, mid-altitude, and low land areas. About half of the district (49.7 %) is categorized under the mid-altitude agro-ecological zone. The remaining 26.7 % and 23.6 % of the area are found under the agro-ecologies of lowland and highland, respectively.

Table 4.1: Agro-ecological Zones of Jimma Arjo District

Agro-ecological Zone	Area (ha)	Percentage
Highland	17,883.16	23.6
Mid-altitude	37,658.24	49.7
Lowland	20,270.60	26.7
Total	75,812.00	100

Source: Woreda Office of Agriculture and Rural Development

Figure 4.1: Location Map of Jimma Arjo District

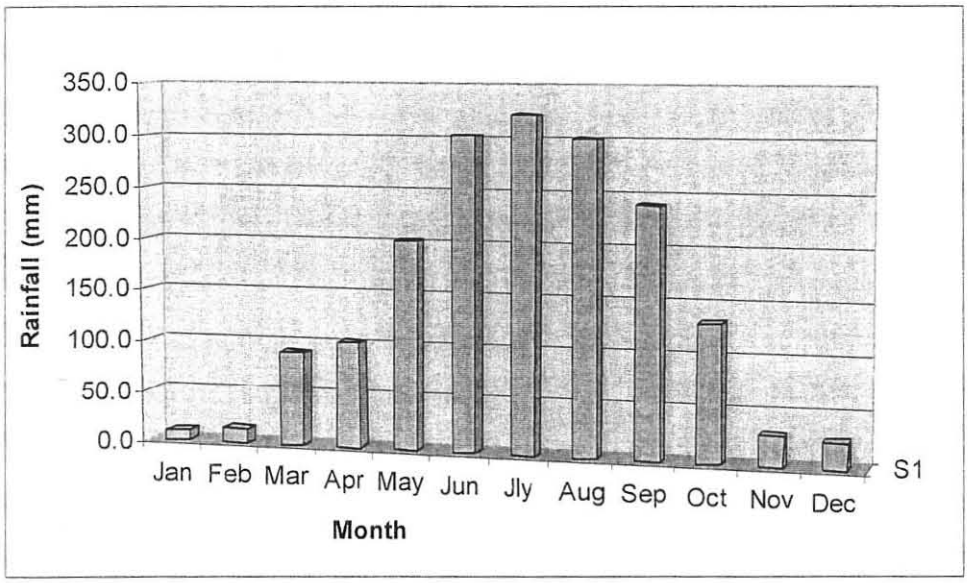


Source: Department of Geography and Environmental Studies, Addis Ababa University

4.1.3 Climate

The area is found in the western highlands of the country where rainfall is expected through out the year. However, due to altitudinal variation different parts of the district receive different amount of rainfall. Since the meteorological station is located in Arjo, the district capital, the available climatic data may not represent the whole district. But, as about three-fourth of the area is found in the middle and high altitude; it is believed that the data represent most areas of the district. Accordingly, June, July, and August are the months when the area receives maximum rainfall. Mean monthly rainfall is minimum during the months of November, December, January, and February (Figure 4.2).

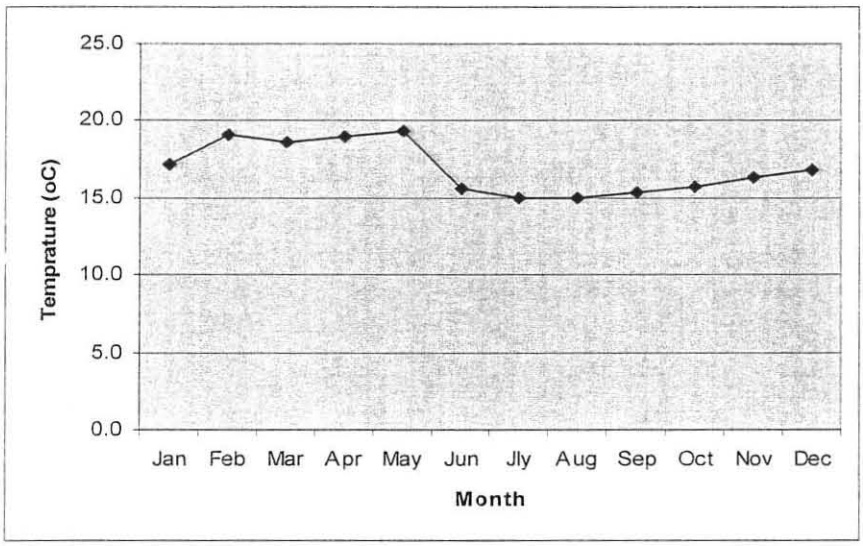
Figure 4.2 Mean Monthly Rainfall of Jimma Arjo District, 1985 - 2004



Source: Computed from Data Given in Annex IV.

According to the data obtained from the Ethiopian Meteorological Services Agency, there is no significant variation in mean monthly temperature of the district (Figure 4.3). May is the hottest month with mean temperature of 19.3°c while July and August are the months when the mean monthly temperature is registered to be 15 °c.

Figure 4.3 Mean Monthly Temperature of Jimma Arjo District, 2005



Source: Computed from Data Given in Annex IV.

4.1.4 Soil Distribution

Molisol is the dominant soil type (55.87 %) in the district. Vertisol accounts for 2.4 % of the soil type. Loam soil and silt covers 25.3 % and 4.8 % of the soil type of the area respectively. Dystric nit sols which have good agricultural production potential cover some part of the area. Orthic acrisols are also found in the district.

4.1.5 Land Use

About 64 % of the landscape of the district is potentially cultivable and 16 % is covered with forests and wood land. Grazing land accounts for 12.2 % of the area while 5.5 % is mountainous area.

Table 4.2: Land use Pattern of Jimma Arjo District, 2004/05

Type of Land	Area (ha)	Percentage
Cultivable land	48738.4	64.3
Forest and wood land	12166	16.0
Grazing area	9237.6	12.2
Swampy area	390	0.5
Mountainous area	4188	5.5
Other	1092	1.4

Source: Woreda Office of Agriculture and Rural Development

4.2 Population Characteristics

4.2.1 Age - Sex Composition

Table 4.3 shows distribution of the district's population by age, sex, and place of residence. The population size of the district was 66,044 as of 1994. Of the total size of the population, 9.9 % and 90.1 % were urban and rural residents, respectively. The majority of the populations were in the age group less than 20 both in urban and rural areas. The general sex ratio was 0.92. It means there were 92 males per 100 females in the area indicating greater number of females.

Table 4.3: Distribution of Population of Jimma Arjo District by Age, Sex, and Place of Residence

Age Group	Total			Urban		Rural		Sex Ratio
	Male	Female	Sum	Total	Percentage	Total	Percentage	
0-9	10015	10126	20141	1911	9.5	18230	90.5	0.98
10-19	9280	9727	19007	1901	10.0	17106	90.0	0.95
20-29	4225	4502	8727	1072	12.3	7655	87.7	0.93
30-39	2752	3523	6275	675	10.8	5600	89.2	0.78
40-49	2108	2451	4559	307	6.7	4252	93.3	0.86
50-59	1456	1833	3289	259	7.9	3030	92.1	0.79
60-69	1104	1210	2314	244	10.5	2070	89.5	0.91
70-79	554	587	1141	113	9.9	1028	90.1	0.94
80+	318	273	591	57	9.6	534	90.4	1.16
Total	31812	34232	**66044**	**6539**	**9.9**	**59505**	**90.1**	**0.92**

Source: CSA (1996a).

4.2.2 Religion

As shown in table 4.4, the majority of people in the area are Orthodox Christians (81.6 %) and the second large faith is Protestant (7.6 %). The remaining 10.6 % of the population of the district follow different religions. With regard to distribution of religious groups by place of residence, the majority of the population in both urban and rural areas (>80 %) are Orthodox Christians.

Table 4.4: Distribution of Population of Jimma Arjo District by Religion

Religion	Total	Percentage	Urban	Percentage	Rural	Percentage
Orthodox	53874	81.6	5565	85	48309	81.2
Protestant	5048	7.6	728	11	4320	7.3
Catholic	31	0.0005	0	0	31	0.05
Muslim	3457	5.2	71	1.1	3386	5.69
Traditional	3547	5.4	146	2.2	3401	5.72
Other	44	0.0007	7	0.1	37	0.06
Not stated	43	0.0006	22	0.3	21	0.04

Source: CSA (1996a).

4.2.3 Ethnic Group

The single most dominant ethnic group of the area is Oromo which comprises 97.2 % of the total population. The Amhara ethnic group accounts for 2.5 % of the whole population. The percentage of other ethnic groups is negligible..

Table 4.5: Distribution of Population of Jimma Arjo District by Ethnic Group

Ethnic Group	Total	Percentage	Urban	Percentage	Rural	Percentage
Oromo	64218	97.2	5663	86.6	58555	98
Amhara	1636	2.5	759	11.6	877	1.5
Guragie*	58	0.0008	58	0.9	0	0
Tigraway	48	0.0007	38	0.58	10	0.0002
Arborie	19	0.0003	0	0	19	0.032
Werji	19	0.0003	1	0.0002	18	0.03
Others	46	0.0006	20	0.31	26	0.04

Source: CSA (1996a)

* It includes sebat bet guragie, soddo guragie and siltie.

4.2.4 Educational Level

As indicated in table 4.6, 80.7 % of the populations were illiterate among which 85.3 % and 39.7 % were rural and urban dwellers, respectively. Among rural population of the district, only 14.69 % were literate, while the figure was 60.32 % for their urban counterparts. Thus, as is the case in many rural areas of the country, there is high illiteracy in rural area of Jimma Arjo district.

Table 4.6: Distribution of Population of Jimma Arjo District by Educational Level

Educational Level	Total	Percentage	Urban	Percentage	Rural	Percentage
Illiterate	37047	80.7	1835	39.7	35212	85.3
Non-regular	784	1.7	63	1.4	721	1.75
1-6	4926	10.7	1361	29.4	3565	8.6
7-8	1619	3.5	586	12.7	1033	2.5
9-12	1300	2.8	581	12.6	719	1.74
12+	224	0.5	199	4.3	25	0.06
Total*	45900		4625		41275	
Percent literate	19.2		60.32		14.69	

Source: CSA (1996b)

* It refers to population aged ten years and above.

4.3 Some Background Characteristics of the Sample Households

The achievement of sustainable livelihood outcomes is based upon the demographic characteristics of households and their access to livelihood assets. Hence, before examining the relationship between household demographics on the one hand and their access to livelihood assets on the other hand with livelihood sustainability, the general features of the sample in relation to some characteristics are presented hereunder.

4.3.1 Sex Composition

Among the household heads covered in the survey, 75.4 % of them were males and the remaining 24.6 % were females. That is, about one-fourth of the sample respondents were female-headed households (Table 4.7).

4.3.2 Marital Status

As far as the marital status of the household heads is concerned, 71.3 % were in marital union at the time of the survey (i.e. currently married) while 98.2 % have ever married. Only 1.8 % of the household heads has not yet married by then.

4.3.3 Religion

Slightly more than half (52.1 %) of the respondents were Orthodox Christians. The respective percentages of the followers of Protestant and Catholic are 42.8 and 3.1. Those who stated their religion as traditional accounts for 2.1% (Table 4.7).

4.3.4 Ethnic Group

The large proportion of the respondents was from Oromo ethnic group (97.7 %). The remaining ethnic group, Amhara, accounts for 2.3 % of the respondents included in the survey (Table 4.7).

4.3.5 Educational level

Information collected on literacy status indicates that more than half of the household heads (51.8 %) were illiterate. Among the literate (48.2 %), 20.3 % can read and write (attended non-formal education). Only 3.6 % of the literates have educational level of grade 9 and above. Generally, about 72.1 % of the household heads didn't attend formal education (Table 4.7).

Table 4.7: Background Characteristics of the Respondents

		Frequency	Percentage
Sex	Male	294	75.4
	Female	96	24.6
Religion	Orthodox	203	52.1
	Protestant	167	42.8
	Catholic	12	3.1
	Traditional	8	2.1
Ethnic group	Oromo	381	97.7
	Amhara	9	2.3
Educational Level	Illiterate	202	51.8
	Read and write	79	20.3
	1- 4	59	15.1
	5- 8	36	9.2
	≥ 9	14	3.6

Source: Field survey, April, 2007

CHAPTER 5: RESULTS AND DISCUSSIONS

5.1 Vulnerability Context

As discussed in the literature review part of this thesis, vulnerability context, the external environment which is beyond the control of the households, includes trends, shocks, and seasonality. Although households cannot overcome these problems at least in the short run, they use different strategies to minimize its impact on their livelihood. These elements of the external environment and the coping mechanisms of the households are explained below.

5.1.1 Trends, Shocks, and Seasonality

i/ Trends: In this study the trends of population and resources in the study area are examined based on data obtained from secondary sources, focus group discussions, and key informants.

Population Trend: Ethiopia in general and the study area in particular is characterized by rapid population growth rate. To show this trend in the study area, the change in the size of population of the district was projected based on the growth rate calculated from the 1994 census data (CSA, 1996) and the 2005 statistical report of CSA (CSA, 2005).

Table 5.1 Estimated Population Size of Jimma Arjo District, 1994 – 2005

Year	Population Size[2]	Crude Density
1994	66044	87.1
1995	68162	89.9
1996	70348	92.8
1997	72603	95.8
1998	74932	98.8
1999	77334	102
2000	79814	105.3
2001	82374	108.7
2002	85015	112.1
2003	87742	115.7
2004	90555	119.4
2005	93459	123.3

Source: Computed by the author from CSA Data

[2] The size of the population is estimated using exponential function $Pt = P_0 (1+r)^t$ where P_t is population size at time t, P_0 is base year population, r is growth rate, and t is time difference between base year and the year for which the population is estimated. The estimation was based on the assumption that the growth rate was constant during the years 1994 – 2005.

As pointed out in table 5.1, population size has increased by about 3.2 % per year during the given years. Crude population density, the ratio of total population to total area of the district, also increased correspondingly. The population density increased by about 36.2 persons per km^2 between 1994 and 2005 which means that crude density has increased by 3.3 persons per km^2 per year.

The respondents were also asked about the changes they observed in their area with regard to population size. As can be observed from table 5.2, 96.2 % of them responded that population size is increasing. For the other 2.1 %, 1.3 %, and 0.5 % of the respondents, the size is decreasing, remains unchanged and unknown, respectively.

Table 5.2 Percentage Distributions of Respondents by their Perception About Changes in Population, Forest, and Soil Fertility

	Increasing	Decreasing	Unchanged	Unknown
Population size	96.2	2.1	1.3	0.5
Forest area	2.3	95.6	1.8	0.3
Soil quality	1.5	85.1	5.9	7.4

Source: Field Survey, April, 2007

This increment of population has implication on the natural resource base of the area. With growing population, given the natural resource based livelihood of rural people, pressure on resources is expected to be high. That is, with high population growth, diminution of per capita land holding, absence of fallowing, land fragmentation, expansion of agricultural activity in to fragile environment, etc are expected with all its adverse consequences on the livelihood of the people and the environment. Such increased demographic pressure also leads to decreased agricultural labor productivity and increased food insecurity (Muluneh, 2003).

Resource Trend: The two types of resources that were included in the survey questionnaire to collect information on the perception of the respondents on the trend of change were forest cover and soil fertility. As shown in table 5.2, almost all of the respondents (95.6 % and 85.1 %) observed the declining trend of forest area and soil fertility. The remaining 2.3 % and 1.8 % stated that it is increasing and unchanged for forest cover change, respectively; while 1.5 %,

5.9 % stated that soil fertility is increasing and remains unchanged, respectively. It was also observed during the field work that areas which were once covered with forests are now changed into farm land. Almost all of the FGD participants attributed this trend of resources to rapidly growing population.

> *Before some two to three decades one can arrive at forest areas after walking distance of few minutes. But now, due to population pressure almost all nearby forest areas were converted to farm land. Let alone forest area, we are lacking grazing lands for our livestock as people are cultivating those areas.*

The secondary data obtained from WoARD is also used to cross check with perception of the study participants. The datum shows that the area of grazing land decreased by about 6.14 % in one year from 9,842 ha in 2004/05 to 9,237.6 ha in 2005/06. An expert in WoARD also noted that forest that is found in the area is the one that is located at remotest area such as Dhidhessa river valley. Forests that are found in different pocket areas are declining, according to this informant, due to expansion of agriculture.

ii/ Shocks: Shocks refer to sudden problems which negatively affect the livelihoods of the people. In order to identify the shocks that the households experienced during the five years before the survey date, FGD and key informant interview were used. Accordingly, livestock disease was the most common problem raised by the discussants in the three agro-ecologies where the study was conducted. They stated that:

> *'The farm land productivity has been declining to the extent that we can not fulfill our subsistence needs. To break this convolution of lives and improve our livelihood, we spend the limited resources we have to buy breeding animals. Unfortunately, the animals die due to livestock diseases.'*

A 61 years old man in the *kolla* agro-ecology stated the sternness of the problem as follows:

> *'I had borrowed money from a lending institution and purchased an ox. The ox died. Now I am left with no draught animal. My land will be remained uncultivated unless I solicit oxen from other farmers or enter in to share cropping arrangements.'*

Trypanosomiasis is one of the highly prevalent livestock diseases in the area. The socio-economic profile of the district prepared by Oromia State Government (OSG, 2005) also listed

other types of animal diseases that are found in the area such as anthrax, blackleg, African horse sickness, pesterollosis, and internal and external parasites.

The other threat to the livelihood sustainability of the people is problem related to crop production. The FGD participants noted the adverse role that population growth plays in reducing crop productivity through absence of fallowing and farming of unproductive land. Moreover, crop pests such as termites, shoot fly, army worms, weevils, monkeys, apes, and birds are common crop pests in the area (Ibid). Smut and rust are also crop diseases that cause crop failure.

Hail and frost are also noted by the discussants as a shock that affects crop production. For instance, data obtained from WoARD show that 652.87ha of land was affected by hail in 2004/05. The frequent occurrence of torrential rainfall, particularly during summer season, was reported as a cause of severe soil erosion.

iii/ Seasonality: Climate is one of the important element of the natural environment that positively or negatively affects the livelihood of people particularly those in rural areas. The spatio-temporal distribution of elements of climate determine cropping pattern, cropping calendar, type of livestock to be raised and so on (Degefa, 2005). Since agriculture in Ethiopia is rainfed, the pattern of distribution of rainfall has close relationship with the livelihood of the people. The importance of hydrology in Ethiopia is stated by World Bank (WB, 2006: xi) as follows:

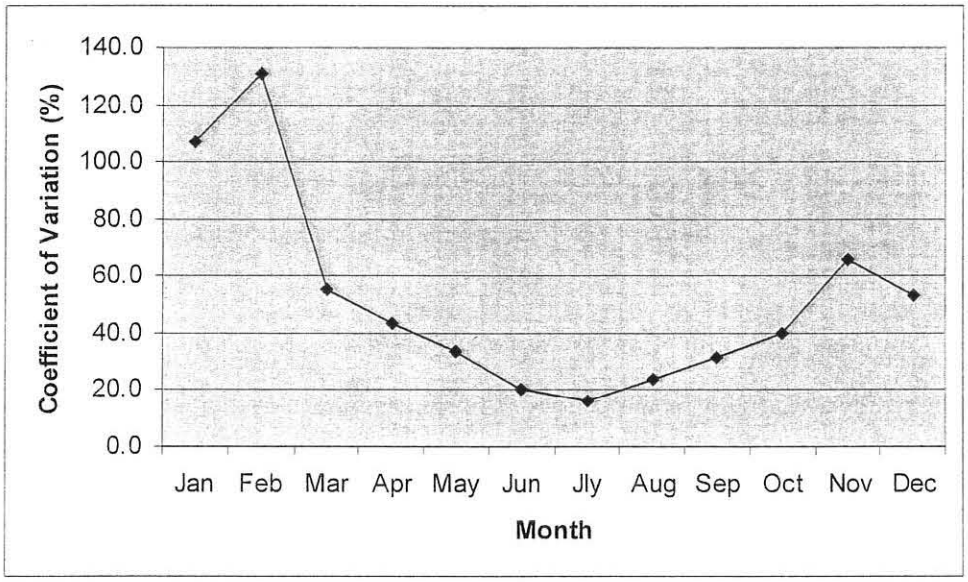
> *'Rainfall plays pivotal role in erosion, land degradation, reduced soil fertility and productivity, and siltation. Ethiopia's high intensity storms cause significant erosion. The erosive effects of rainfall are significantly augmented by Ethiopia's mountain terrain, severe deforestation, and traditional agricultural practices of cultivating steep slopes without protective measures.'*

The high dependence of rural people on rain-fed agriculture and limited irrigation practices worsen the vulnerability of the people to climatic changes. In Ethiopia there are cases where two extreme weather conditions affect rural livelihood. On the one hand, inadequate and unreliable rainfall causes the destruction of crop in the field, particularly in drought prone areas. On the other hand, high intensity rainfall aggravates soil erosion in the high land areas, due to lack of adequate conservation works. In this regard the study area is categorized under

the second scenario of climate related problems. According to the participants of FGD, the frequent occurrence of torrential rainfall is responsible for soil erosion.

The other problem related to seasonality and thereby rural livelihood is variation in the amount of rainfall that a given area receives throughout a year. Figure 5.1 shows coefficient of variation of mean monthly rainfall computed for ten years. There is high coefficient of variation during the months of November to February while the variation is not as such pronounced for the months of June, July, and August. Such variation in monthly rainfall, given limited irrigation practices, is responsible for seasonality of farming activities.

Figure 5.1 Coefficient of Variation of Monthly Rainfall



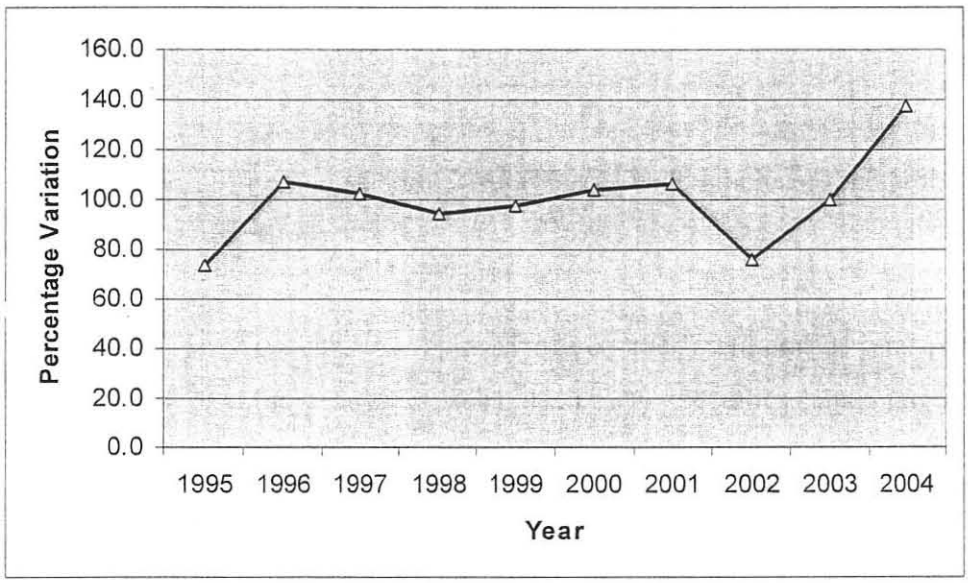
Source: Computed from data given in annex IV

Hydrological variability (extreme cases of flood and drought) is the problem of developing countries including Ethiopia, in which the poor are most sharply affected (WB, 2006). Rainfall variability trend of the study area shown in figure 5.2 is calculated from the total rainfall in year *t* as a percentage of the mean of average annual rainfall levels during 1995 – 2004. Accordingly, compared with the mean rainfall registered in the area during 1995 – 2004, rainfall variability has increased in the recent three years. Such fluctuation in rainfall (too little and too much rain) has significant implication on the livelihood of rural households. According to Kifle and Yoseph (1999), high variation in rains increases the food security risk

to the average Ethiopian farming household. Its unreliability also increases the probability that farmers plant at a wrong time (Ibid).

Both too little and too much rainfall detrimentally affects the livelihood of rural people. Too little rain may cause crop failure and livestock death. On the other hand, too much rain, coupled with rugged terrain and low conservation measures, is responsible for soil erosion. The latter is found to be more prevalent in the study area. Even some informants stated that the problem of soil erosion is severe to the extent that they couldn't solve.

Figure 5.2 Rainfall Variability of Jimma Arjo District, 1995 - 2004



Source: Computed from data given in annex IV

5.1. 2 Coping Strategies

Coping strategies are one or a combination of mechanisms that households use to reduce the negative impacts of external environment explained in the preceding section. The strategies that households use to cope with shocks and stresses can generally be classified into two: asset disposal strategies and adaptive strategies. The former refers to the usage of livelihood assets that are accumulated during the 'good times' in the 'bad days'. It includes selling of oxen, selling other livestock, and selling household properties. The later shows the means of minimizing the impact of external environment by using mechanisms that are not related to

asset disposal such as wage labor, borrowing money or grain, selling fuel wood and charcoal, and reducing meals.

Table 5.3 Coping Strategies Used by Households Before and During the Last 5 Years

Type of strategies	Before 5 Years		During the Last 5 Years	
	Number of responses	Percent of cases	Number of responses	Percent of cases
Selling oxen	86	22.1	92	23.6
Selling other livestock	139	35.6	130	33.3
Selling household property	96	24.6	98	25.1
Daily wage labor	285	73.1	262	67.2
Borrowing money or grain	165	42.3	159	40.8
Selling fuel wood or charcoal	123	31.5	136	34.9
Reducing meals	218	55.9	209	53.6
Others	5	1.3	7	1.8

Source: Field Survey, April, 2007

As shown in table 5.3, engagement in daily wage labor is the coping strategy that was used by most households. Before five years, about 73.1 % of the households used this strategy. The second strategy that was used by most households during the same time was reducing meals (55.9 %) followed by borrowing money or grain and selling of livestock other than oxen during time of problems (42.3 % and 35.6 %, respectively). During the last five years before the survey date, though the percentage of households which used wage labor decreased to 67.2 %, it is still the widely used coping mechanism. Reducing of meals and borrowing money or grain were the second and the third strategies used by 53.6 % and 40.3 % of the households, respectively. Generally, the sample households preferred adaptive coping strategies than asset disposal strategies.

When the two periods are compared as to whether there is a change in coping mechanisms, no significant change is observed. However, there is a decrement of wage labor as a coping mechanism. This may be due to marginal return to labor productivity. With increased labor supply, the income to be obtained from wages is expected to decline which reduces its role as a strategy to overcome risks. On the other hand, the percentage of households which used

selling of fuel wood and charcoal increased by about 10.6 %. Most of the users of this strategy are those found in the highland area, where there is pocket of forest. From the point of view of environmental protection, it seems that the strategy depletes the existing forest of the district.

5.2 Demographic Dynamics and Changes in Livelihood Assets

The sustainability of the livelihood of rural people is based upon changes in the demographic characteristics of the households and the livelihood assets they have. The changes that had taken place in the study area in relation to the two during the five years are presented below.

5.2.1. Demographic Dynamics

i) Age of household head

Table 5.4 shows the age distribution of household heads who were interviewed during the survey. Most of the household heads were found in the age group 40 – 49, while the percentage of respondents whose age was greater than 70 years was only 4.1 %, which is the reflection of the narrow apex of population pyramid of the country. The Mean age of respondents was 46.5 year.

Table 5.4 Distribution of Respondents by Age Group

Age Group	2006/07	
	Frequency	Percentage
≤ 29	33	8.5
30 – 39	67	17.2
40 – 49	115	29.5
50 – 59	108	27.7
60 – 69	51	13.1
70 +	16	4.1
Mean	46.5	

Source: Field survey, April, 2007

ii) Family Size

One of the ways through which demography affects livelihood is through the size of households which is related to production and consumption. The simple count of household members was converted in to Adult Equivalent (AE) based on their age and sex distribution. The conversion scale for computation of AE is given in annex II A.

As can be seen from table 5.5, in 2001/02, for about 38.7 % of households their family size was between 4.01- 6.0. During the same year, only 1.5 % of the households had a family size of grater than 8. The respective family sizes for the other 8.5 %, 15.4 %, and 35.9 % of the households were < 2, 6.01 - 8, and 2.01 - 4.

After five years (in 2006/07), the percentage of households with family size of less than 2 remained unchanged (8.5 %). The percentage decreased for family size of 2.01- 4 from 35.9 % to 33.8 %. The figure slightly increased for the remaining family size groups. The mean family size was large in the mid-altitude area (*Waayyuu warqee*) (4.6 AE) and small in high land area (*Laaloo hindhee*) (4.1 AE).

Table 5.5: Distribution of Households by Family Size

Family Size (Adult equivalent)	2001/02		2006/07	
	Frequency	Percentage	Frequency	Percentage
≤ 2	33	8.5	33	8.5
2.01- 4.0	140	35.9	132	33.8
4.01- 6.0	151	38.7	155	39.7
6.01- 8.0	60	15.4	63	16.2
8.01+	6	1.5	7	1.8
Total	390	100	390	100
Mean	4.30 (1.71)		4.36 (1.72)	
t	- 1.326*			

Figures in parenthesis are standard deviations
* Not significant at 5 %.
Source: Field survey, April, 2007

The average family size of the sample was 4.30 in 2001/02 and 4.36 in 2006/07 with insignificant change in respective standard deviations (1.71 and 1.72). The paired sample t-test shows that the change in mean household size between the two periods is not statistically significant ($p>0.05$).

iii) Dependency ratio

Dependency ratio refers to the ratio of the sum of total number of persons in the age group less than 14 and greater than 65 to the number of household members in the age group 15 to 64. It indicates the proportion of household members that are economically capable to contribute to livelihood improvement of a household. Table 5.6 shows that the dependency ratio of about 57.4 % of the households was less than 1 in 2001/02, while the percentage increased to 75.4 in 2006/07. The data also indicate the decrement of percentage of households with dependency ratio of greater than 1.1 from 42.6 % to 24.6 % during the five years. The average dependency ratio is large in the high land area (*Laaloo hindhee,* which was 0.98) and the smallest in the mid-altitude area (*Waayyuu warqee* – which was 0.56).

Table 5.6: Distribution of Households by Dependency Ratio

Dependency ratio	2001/02		2006/07	
	Frequency	Percentage	Frequency	Percentage
0 – 1	224	57.4	294	75.4
1.1 – 2	107	27.4	82	21.1
2.1 – 3	44	11.3	12	3.1
3.1+	15	3.8	2	0.5
Total	390	100	390	100
Mean	1.21 (1.05)		0.79 (0.75)	
t	8.827*			

Figures in parenthesis are standard deviations

* Significant at 1 %

Source: Field survey, April, 2007

The average dependency ratio of the households was 1.21 in 2001/02 and the standard deviation was 1.05. In 2006/07 the mean dependency ratio decreased to 0.79 with corresponding decline in standard deviation to 0.75 in which the decrement of the ratio of economically unproductive to productive members of the household was statistically

significant (P<0.01). This decrement in dependency ratio can be attributable to insignificant change in family size of the sample.

5.2.2 Changes in Livelihood Assets

i) Natural Capital

From the different natural resources on which the livelihoods of rural households depend, this study considered land. The pattern of distribution of size of land holding is given in table 5.7.

Table 5.7: Distribution of Households by Size of Land Owned

Land size (ha)	2001/02		2006/07	
	Frequency	Percentage	Frequency	Percentage
≤ 1	238	61	241	61.8
1.1- 2.0	117	30	114	29.2
2.1 – 3	25	6.4	24	6.1
3.1+	10	2.6	11	2.8
Total	390	100	390	100
Mean	1.07 (0.82)		1.06 (0.84)	
t	0.467*			

Figures in parenthesis are standard deviations

* Not significant at 5 %

Source: Field Survey, April, 2007

As shown in table 5.7, 61 % of the households owned land size of less than 1 ha in 2001/02, while the size was between 1.1 and 3 ha for 36.4 % of the households. The percentage of households which had land size of greater than 3 ha was only 2.6 %. In 2006/07, the percentage of households which owned a land size of less than 1 ha slightly increased to 61.8. The respective percentages of households with land sizes of 1.1 to 3 ha and greater than 3.1 ha were 35.3 and 2.8. Generally, the data show that most households have a land size of less than 1 ha. Except for land sizes of less than 1 ha and 3.1+ ha, for which the percentage of the households owning the respective sizes has slightly increased, the percentage decreased for the remaining land size categories. The addition of another newly established households with no or small piece of land could be the reason for the increment of the former. The increment of

households with land sizes of greater than 3 ha could be due to expansion of farm land in to forest, grazing area and steep slope areas.

The average land holding size in 2001/02 was 1.07 with standard deviation of 0.82 while the figure decreased to 1.06 ha after five years with increased standard deviation (0.84). However, the decline in mean land holding (mean difference) is not statistically significant as indicated by the paired sample t-test statistic (P> 0.05). Households in the low land area (*Luugama*) have relatively large size of land holding (1.98 ha), while the mean size is 0.94 ha and 0.83 ha in the mid-altitude (*Waayyuu warqee*) and high land areas (*Laaloo hindhee*), respectively.

Although the statistical test shows insignificant change in mean size of land holding, about 74 % of the respondents replied that the size of land holding per household in the area is decreasing. For the other 20.5 % and 6 % of the respondents, the trend is unchanged and increasing, respectively. Among the respondents who observed the declining trend of land holding, 55.6 % of them attributed it to population growth. Regarding the sufficiency of their land, 65.1 %, 17.2 %, and 3.6 % of the respondents considers the size of their land in 2001/02 as small, sufficient, and excess, respectively. In 2006/07, the percentage of those households which considers their land as small increased to 67.7 %. The percentage of household heads who consider their land size as sufficient and excess decreased to 15.6 and 2.8, respectively.

ii) Human Capital

Based on the conceptual framework, data on human capital were collected on educational level of household heads, labor force size, and health status of household members.

Educational level: With regard to educational level of the heads, they are generally categorized in to literate and illiterate. The former refers to those respondents who can at least read and write. Among the sample respondents, more than half of the household heads (51.8%) were illiterate (unable to read and write). In the area, illiteracy rate decreased with decreasing altitude. That is, most literate households were from low land area (*Waayyuu warqee*) and they were found to be few in number in the high land (*Laaloo hindhee*) area.

Labor force size: In this study, labor force size of a household is described in man- equivalent which was calculated based on the age and sex distribution of household members (see annex II B for man equivalent conversion scale).

Table 5.8 shows distribution of households by their labor force. Nearly half of the households (47.4 %) had labor force size of less than 2, and 6 households (1.5 %) had greater than 6.1 in 2001/02. After five years, higher percentage of the households had labor force of 2.1 to 4. During the same time, only 7 households had labor force size of greater than 6. The average labor force size of the sample had increased by 18.8 % from 2.56 in 2001/02 to 3.04 in 2006/07. The paired sample t-test also indicates statistically significant difference in mean labor force size of the households between the two years ($p < 0.01$). The mean man equivalent labor force size was large in mid-altitude area (*Waayyuu warqee*) and the size was small in the high land area (*Laaloo hindhee*).

Table 5.8: Distribution of Households by Labor Force Size

Labor force size	2001/02		2006/07	
	Frequency	Percentage	Frequency	Percentage
≤ 2.0	185	47.4	122	31.3
2.1 – 4	150	38.4	172	44.1
4.1 – 6	49	12.5	89	22.8
6.1+	6	1.5	7	1.8
Total	390	100	390	100
Mean	2.56 (1.27)		3.04 (1.37)	
t	- 9.474*			

Figures in parenthesis are standard deviations

* Significant at 1 %.

Source: Computed from survey data

Health Status: The household heads were asked to evaluate the changes that s(he) has observed concerning the health situation of the family members during the time of survey in relation to the condition before five years. 78.7 % of the respondents avowed that the health status of their family member was well while the remaining heads reported health problem of their household members. For 69.9 % of the heads who reported health problem of their

household members, the reason for poor health was high cost of treatment. Distance to health center is the other reason stated by the remaining households.

iii) Physical Capital

Variables that were considered as physical capitals are ownership of farm equipments, size of livestock owned, distance from market center, and distance from all-weather and/or dry-weather road. As for other variables, distance from market center and main road were asked for two periods of time. Since the distance from the two has not changed between the two years, the data for 2006/07 was used for analysis. This is because the road was constructed before five years and no new market center was established in the study *kebeles* during the last five years.

Farm Equipments: The respondents were asked whether they had farm equipments such as plough, woke, sickle, hoe, etc. The respective percentages of households who had all equipments, some equipment, and no equipment before five years were 33.6, 26.2 and 40.3. After five years those which had all farm equipments has increased to 36.9 % whereas those which had no equipment decreased to 37.9 %.

Table 5.9: Distribution of Households by Ownership of Farm Equipments

Amount owned	2001/02		2006/07	
	Frequency	Percentage	Frequency	Percentage
Had all equipments	131	33.6	144	36.9
Had some equipment	102	26.2	98	25.1
Had no equipment	157	40.3	148	37.9
Total	390	100	390	100

Source: Field survey, April, 2007

Household heads who stated that they did not have farm equipments include those who have no farm land, and those that have farm land but not draught animal. Those who have farmland but not oxen entered in to share cropping arrangements to plough their land. Households which do not have farm land depend on off-farm and non-farm activities.

Livestock ownership: The size of livestock that a household owns is given in Tropical Livestock Unit (TLU). The conversion scale used to compute TLU is given in annex II C. The average number of TLU that households owned in 2001/02 was 2.55 with standard deviation of 2,65, which increased to 2.95 with decreased standard deviation of 2.63 in 2006/07. The paired sample t-test shows statistically significant difference in the mean TLU that households own ($P < 0.01$). As one can see from table 5.10, half of the households (50.5 %) covered in the survey had less than 2 TLU in 2001/02 while the figure decreased to 44.1 % after five years. The percentage of households with TLU of more than 4.1 increased from 21.8 % to 29.5 % while those with TLU of 2.1 to 4 decreased between the five years gap. 22 % of the households did not have livestock during the time of survey. More than half (52.3 %) affirmed lack of income to buy breeding animals as a reason for not having livestock. The other reason mentioned by 24.4 % of the household heads was lack of grazing land. Livestock disease was the third reason stated by 21 % of the heads. Similar to land holding, households in the low land area (*Luugama*) have relatively large size of tropical livestock units (3.2). The mean livestock sizes are 2.96 and 2.84 in the mid-altitude (*Waayyuu warqee*) and high land areas (*Laaloo hindhee*), respectively.

Table 5.10: Distribution of Households by Livestock Ownership

TLU	Before Five Years		Last Twelve Months	
	Frequency	Percentage	Frequency	Percentage
≤ 2.0	197	50.5	172	44.1
2.1 – 4.0	108	27.7	103	26.4
4.1 – 6.0	55	14.1	65	16.7
6.1 +	30	7.7	50	12.8
Total	390	100	390	100
Mean	2.55 (2.65)		2.95 (2.63)	
t	- 5.142*			

Figures in parenthesis are standard deviations

* Significant at 1 %.

Source: Computed from survey data

Distance from market center: The households were asked to estimate the time it takes them to reach the urban market center. Their response is summarized in the following table.

Table 5.11: Distribution of Households by Distance from Market Center

Time required (minute)	Frequency	Percentage
≤ 30	5	1.3
31 – 60	102	26.2
61 – 90	47	12.1
91 – 120	142	36.4
121 – 150	73	18.7
151 +	21	5.4
Total	390	100

Source: Field Survey, April, 2007

About three-forth of the respondents are found at less than two hours walking distance from the nearby urban market center. 27.5 % of the households are found at a distance of less than one hour walking distance. However, for the largest percentage of the respondents (36.4 %), it takes one and half to two hours to reach market center.

Distance from Road: Similar to distance from market center, household heads were asked to estimate distance from all-weather and/or dry-weather road. Accordingly, almost all of them (97.9 %) are found at a location which takes them less than one hour to reach all-weather or dry-weather road. The largest percentage of the households (67.7 %) resides at less than 20 minutes walking distance from road.

Table 5.12: Distribution of Households by Distance from Main Road

Distance (in minute)	Frequency	Percentage
≤ 20	264	67.7
21 – 40	75	19.2
41 – 60	43	11.0
61 – 80	4	1.0
81 +	4	1.0
Total	390	100

Source: Field Survey, April, 2007

iv) Financial Capital

Data on financial capital of the households were collected with regard to whether they received credit, remittance, and saved in cash or kind. In this study, access refers to whether the household heads received credit and remittance.

Access to Credit: The large percentage of the respondents didn't receive credit during both periods (84.6 % in 2001/02 and 81.3 % in 2006/07). With respect to those who have received credit, the change between the two periods was also insignificant as only 13 household heads who did not borrow in 2001/02 borrowed after five years. The figures generally show limited access of households to credit services.

Table 5.13: Distribution of Respondents by Financial Capital

Financial capital	Access to Credit	Before Five Years		Last Twelve Months	
		Frequency	Percentage	Frequency	Percentage
Received credit	Yes	60	15.4	73	18.7
	No	330	84.6	317	81.3
Saved birr or grain	Yes	213	54.6	224	57.4
	No	177	45.4	166	42.6
Received remittance	Yes	11	2.8	10	2.6
	No	379	97.2	380	97.4

Source: Field survey, April, 2007

Savings: The heads were asked whether they saved in cash or kind to use in the case of emergency. As shown in table 5.13, 54.6 % of the respondents stated that they saved in cash or kind in 2001/02. The number of households that saved birr or grain has increased to 57.4 % after five years. Those which didn't save decreased from 45.4 % to 42.6 % between the five years interval.

Remittance: The percentage of households that received remittance was insignificant during both periods. The figure was only 2.8 % in 2001/02 and 2.6 % in 2006/07.

v) Social Capital

Data on social capital were collected by asking heads' membership in local Community Based Organizations (CBOs) and their level of decision making in those CBOs in which they are members. The local CBOs considered were *daboo, daadoo, mahiber, sanbatee, iqub, and idir.*

Membership in CBOs: Of 390 households covered in the survey, 349 of them (89.5 %) said that they were members in at least one local community based organization. Only 10.5 % responded that they were not members.

Index of Decision Making in CBOs – The household heads were asked to subjectively evaluate whether their level of decision making in those CBOs in which they are members is high, medium, or low. Their response was respectively scaled as 2, 1, and 0. Finally, it was averaged to get a single index. The value of the index ranges from 0 to 1. The value of 0 shows that the head does not participate in decision making, and the value of 1 shows maximum involvement in making decisions. For similar approach see Grootaert (1999).

Table 5.14: Distribution of Respondents by Index of Decision Making

Index of decision making	Frequency	Percentage
0.0 – 0.20	74	19.0
0.21 – 0.40	115	29.5
0.41 – 0.60	159	40.8
0.61 – 0.80	41	10.5
0.81+	1	0.3
Total	390	100

Source: Field Survey, April, 2007

As can be seen from table 5.14, for larger percentage of the respondents (40.8 %), their decision making index was between 0.41 and 0.60. For nearly half of the respondents (48.5%), their index of decision making was less than 0.40. The index was found to be greater than 0.81 only for one respondent.

5.3 Differential Access to Livelihood Assets Vis-à-vis Household Demographics

There exists variation in the quantity and quality of livelihood assets that households own, which is a function, among other things, of the household's demographic characteristics. This section, therefore, provides an overview of the difference in the livelihood assets of households in relation to their demographic characteristics.

A/ Natural Capital

Land size and sex of household head: Table 5.15 shows statistically significant difference between male and female-headed households with respect to their mean land sizes during both years ($P< 0.01$). The former had mean land sizes of 1.15 and 1.16 ha in the years 2001/02 and 2006/07, respectively; while it was 0.81 and 0.78 for female-headed households during the same period. The mean land holding size of male-headed households was higher than female-headed households by 42 % in 2001/02 and 49 % in 2006/07.

Table 5.15: Mean Land Size (ha) by Sex of Household Heads

Period	Sex of HHH		t-test for equality of means		
	Male	Female	t	df	Sig.(2-tailed)
2001/02	1.15 (0.83)	0.81 (0.68)	3.667	388	0.000
2006/07	1.16 (0.86)	0.78 (0.68)	3.818	388	0.000

Figures in parenthesis are standard deviations.

Source: Computed from survey data

Land size and age of household head: As one can clearly observe from table 5.16, the mean land holding was high for heads in the age group 36 – 54 during both periods with respective mean land sizes of 1.29 and 1.20 ha. The size of land owned was small for household heads in the age group ≤ 35, which was 0.78 ha in 2001/02 and 0.66 in 2006/07. It is between the two for the remaining age group (55+). The Pearson chi-square test also shows significant association between age category of the heads and land size during both years ($P<0.05$).

Table 5.16: Mean Land Size (ha) by Age Group of Household Heads

Age Category (Year)	Statistics	2001/02	2006/07
≤ 35	Mean	0.78 (0.71)	0.66 (0.65)
	N	135	84
36 – 54	Mean	1.29 (0.86)	1.20 (0.86)
	N	188	208
55 and above	Mean	1.06 (0.73)	1.14 (0.84)
	N	67	98

Figures in parenthesis are standard deviations.

Source: Computed from survey data

B/ Human Capital

Sex of Household Head and Literacy Status: As can be seen from table 5.17, of 294 male heads, more than half of them (54.8 %) are literate and the illiterate accounts for 45.2 % of the heads. On the other hand, among female household heads, only 28.1 % are literate and the other 71.9 % are illiterate. Generally, literacy rate for female headed household heads is so small when compared with their male counterparts. The χ^2 test result also shows significant association between sex of the household head and literacy ($p < 0.01$).

Table 5.17 Literacy Status by Sex of Household Heads

Sex of the head		Education Category		χ^2	df	Sig
		Literate	Illiterate			
Male	Frequency	161	133	20.566	1	0.000
	Percentage	54.8	45.2			
Female	Frequency	27	69			
	Percentage	28.1	71.9			

Source: Computed from survey data

Labor force size and sex of household head: As is the case for other resources, female headed households had smaller size of labor force when compared with male heads. For instance, in 2001/02, female-headed households had an average labor force size of 2.07 while it was 2.72 for males. In 2006/07, when the labor force of the former increased to 2.20, it increased to

3.31 for the later. This difference in mean labor force size is statistically significant as confirmed by independent sample t-test for equality of means ($p < 0.01$).

Table 5.18: Labor Force Size by Sex of the Household Heads

Year	Statistic	Sex of HHH		t-test for equality of means		
		Male	Female	t	df	Sig. (2-tailed)
2001/02	Mean	2.72	2.07	4.475	388	0.000
	St. Dev.	1.23	1.26			
2006/07	Mean	3.31	2.20	7.377	388	0.000
	St. Dev.	1.34	1.10			

Source: Computed from survey data

Labor force size and age of household heads: With regard to distribution of labor force size by age group of household heads, the average labor force size was found to be high for heads in the age group 36 – 54 during both years (2.96 and 3.37 respectively) followed by those in the age group 55 and above. Households in the age group ≤ 35 had small labor force size compared to the other two age groups.

Table 5.19 Labor Force Size by Age Group of Household Heads

Year		Age Category		
		≤ 35	36 – 54	55 +
2001/02	Mean	1.91	2.96	2.77
	Std. Dev.	0.59	1.24	1.75
2006/07	Mean	2.25	3.37	3.03
	Std. Dev	0.63	1.33	1.62

Source: Computed from survey data

This difference in labor force size of households is related to family size. The respective mean family sizes for male and female headed households are 4.6 and 3.4 in 2001/02 and 4.8 and 3.1 in 2006/07 with statistically significant difference in mean family sizes during both years ($P<0.01$). The Pearson correlation coefficient between family size and labor force size is also significant at less than 1 percent level with respective correlation (r) values of 0.74 and 0.79.

C/ Physical Capital

Sex of household head and livestock ownership: Female-headed households are disadvantaged in livestock ownership. The mean TLU they had was 1.18 in 2001/02, which slightly increased to 1.31 after five years. For male-headed households their respective mean TLU was 2.99 and 3.48 in 2001/02 and 2006/07. The test for equality of means of livestock ownership also shows significant difference between the two sexes in the mean TLU they have ($p < 0.01$).

Table 5.20: Livestock Ownership by Sex of Household Heads

Period	Statistic	Sex of HHH		t-test for equality of means		
		Male	Female	t	df	Sig. (2-tailed)
2001/02	Mean	2.99	1.18	6.085	388	0.000
	St. Dev.	2.728	1.844			
2006/07	Mean	3.48	1.31	7.496	388	0.000
	St. Dev.	2.611	1.951			

Source: Computed from survey data

Age of household head and livestock ownership: Regarding ownership of livestock by age group of household heads, the same pattern of distribution as in labor force size is observed. In 2001/02 households whose ages of the heads were between 36 and 54 had more number of livestock followed by households whose ages of the heads were greater than 55 years. During both times, younger household heads (those heads in the age group ≤ 35) had smaller number of livestock compared to the others.

Table 5.21 Livestock Ownership by Age Group of Household Heads

Year		Age Category		
		≤ 35	36 – 54	55 +
2001/02	Mean	1.79	3.03	2.76
	Std. Dev.	2.13	2.63	3.29
2006/07	Mean	1.83	3.49	2.79
	Std. Dev	1.98	2.48	3.11

Source: Computed from survey data

The Pearson's correlation coefficient shows statistically significant relationship between land size and livestock ownership during both periods (significant correlation at 1 % levels during

both years). But the correlation coefficient was not as such strong (r = 0.506 and 0.480 for the years 2001/02 and 2006/07 respectively).

D/ Financial Capital

Sex of household head and access to credit: Regardless of the amount of money they borrowed, male-headed households were over represented in receiving credit. In 2001/02, of male household heads, 20 % of them borrowed money while only 6.3 % of female household heads borrowed. In 2006/07, when male-headed borrowers increased by 20 % from 59 to 71 heads, it increased by 16 % for female heads. Among the receivers, more than 90 % were male heads during both years. The chi- square test of independence also shows significant association between sex of the head and borrowing of money during both years ($p<0.01$).

Table 5.22 Access to Credit by Sex of Household Heads (in Percentage)

Period	Received Credit	Sex of the Head		χ^2	df	Sig.
		Male	Female			
2001/02	Yes	20.1 (59)	6.3 (6)			
	No	79.9 (235)	93.7 (90)	9.949	1	0.002
2006/07	Yes	24.1 (71)	7.3 (7)			
	No	75.9 (223)	92.7 (89)	12.854	1	0.000

Figures in parenthesis are frequencies

Source: Computed from survey data

Age of household head and access to credit: Table 5.23 shows differential access to credit by age group of household heads. In 2001/02, the largest borrowers were heads in the age group 36 – 54 (22.3 %) followed by those in the age group 55+ (11.9 %); while households headed by younger persons were the least borrowers (11.1 %). In 2006/07, the same pattern of distribution is observed. That is, the larger percentage of borrowers was those in the age group 36 – 54.

Table 5.23: Access to Credit by Age Group of Household Heads (in Percentage)

Period	Received Credit	Age of Household Heads			χ^2	df	Sig.
		≤ 35	36 – 54	55 +			
2001/02	Yes	11.1(15)	22.3(42)	11.9(8)	8.44	2	0.015
	No	88.9 (120)	77.7 (146)	88.1 (59)			
2006/07	Yes	9.5(8)	25(52)	18.4(18)	9.175	2	0.010
	No	90.5 (76)	75 (156)	81.6 (80)			

Figures in parenthesis are frequencies

Source: Computed from survey data

Access to credit and livelihood assets: Access to credit, as a financial capital, also depends on other livelihood assets. As shown in table 5.24, the largest percentage of the borrowers were over-represented among those households which had a land size of greater than 1 ha; households headed by literates; those with livestock size of more than the median size (2.70 TLU); and those with high index of decision making in CBOs.

Table 5.24: Differential Access to Credit by Livelihood Assets, 2006/07

Livelihood Assets	Category	Received Credit		χ^2	df	Sig.
		Yes	No			
Land size	< 1ha	30	211	22.485	1	0.000
	≥ 1ha	48	101			
Education	Illiterate	21	181	24.157	1	0.000
	Literate	57	131			
Livestock	< 2.70	25	244	62.114	1	0.000
	≥ 2.70	53	68			
Index of decision making in CBOs	< 0.50	20	182	26.711	1	0.000
	≥ 0.50	58	130			

Source: Computed from survey data

Generally speaking, access to credit is limited in the study area as only 16.7 % and 20 % of the respondents borrowed money in the years 2001/02 and 2006/07, respectively. This could be attributed to different reasons. The heads who did not receive any credit during both years were asked the reason. Only 54 heads (17.3 %) stated that they did not want. Most of them (43.6 %) replied absence of borrowing institutions. Lack of collateral was the second reason stated by 20.2 % of the respondents. For the remaining 18.9 %, high interest rate was the reason for not borrowing.

The other difference between households with respect to financial capital is saving. The importance of saving in cash or kind during good harvest time is indispensable to use it during times of scarcity. Thus, among the household heads covered in the survey, 59.9 % and 63.3 % of the male heads stated that they saved some in the years 2001/02 and 2006/07, respectively; while the respective figures for female heads are 38.5 % and 39.6%. Again, regardless of the amount saved, the percentage of male head savers is greater than female head savers.

Table 5.25: Difference in Saving by Sex of Household Heads (in percentage)

Period	Saved birr and/ or grain	Sex of the Head		χ^2	df	Sig.
		Male	Female			
2001/02	Yes	59.9(176)	38.5(37)	13.274	1	0.000
	No	40.1(118)	61.5(59)			
2006/07	Yes	63.3(186)	39.6(38)	16.602	1	0.000
	No	36.7(108)	60.4(58)			

Figures in parenthesis are frequencies
Source: Computed from survey data

The difference in saving can also be observed when respondents are classified based on their age groups. As shown in table 5.26, the majority of the respondents who saved cash or grain are found in the age group 36 – 54 both in 2001/02 and 2006/07 with respective percentages of 60.6 and 63.9. There is no significant difference between younger and older household heads.

The Pearson chi square test shows significant association between age group and saving (significant at 10 % in 2001/02 and at 5 % in 2006/07).

Table 5.26 Difference in Saving by Age Group of Household Heads (in Percentage)

Period	Saved	Age of Household Heads			χ^2	df	Sig.
		≤ 35	36 – 54	55 +			
2001/02	Yes	49.6 (67)	60.6 (114)	47.8 (32)	5.375	2	0.068
	No	50.4 (68)	39.4 (74)	52.2 (35)			
2006/07	Yes	50(42)	63.9(133)	50(49)	7.718	2	0.021
	No	50(42)	36.1(75)	50(49)			

Figures in parenthesis are frequencies
Source: Computed from survey data

E/ Social Capital

Sex of household head and index of decision making: As presented in table 5.27, significant difference between male and female heads is observed with respect to their index of decision making in local CBOs. The mean index of decision making was 0.41 for male heads while it was 0.23 for female heads. That is, the index for the later is 78.3 % lower than that of the former. The t-test for equality of means also confirms the difference ($p< 0.01$).

Table 5.27: Difference in Index of Decision Making by Sex and Educational Level of the Household Heads

	Category	Statistics for index of decision making				
		Frequency	Mean	t	df	Sig. (2-tailed)
Sex of the head	Male	294	0.41	8.195	388	0.000
	Female	96	0.23			
Education of the head	Illiterate	202	0.32	-4.819	388	0.000
	Literate	188	0.41			

Source: Computed from survey data

The index also varies by educational level of the head. The mean index for illiterate household heads was 0.32 while it was 0.41 for literates. That is, the decision making index of illiterate household heads is lower than the literates by about 28 %. The t-test for equality of means also shows significant difference between the two in their mean index of decision making.

With regard to age group of household heads, the mean index for those heads in the age group 36 to 54 was 0.39 and the least was of those in the age group 55+. The mean index of decision-making was 0.36 for household heads in the age group of less than or equal to 35 years.

5.4. Livelihood Strategies

As pointed out by Scoones (1998), this study explains the livelihood strategies of the sample by classifying them in to four: agricultural extensification, agricultural intensification, livelihood diversification, and migration.

1. Extensification: In the study area the expansion of crop cultivation into marginal land was found to be insignificant as there were only 16 household heads (4.1 %) who reported that they expanded their farm land in to other areas such as forests and steep slope areas. This may be because land with relatively high fertility and accessibility have already been exhausted. Nevertheless, households are converting grazing land that is at their disposal into cultivation. 54.6 % of the heads replied that they did not have grazing land in 2001/02. After five years, the percentage of such households increased into 60 %. Similarly, the mean grazing land of households decreased from 0.13 ha in 2001/02 to 0.11 ha in 2006/07. This indicates that those households which have grazing land are converting it into farm land. The mean farm land of the respondents was 0.92 ha in 2001/02 which slightly increased to 0.93 ha after five years. Pender (2001) noted that expansion of farm land into such areas adversely affects the resource base of the area. As such extensification of farm land into forest and grass land is associated with little or no investment in land improvements (Pingali and Binswanger, 1987 cited in Tesfaye, 2003), it has negative impact on the livelihood sustainability of the households. By and large, the decrement of grazing land may also contribute to dwindling of livestock population.

*2. **Intensification***: The use of intensification as a livelihood strategy to achieve certain desired livelihood outcomes in the study area can be observed from lack of land to which cultivation can expand to and absence of fallowing. For Boserup (1965), absence and reduction in time of fallowing is the manifestation of agricultural intensification. In this regard, only 10.7 % of the respondents stated that they fallowed their land before five years. The percentage of heads that used fallowing as a means of soil fertility replenishment decreased to 8 %, which indicates frequent cultivation of the available land.

According to Tiffen *et al.* (1994), increase in labor input per unit of land shows agricultural intensification. In the study area, the mean land holding of the sample households was 1.07 in 2001/02 and 1.06 ha in 2006/07. On the other hand, man equivalent labor force size increased by 18.8 % from 2.56 in 2001/02 to 3.04 in 2006/07. This shows the increased labor land ratio from 2.39 to 2.87 within five years.

Intensification as a livelihood strategy yields non- declining product with the appropriate soil conservation and management mechanisms and the use of yield increasing inputs. In this regard, the majority of the households (87.1 %) used manure as a means of maintaining soil fertility. Mulching is the second widely used soil management mechanism in terms of number of households that used it. The figure shows low percentage of the users of modern inputs compared to the traditional mechanisms. During both years, less than 30 % of the households used improved seeds, herbicide, and pesticide. Nearly more than half of the households didn't use fertilizers to increase their farm land productivity. The respondents attributed limited use of fertilizer to its high cost. The farmers are also pessimistic with regard to taking fertilizers on loan due to fear of crop failure. Regarding the number of users of traditional and modern soil management mechanisms, no significant difference is observed except that the percentage of the users slightly decreased for all mechanisms other than manure application.

Table 5.28: Distribution of Households by Use of Soil Management Mechanisms

Type	2001/02		2006/07	
	No. of responses	Percent of cases	No. of responses	Percent of cases
Manure application	250	87.1	252	87.5
Mulching	224	78.0	223	77.4
Used fertilizer	134	46.7	129	44.8
Used improved seed	82	28.6	79	27.4
Used herbicide	73	25.4	73	25.3
Used pesticide	15	5.2	10	3.5

Source: Field survey, April, 2007

The practice of soil conservation practices used to maintain land productivity is also an important issue for intensification to yield sustainable output. The household heads were asked whether they used some conservation measures. 66.2 % and 67.4 % of the respondents stated that they used at least one conservation measure. Among these, more than 90 percent of them used planting trees, check dams, and contour ploughing during both years. The percentage of users slightly increased in 2006/07 than 2001/02.

Table 5.29 Soil Conservation Practices Used by Households

Type	2001/02		2006/07	
	No. of responses	Percent of cases	No. of responses	Percent of cases
Terracing	175	67.8	190	72.0
Planting trees	234	90.7	240	90.9
Check dams	242	93.8	251	95.1
Contour ploughing	241	93.4	252	95.5

Source: Field survey, April, 2007

Although agricultural intensification is considered as a positive process of increasing output, there may be negative effects on the sustainability of livelihood (Carswell, 1997). One of the consequences of agricultural intensification is environmental degradation (Turner *et al.*, 1993 cited in Carswell, 1997). They stated that the long term sustainability of the agricultural resource base can be threatened by the process of intensification. In the study area, it was found that land productivity has increased for 38.5 % of the respondents. For the other 30.3 % and 31.3 %, the productivity of land remained unchanged and decreased, respectively.

Thus, agricultural intensification as a livelihood strategy is seen not only in terms of increased production per unit of fixed land but also in its impact on the long term productivity of the natural resources, which is central to the concept of sustainable livelihood. In this regard the problem related to sustainability of intensification is beyond the scope of this study and requires further research.

*3. **Livelihood Diversification***: One of the strategies that rural households use to achieve their desired livelihood outcomes is diversifying their activities. In the study area, households are engaged in different activities to diversify their sources of income. Among the sample respondents, 80 % of them replied that some member of a household was engaged in non-farm activities. The remaining 78 households (20 %) stated that no member was engaged in activities other than farming and livestock rearing. The later households were asked why any member of their household was not engaged in non-farm activities. 34.6 % of them stated lack of non-farm employment opportunity. The respective percentages of households which stated distance location of place of work and low payment for non-farm activities are 20.5 and 15.4. About 18 % of the respondents said that they want to work only agricultural works. Regarding households that were engaged in some activities other than farming, the main reason (71 % of the respondents) that forces them to be engaged in such activities is low agricultural product. This indicates necessity other than choice that derives livelihood diversification. 21 % of the heads stated small or lack of farm land as a cause of working non-farm activities. For the other 4.5 %, 2.9 %, and 1 % of the respondents the respective reasons are seasonality of agricultural work, nearby location to urban center, and availability of non-farm employment opportunities.

In this study, Inverse Herfindahl - Hirschman Diversity Index (IHHD) was used to calculate livelihood diversification at household level. IHHD is calculated using the following formula (Anderson and Deshingkar, 2005).

$$IHHD_i = \left[\frac{1}{\sum aj^2} \right] ,$$

where a_j represents the proportional contribution of each livelihood activity j to household i' s income. The minimum value of IHHD is 1 which shows that for the household there is only one source of income (perfect specialization). The maximum possible value is the total

number of different income sources when the total income is equally distributed between each source (Ellis, 2000 cited in Anderson and Deshingkar, 2005). The sources of income considered in this study were farming, livestock rearing, trading (trading livestock and grain, and petty trade), selling fuel wood and charcoal, daily wage labor, and traditional occupations (weavers, blacksmiths, and pottery).

For the households included in the sample, their mean annual income was 8298.21 Birr. However, non farm activities contributed only 8.8 % to household income. The remaining household income is that derived from farming and livestock rearing. Farming is the main source of their livelihood, followed by both farming and livestock rearing.

Table 5.30: Index of Livelihood Diversification Category

IHHD category	Frequency	Percentage
1.00	36	9.2
1.01 – 2.00	253	64.9
2.01 – 3.00	94	24.1
3.01+	7	1.8
Total	390	100

Source: Field Survey, April, 2007

As shown in table 5.30, there is perfect specialization for 36 households (9.2 %). That means their livelihood depends on only one source of income. For the majority of the households (64.9 %), the index is between 1.01 and 2.00. If there were perfect diversification, the value of the index would be 6, indicating that income is equally distributed between the six types of activities. However, given the types of activities considered in the study, it was only for 1.8 % of the households that the index is greater than half of perfect diversification. This suggests that, though most households (90.8 %) are engaged in several activities, the income obtained from the activities is not evenly distributed between the six sources.

The difference in livelihood diversification for different groups of the sample households is given in table 5.31. The mean index of livelihood diversification was found to be high for male headed households, household headed by persons in the age group 36 – 54, households with illiterate heads, households with land size of greater or equal to 1 ha, and households which live in the low lands (Waayyuu warqee).

Table 5.31: Differences in Mean Index of Livelihood Diversification

Variable	Category	IHHD	
		Mean	Std. Dev.
Sex of the head	Male	1.77	0.48
	Female	1.74	0.62
Age of the head	≤ 35	1.77	0.52
	36 – 54	1.82	0.53
	55+	1.63	0.48
Agro-ecology	*High land*	1.65	0.45
	Middle altitude land	1.79	0.57
	Low land	1.97	0.49
Education	Illiterate	1.77	0.52
	Literate	1.75	0.52
Land size	< 1ha	1.74	0.55
	≥ 1ha	1.80	0.46

Source: Computed from survey data

4. Migration: Migration is the other strategy that households can use to sustain livelihood. However, the role of migration in sustaining rural livelihood is insignificant in the study area. Among the respondents, only 2.1 % stated that member of the household migrated to other area in 2001/02; and the percentage decreased to 1.8 in 2006/07.

5.5 Institutions

As discussed in the review literature part, the role that rural local organizations play in the livelihood of people is well documented. In the study area, among the number of roles that the institutions play in the social life of rural people, the following labor sharing arrangements have been identified in FGD as a means of access to draught animal and /or human labor.

Araasoo: It is an agreement that is made between a person who has oxen but not labor and other person who has labor but not oxen. The later ploughs the farm land of the former for two days and for himself for one day.

Yagutoo: When two individuals have certain common farm land and one of the two does not participate in ploughing land, the other individual ploughs it. Then the farm product is shared between the two individuals equally since they own the land in common. But since only one of the two participated in ploughing the land, farm product which is assumed to be equivalent to his labor is given for the person who ploughed the land. That is, they shared one third and two third of the farm product.

Hidhata: It is an agreement that takes place between two individuals who have only one ox each. They use the draught animals in turn. This labor sharing arrangement is similar to *mekenajo* in northern part of the country.

Gatiitti (Cimaada): This method is mostly used by female headed households as they lack labor. Female heads who have oxen but not labor give their oxen to a person who is able to use. The person agrees to provide certain quantity of farm product for use of the oxen. The discussants stated that the quantity of the product to be given for oxen owners was about 3 quintal. But these days it has decreased to about one and half quintal.

5.6 Correlates of Sustainable Rural Livelihoods

Households employ different strategies to achieve certain desired livelihood outcomes. The outcome is derived from the assets that are found at their disposal. Thus, the sustainability of the livelihood outcomes of households depends on the changing pattern of their demographic patterns and livelihood assets. This sub topic examines the role of household level demographic dynamics and changes in livelihood assets in achieving sustainable livelihood.

5.6.1 Livelihoods Sustainability Matrix

As noted in chapter 3, this study gives emphasis to economic and environmental sustainability. The former was measured in per capita income per adult equivalent of a household. The minimum level of per capita income to identify households in terms of their economic sustainability was US$[3] 0.45. This value was selected based on poverty line that the Ministry of Finance and Economic Development (MoFED, 2005) used to estimate percentage of population living below poverty line. Thus, the livelihood of a household was considered economically sustainable only when the per capita income per AE was at least US$ 164.25[4] for both years (2001/02 and 2006/07). Land productivity of the two periods was used as a proxy variable for environmental sustainability in which its productivity for the latter period should be at least equal to that of its productivity before five years. The livelihood of households that fulfilled these two criteria was considered to be sustainable.

Table 5.32: Livelihoods Sustainability Matrix

Per capita income per year (US$)		**Land productivity**		
2001/02	*2006/07*	*Decreased*	*Unchanged*	*Increased*
< 164.25	< 164.25	# (47)	# (89)	# (48)
< 164.25	> 164.25	# (56)	# (19)	# (45)
> 164.25	> 164.25	# (19)	§ (10)	** (57)

Figures in parenthesis are number of households categorized under that cell.

** shows dynamically sustainable livelihood

§ shows statically sustainable livelihood

shows unsustainable livelihood

[3] To calculate the per capita income of households for the years 2001/02 and 2006/07, the USD value (weighted averages) of 8.543 and 8.6986 were used, respectively, based on the exchange rate obtained from the 2006/07 statistical report of the National Bank of Ethiopia (NBE).

[4] The poverty line of US$ 0.45 per AE per day was translated into per capita income per year by multiplying by 365.

Based on the sustainability matrix given above, only 67 households fulfilled the criteria of static and dynamic sustainability. That is, the livelihood of only 17.2 % of the households is found to be sustainable. About 47 % of the sample households live below poverty line of US$ 0.45 in 206/07. For about 5 % of them improved per capita income had taken place at the expense of land productivity improvement. The chi square test of association between land productivity and per capita income was also found to be significant ($P<0.01$) with χ^2 value of 76.061 and degree of freedom of 4. Using the test proportion of 0.17, the binomial test shows statistically significant difference between households with sustainable and unsustainable livelihood at 1% significance level.

5.6.2 Bi - variate Analysis

Chi square test was used to examine whether there exists association between the dependent variable and the set of predictor variables. The dependent variable is livelihood sustainability which was assumed to be influenced by demographic dynamics and changes in livelihood assets. The results are summarized in tables 5.33 and 5.34.

5.6.2.1 Demographic Dynamics and Sustainable Livelihoods

Age of the household head is one of the demographic variables that were found to be related to livelihood sustainability. The respective percentages of households headed by persons in the age groups ≤ 35, 36 – 54, and greater than or equal to 55 that achieved sustainable livelihood are 4.8, 23.6, and 14.3. This shows that the livelihood of households with middle-aged heads was more sustainable than those headed by younger and older aged heads. The chi-square test also indicates statistically significant association between the age group of household heads and livelihood sustainability ($P<0.01$).

With regard to sex of the head, the livelihood of male headed households was more sustainable than their female counter parts. Among 294 male headed households included in the sample, the livelihood of 22 % of them was found to be sustainable; while the figure is only 2.1% among 96 female headed households. From households with sustainable livelihood, 97 % of them were headed by males. The association between sex of the head and livelihood sustainability is found to be significant at 5 % level of significance.

As far as the relationship between livelihood sustainability and adult equivalent family size of a household is concerned, the percentage of households with sustainable livelihood was 23 % for households with family size of less than 4.25 adults. Among households with family size of greater than 4.25, only the livelihood of 10.3 % was sustainable. The Pearson chi-square test also shows statistically significant ($P<0.01$) relationship between family size and livelihood sustainability.

The relationship between change in dependency ratio of households and sustainability of their livelihood was found to be statistically significant. For about 23.6 % of households with sustainable livelihood, their dependency ratio has decreased during the five years. However, among the households with increased dependency ratio, the livelihood of 92.8 % was unsustainable. It indicates that livelihood unsustainability is over-represented among households with increased dependency ratio.

Table 5.33: Chi-square Test of Association between Demographic Dynamics and Sustainable Livelihoods

Variables	Sustainability of Livelihood		Pearson chi-square	df	Sig. (2 sided)
	No	Yes			
Age of household head					
≤ 35	80	4	15.627	2	0.000
36 – 54	159	49			
55+	84	14			
Sex of household head					
Male	229	65	20.397	1	0.000
Female	94	2			
Change in family size (Adult Equivalent)					
< 4.25	149	47	12.806	1	0.000
≥ 4.25	174	20			
Change in dependency ratio					
Decreased	175	54	16.034	2	0.000
Unchanged	84	8			
Increased	64	5			

Source: Computed from survey data

5.6.2.2. Changes in Livelihood Assets

Much has been said about the role of changes in livelihood assets in sustaining livelihood. Land, the crucial assets for rural people, plays significant role in their life. As noted in table 5.34, among the households with sustainable livelihoods, 67.2 % of them had a land size of greater than 1ha (the mean land holding size of the sample). On the other hand, of the households with land size of less than 1 ha, the livelihood of about 90.8 % was not sustainable. The relationship between land size and livelihood sustainability is statistically significant ($p<0.05$). This indicates that, given limited modern agricultural input, small land size yields low production.

Literacy status of the household head is one of the human capitals related to livelihood sustainability. In this regard, as shown in table 5.34, among the households which achieved sustainable livelihoods, 91 % of them were found to be headed by literate persons. This difference of livelihood sustainability due to literacy status is confirmed by statistically significant chi-square test ($P<0.01$). The result is consistent with findings of other studies that households headed by illiterate households have high incidence of poverty (Tsegazeeab, 2003) and low level of participation in soil & water conservation activities (Chalachew, 2004). Health status of household members, the other human capital, was significantly related to livelihood sustainability as 95 % the households which stated poor health status of their household members had not achieved sustainable livelihoods ($P< 0.01$). From the total number of households for which livelihood was sustainable, 94 % of them have improved health status during the last five years.

As far as rural livelihood is concerned, labor force size of a household is an indispensable asset. In this case, livelihood was found to be sustainable for 79 % of households with increased size of labor force. The relationship was, however, not statistically significant. This could be attributable to marginal return to labor productivity. If labor force has increased on a limited size of farm land, it causes a declining return to production. A study by Degefa (2005) in Ernessa and Garbi Woredas of Oromia Zone, Amhara Regional State showed that due to surplus labor supply there is prevalent problem of unemployment and underemployment. Similarly, a study by Tsegazeab (2003) in rural North Shoa found worsening living standard with increasing labor force due to low productivity of labor. One of the key informants in the

study area also replied that '*we are spending the resources we have on education of our children. Let alone the illiterate, the educated youngsters themselves are returning back to rural area and claiming the small piece of land we have*'. Thus, unless alternative sources of income in non-agricultural activities are available to use the surplus labor, its contribution to sustainable rural livelihoods is limited.

Regarding ownership of livestock and livelihood sustainability, statistically significant ($P<0.01$) association was found between the two. Of the total respondents, the size of livestock has increased for 34.5 % of them; and the livelihood of 30.2 % of them was sustainable. Generally, from those households with sustainable livelihoods, livestock ownership has increased for about 86.6 % of them. Ownership of farm equipments was also significantly related to sustainability of livelihood ($P<0.01$). The livelihood of 36 % of households which had all physical equipments was sustainable. On the other hand, among household who had no farm equipments during both times (37.7%), the livelihood of none was sustainable. So long as most rural people depend on traditional production mechanisms, the role of farm equipment ownership is unquestioned.

Distance from road (all weather and /or dry weather road) and market center are among the physical capitals of rural households. These resources determine the activities of farmers as producers and consumers. With regard to distance from the road, 64 % of households with sustainable livelihoods reside at less than 20 minutes walking distance from road. However, the relation was not statistically significant. This may be because, in the study area, most rural *kebeles* are found at a reasonable similar distance at least from dry weather road. Data obtained from capacity building office of the district show that, of 20 rural *kebeles* in the district, only one *kebele* has no access to dry weather road. In relation to distance from market center, among 67 households which achieved sustainable livelihood, about 86 % of them live at less than 2 hours walking distance from the market center. The Pearson chi-square test also shows significant association between the two at 5 % level of significance.

The association between financial capital and livelihood sustainability is also presented in table 5.34. Significant relationship was observed between access to credit and sustainability of livelihood ($P<0.01$) as about 65.6 % of households with sustainable livelihoods have received

credit at least in one of the years considered in the survey. With respect to saving, significant difference was observed between households that saved in cash or kind and those which didn't. Among 67 households with sustainable livelihoods, 97 % of them stated that they had savings during both years. The relationship between remittance and sustainable livelihood was found to be insignificant (P>0.05). This could be due to negligible contribution of remittance to the livelihood of the people. The result shows that only 2.8 % of households have received remittance. Besides, if income from remittance is used only for survival rather than investment in livelihood assets, it may not contribute to improvement of livelihood.

As to social capital of the households, participation or membership in CBOs was insignificantly related to livelihood sustainability (P>0.05). On the other hand, there existed significant relationship between index of decision making and livelihood sustainability. Among household heads with high index of decision making (>0.50), the livelihood of 46 % of them was sustainable. Similarly of the 67 households that achieved sustainable livelihoods, the index was ≥ 0.50 for 83.5 % of them.

Among the households that achieved sustainable livelihoods, 44.8 % of them live in the high land area (*Laaloo hindhee*). The remaining 37.3 % and 17.9 % live in the mid-altitude (*Waayyuu warqee*) and low land (*Luugama*) areas of the district, respectively. However, the chi-square test shows insignificant association between agro-ecological location and livelihood sustainability ($\chi^2 = 0.912$, df = 2, p = 0.634).

Table 5.34: Chi-square Test of Association between Changes in Livelihood Assets and Sustainable Livelihoods

Variables	Sustainability of Livelihood		Pearson chi-square	df	Sig. (2 sided)
	No	Yes			
Land size (ha)					
< 1	219	22	28.736	1	0.000
≥ 1	104	45			
Educational level of the head					
Illiterate	196	6	59.463	1	0.000
Literate	127	61			
Change in labor force					
Decreased	42	7	1.552	2	0.460
Unchanged	49	7			
Increased	232	53			

Table 5.34 (Continued)					
Health problem					
No	244	63	11.322	1	0.001
Yes	79	4			
Change in livestock size (TLU)					
Decreased	43	5	46.655	2	0.000
Unchanged	146	4			
Increased	134	58			
Ownership of farm equipments					
No equipment	147	0	62.924	2	0.000
Some equipments	95	21			
All equipments	81	46			
Distance from market center (minutes)					
< 120	238	58	5.034	1	0.025
≥ 121	85	9			
Distance from road (minutes)					
< 20	221	43	0.457	1	0.499
≥ 21	102	24			
Credit					
Received both times	25	40	112.674	2	0.000
Received once	9	4			
Did not receive	289	23			
Saving					
Saved both times	146	65	60.347	2	0.000
Saved only once	14	1			
Didn't save	163	1			
Remittance					
Received	8	3	0.810	1	0.368
Did not receive	315	64			
Participation in CBOs					
Yes	285	64	3.132	1	0.077
No	38	3			
Index of decision making					
< 0.49	258	11	104.419	1	0.000
≥ 0.50	65	56			

Source: Computed from survey data

5.6.3 Multivariate Analysis

Binary logistic regression model is the multivariate statistical tool that was used for further analysis of the subject matter. As discussed in chapter three, it is employed when the dependent variable takes the value of 0 and 1 for negative (unfavorable response) and positive (for favorable response), respectively. In this study, the household took the value of 1 if its livelihood was sustainable and 0 otherwise. Before estimating the correlates of sustainable livelihood using the model, the goodness of fit of the model and multi-collinearity diagnosis is presented below.

5.6.3.1 Assessing the Goodness of Fit of the Model

There are various ways to assess whether the model fits the data or not. In this study, classification table and Hosmer and Lemeshow test were used. The classification table shows the percentage of observed cases that are correctly or incorrectly classified. As can be seen from table 5.35, 315 households with unsustainable livelihoods were correctly predicted by the model as not sustainable. Similarly, 58 households with sustainable livelihoods were correctly classified as sustainable. On the other hand, 17 households were misclassified: 9 households with sustainable livelihoods and 8 households with unsustainable livelihoods. Generally, among households with unsustainable livelihoods, 97.5 % were correctly classified; and among those with sustainable livelihoods, 86.6 % were correctly classified. Overall, 95.6 % of the households were correctly classified by the model.

Table 5.35: Classification Table

Observed			Predicted		
			Sustainability of livelihood		Percentage correct
			No	Yes	
	Sustainability of livelihood	No	315	8	97.5
		Yes	9	58	86.6
	Overall percentage				95.6

Source: Computed from survey data

Hosmer and Lemeshow test is used to accept or reject the alternative hypothesis "the model adequately describes the data". If the significance level of the test is less than 0.05, it indicates that the alternative hypothesis is rejected and the null hypothesis which states the inadequacy of the model to describe the data is accepted. In the case of this study, the significance level of the test was found to be 0.897. Thus, the alternative hypothesis which states that the model is adequate to describe the data was accepted.

5.6.3.2 Multi-collinearity Diagnosis

The predictor variables used in the model were non-continuous. Thus, coefficient of contingency was computed to detect the problem of multi-collinearity. The coefficient is given as (Kothari, 1990)

$$C = \sqrt{\frac{\chi^2}{n + \chi^2}}$$

Where C is coefficient of contingency, χ^2 is chi square test, and n is total sample size. The value of C ranges from 0 to 1. Smaller values of C indicate weak association between the variables and vice-versa. The multi-collinearity diagnosis for the variables of the study shows weak relationship between the predictor variables with a maximum value of 0.479 (see annex III for the full result).

5.6.3.3 Results of the Model

Table 5.36 presents the parameters of logistic regression model estimated by regressing demographic variables and livelihood assets on livelihood sustainability indicators. The coefficients, probability level, and odds ratio indicate whether a particular variable is associated with sustainable livelihoods statistically significantly. The odds ratios given in the last column of the table show change in the odds of livelihood sustainability versus unsustainability due to membership in a particular sub group of a variable. If the value of the odds ratio is 1, it indicates that the variable has no effect. If the value is greater than 1, the probability of livelihood sustainability is higher for members of that group in relation to the reference category. An odds ratio of less than 1 indicates lower probability for members of that particular sub group.

As far as age group of household heads is concerned, those in the age group 36 – 54 had higher likelihood of achieving sustainable livelihood when compared with the reference category (≤ 35). However, it is not statistically significant. Similarly, being significant at 5 %, households headed by older persons (aged 55+) had higher likelihood of achieving sustainable livelihoods than those headed by younger persons (≤ 35).

Sex of household head was found to be significantly related to sustainable livelihoods. Female headed households had lower probability of achieving sustainable livelihoods when compared with male headed households ($p< 0.01$). The likelihood that their livelihood is sustainable was 0.065 times lower than households headed by males. Thus, the hypothesis which states that the livelihood of female headed households is less sustainable than male headed households is accepted.

Households for which the family size was greater than the median size (4.25), the odds ratio significantly decreased compared to households with family sizes of less than 4.25 ($p<0.01$). It indicates that increased family size decreases the probability of achieving sustainable livelihoods. The hypothesis which states that large family size decreases the probability of sustaining livelihoods is, therefore, accepted.

Regarding change in dependency ratio, when compared with households for which the dependency ratio had decreased during the five years, the likelihood of achieving sustainable livelihoods was 0.050 times lower for households with unchanged dependency ratio (significant at 1 % level); and 0.031 times lower for households with increased dependency ratio (significant at 1 %). This confirmed the hypothesis which states that the probability of sustaining livelihood decreases with increasing dependency ratio.

With regard to size of land holding of the sample, the likelihood of sustaining livelihood was 2.39 times higher for households with land size of greater than or equal to 1 ha compared to households which own land size of less than 1 ha. But, it was not statistically significant. This is consistent with the study conducted in Hillside areas of Honduras by Jansen and others. They found that more land *per se* does not lead to higher income per capita, and households

with less land are able to compensate by obtaining higher productivity or by pursuing off farm activities (Jansen *et al.*, 2006). Similarly, Yared (1999) in his study in Wogda of North Shoa found that fertility of land matters than the size of land owned.

Education was one of the human capitals that significantly influenced livelihood sustainability. For households headed by illiterate households, the odds ratio of livelihood sustainability to unsustainability was 0.083 times lower than those households headed by literate persons. In this regard, other things being constant, negative relationship was observed between literacy status of household heads and sustainability of the households' livelihoods. Thus, the hypothesis which states that the probability of sustaining livelihood is less for households headed by illiterates compared to households headed by the literates is accepted. This influence of education on livelihood sustainability can be seen from the point of view of its impact on decisions related to livelihood activities.

As far as labor force size of households is concerned, compared to households for which their labor force size had increased during the five years, the likelihood of sustaining livelihoods for households with decreased labor force size was lower by 42 %. Households for which labor force size remained unchanged had 3.3 times higher likelihood of achieving sustainable livelihoods. The relationship was, however, not statistically significant. Similar statistically insignificant relationship was also observed in bi-variate test. Thus, the hypothesis which states that increased labor force size increases livelihood sustainability is rejected. As mentioned earlier, this could be due to negligible contribution of labor to households' livelihood which may be attributable to low labor productivity. With regard to health status of households, the likelihood of sustaining livelihoods decreased by about 89 % for households which stated health problems of their family members compared to their counterparts. The relationship between the two was found to be statistically significant at 10 % level.

Livestock ownership was the other physical capital that significantly influenced livelihood sustainability. Compared to those households for which the size of livestock had increased during the five years, the likelihood of sustaining livelihood was 0.044 times less for households for which the size had decreased (significant at 1 % level); and 0.077 times lower for households for which the size remained unchanged (significant at 5 % level). Thus, the

expected relationship which states that decrement of livestock size decreases the probability of sustaining livelihoods is accepted.

Regarding distance from market center, though the relationship is not significant, households which reside at less than two hours walking distance from market center had 2.61 times higher likelihood of sustaining livelihood than those that live at more than two hours walking distance from market center. In the case of distance from road, the result was found to be the opposite of the expected direction. That is, the livelihood of households that reside at less than 20 minutes walking distance from main road was 0.143 times less sustainable than the reference category, which is significant at 10 % level. This may be due to limited role of diversification of activities in their livelihood, which is a function of proximity to road. The other physical capital, ownership of farm equipments was not included in the logistic regression model since its standard error of mean was found to be high. This is due to the reason that some of the cells have too small frequencies ranging from 0 to 147.

According to the result of the model, compared to households which did not borrow money, the livelihoods of households that borrowed during one of the years considered in the survey was 2.205 times more sustainable. However, it is not statistically significant. On the other hand, compared to the reference category, the livelihoods of households which borrowed money during both years considered in the survey was 4.9 times more sustainable, significant at 1 % level. Thus, the expected relationship, the livelihood of households which borrowed twice is more sustainable than non-borrowers, is accepted. Access to credit contributes to sustainability of rural livelihood through financing agricultural inputs and non-farm activities on the one hand, and protecting the loss of crucial livelihood assets due to influence from external environment such as seasonal food shortage, illness, death etc on the other hand (Tesfaye, 2003). As far as saving in cash or kind is concerned, the livelihood of households which had savings in one of the years considered in the survey was more sustainable than non-savers (but it is not statistically significant). Similarly, the likelihood of sustaining livelihoods for households which had savings during both years was 9.8 times higher than the non-savers (significant at 10 % level). The other financial capital, access to remittance, was not included in the model as the proportion of the sample households which had access to it was negligible.

Participation in CBOs was found to be related to improvement of livelihoods. Households for which the heads were members of certain CBO had 1.24 times higher likelihood of sustaining livelihoods. The relation is, however, not statistically significant. But when index of decision making of the head is considered, the likelihood of sustaining livelihoods was 0.093 times lower for households headed by persons of low decision making (< 0.50) compared to those heads whose index of decision making is high (0.50+), significant at 1 % level. The expected relationship, there is positive relationship between livelihood sustainability and index of decision making, is, thus, accepted.

In multiple regression analysis, since linear relationship is expected between dependent variable and set of predictor variables R^2 is used to explain the amount variation of dependent variable explained by changes in predictor variables. In the case of logistic regression analysis, as the relation was assumed to be non-linear, it can not be computed. Thus, the pseudo r-squared statistics are designed to have similar properties to that of R^2 in multiple regression analysis. Cox and Snell R^2 value is one of the statistic used for this purpose. But, since its value is less than 1, the Nagelkere R^2 statistic is used as its correction. In the case of this study, therefore, the predictor variables explained 83.3 % variation in the dependent variable (livelihood sustainability).

Table 5.36: Logistic Regression Result of the Effect of Predictor Variables

Variables	Category	B	SE	Exp (B)
Age Group of the Head	≤ 35	Reference category		
	36 – 54	1.727	1.063	5.624
	55 +	2.634	1.228	13.923**
Sex of the Head	Male	Reference category		
	Female	-2.739	1.070	0.065*
Family Size	< 4.25	Reference category		
	≥ 4.25	-3.745	0.918	0.024*
Change in dependency ratio	Decreased	Reference category		
	Unchanged	-2.987	1.031	0.050*
	Increased	-3.462	1.215	0.031*
Size of land owned	< 1ha	Reference category		
	≥ 1ha	0.872	0.813	2.393
Literacy status of the head	Literate	Reference category		
	Illiterate	-2.485	0.767	0.083*
Health problem	No	Reference category		
	Yes	-2.192	1.321	0.112***
Change in labor force	Increased	Reference category		
	Decreased	-0.546	1.063	0.579
	Unchanged	1.194	1.068	3.300
Change in TLU	Increased	Reference category		
	Decreased	-3.130	1.121	0.044*
	Unchanged	-2.562	1.014	0.077**
Distance from market center	≥ 121	Reference category		
	< 120	0.959	0.800	2.609
Distance from road	≥ 21	Reference category		
	< 20	-1.948	0.831	0.143***
Credit	Didn't borrow	Reference category		
	Borrowed once	0.791	1.437	2.205
	Borrowed both times	1.590	0.737	4.904**
Saving	Didn't save	Reference category		
	Saved once	1.254	1.864	3.504
	Saved both times	2.285	1.182	9.821***
Participation in CBOs	No	Reference category		
	Yes	0.213	1.119	1.237
Decision making index	≥ 0.5	Reference category		
	≤ 0.49	-2.372	0.665	0.093*

* Significant at 1 % ** Significant at 5 % *** Significant at 10%

Nagelkere $R^2 = 0.833$

Source: Computed from survey data

CHAPTER SIX: SUMMARY, CONCLUISIONS, AND RECOMMENDATIONS

6.1 Summary

In this study, attempt has been made to explain the relationship between demographic dynamics and changes in livelihood assets and livelihood sustainability. In order to analyze the relationship, data on changes in livelihood assets and demographic characteristics of households were collected from 390 randomly selected households. The data were analyzed using descriptive statistics and multivariate method.

The distribution of the sample households by age and sex shows that the majority of the respondents were found in the age group 36 – 54 and about three-fourth of the respondents were females. With regard to demographic dynamics, the paired sample t-test shows significant change in mean dependency ratio of the sample households during the five years. However, the test shows statistically insignificant change in mean family sizes of the sample during the same period. Regarding livelihood assets, the change in mean size of land holding of the sample was insignificant. On the other hand, the size of labor force and livestock ownership of the households significantly changed between now and five years ago, as confirmed by statistically significant test of mean difference. The sample households live at reasonably similar distance from all-weather and/or dry-weather road. The percentage of households which had access to credit service and remittance was very small. Most of the households were members in local community based organizations, but few of them had high index of decision making in those organizations.

As far as access to resources is concerned, newly established households and female headed households are at a disadvantage. When compared with male headed households, female household heads are characterized by small family size, labor force, land, livestock ownership; high illiteracy, and low index of decision making in CBOs. They also have limited access to credit services. The newly established households have also limited livelihood assets compared to households headed by middle-age (36 – 54) and old-age (55+) persons.

The result of multivariate analysis shows that sex of household head, changes in dependency ratio, and family size, among the demographic variables, were significantly related to livelihood sustainability. The likelihood of sustaining livelihood was found to be high for male headed households; households that had small family size; and households for which the dependency ratio had decreased during the five years. Being significant at 5 %, households headed by old-age persons had higher likelihood of sustaining livelihood compared to households headed by younger persons. Similarly, though it is not statistically significant, households headed by middle-age persons had higher likelihood of sustaining livelihood than those headed by younger persons ($\leq$ 35 years old).

From indicators of changes in livelihood assets included in the model, education of the head, change in the size of livestock ownership, access to credit, and index of decision making in CBOs were found to be statistically significantly related to livelihood sustainability. The likelihood of sustaining livelihood was high for households headed by literates; households that had increased size of TLU; households that had received credit during both years considered in the survey; and households whose heads had high index of decision making in CBOs. At 5 % level of significance, land size, health status, labor force size, distance from road and market center, and participation/ membership in CBOs were found to be insignificant.

In relation to livelihood strategies, the possibility of expanding farm land into other areas to increase farm size and thereby yield seems to be terminated as only 4.1 % of the households had expanded their farm land during five years. Thus, the households repeatedly use the farm land they have. Regardless of its nature, the households use intensification as a livelihood strategy. Although most households were engaged in more than one activities to diversify their sources of income, the contribution of these different activities to households' income was found to be negligible. Similarly, migration as a livelihood strategy is uncommon in the study area.

6.2 Conclusions

Achieving economic prosperity through eradication of poverty without adversely affecting the natural resource base of an area is the main development agenda of the time. The concept of sustainable development entails the simultaneous achievement of economic development and environmental protection. Thus, any development effort that undermines the natural resources compromises the needs of future generations to meet their needs from the existing environmental resources. Human beings in general and rural people in particular interact with their environment to achieve certain livelihood outcomes, which has an implication both on the fulfillment of the needs of the people and their environment.

The issue of sustainable livelihoods is something that is to be seen within the framework of peoples' interaction with their environment. As indicated in the environmental entitlements approach and emphasized in the sustainable livelihoods framework, households' access to resources mediates the nature of their interaction with the environment. In this vein, households covered in this study have limited access to livelihood assets, particularly female headed households and households headed by younger persons. Since the quantity and quality of livelihood outcomes is dependent upon these assets, limited access to these resources inhibits the likelihood of sustaining livelihoods.

Given such limited access to livelihood assets, household level demographic dynamics contributed to livelihood unsustainability. This can be inferred from the finding that increased family size significantly decreased the likelihood of sustaining livelihoods on the one hand, and low likelihood of sustaining livelihoods with increased labor force size of households on the other hand. That is, unless there are assets to be utilized to derive certain desired livelihood outcomes, the mere increment of number of persons in a household degenerate the livelihood situation. Such demographic pressure challenges the livelihood of rural people as it can not contribute to the improvement of the wellbeing of the households being constrained by limited options of diversifying sources of income.

The livelihood strategies that the sample households employed to convert their livelihood assets into livelihood outcomes are intensification and diversification. Intensification seems to be the only option for households due to limited possibility of expanding their farm land into other spatially accessible and fertile land. On the other hand, the contribution of non-farm income to households' income is insignificant. This negligible contribution of diversification of activities to their livelihood, coupled with uncommonness of migration as an alternative strategy, increased the importance of agricultural intensification as a livelihood strategy. However, the productivity of land had decreased during the last five years for about 31 % of the sample households. The limited non-farm income inhibits investment in agricultural land to increase its productivity. Generally, limited access to livelihood assets, insignificant possibility of livelihood diversification, coupled with demographic pressure, inhibits the achievement of sustainable livelihoods by increasing the risk of poverty and little incentive for investment in environmental resources conservation activities.

6.3 Recommendations

Based on the findings of the study, the following points are recommended to improve the livelihood situation of rural people and thereby facilitate the achievement of sustainable livelihoods:

Increasing the awareness of rural households about the disadvantages of large family size: Decreased family size and dependency ratio are found to be significantly related to livelihood sustainability. This calls for the importance of increasing the awareness of the households to limit their family size.

Improving households' access to livelihood assets: The livelihood outcomes of households are the function of the quantity and quality of assets the households own. Thus, improving their access to assets is indispensable to sustain livelihoods. One of the ways of improving livelihood assets is through credit. This is because, it increases the financial capital of households, which, in turn, enable the households to diversify their activities to increase sources of income. Such diversification of income sources promotes livelihood sustainability by building other assets such as buying livestock, increased saving, usage of modern inputs for

agricultural production, etc. It is also important to encourage households to develop the culture of saving as it is the prerequisite for building of other assets and minimization of the problems of livelihood.

Affirmative action for disadvantaged groups: Efforts that will be made to improve rural livelihood should consider households that are exceptionally at a disadvantage. These are female headed households, newly established households, and other poor households which lack collateral for borrowing or other crucial resources of livelihoods.

Strengthening the capacity of rural institutions: Rural institutions are powerful enough to improve households' access to livelihood assets. By doing so, they reduce households' vulnerability to external environment. They are also safety nets that the households can immediately get during time of emergencies. In order for rural institutions to play such role of supplementing livelihoods, capacitating them through training and funding is indispensable.

Finally, due to low responses, some variables were not included in the model to test their influence. Hence, conducting similar research with larger sample size will help to further broaden the knowledge on the subject matter. Moreover, the study gives emphasis to demographic dynamics and livelihood assets than livelihood strategies. In this regard, further inquiry is required on the role of livelihood diversification in sustaining livelihood and the path of intensification to achieve sustainable livelihoods. The other core element of sustainable livelihoods framework, transforming structures and processes, also necessitate further investigation as it was beyond the scope of this study, but by and large determines the sustainability of rural livelihoods.

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Annex I
A/ Survey Questionnaire

1/ General Information

1.1 Location Identification:

Zone – East Wollaga District – Jimma Arjo *Kebele* - _____

Agro-ecology: 1. *Dega* ___ 2. *Woina dega* ____ 3. *Kolla* ____

1.2 Interviewer's Name: _____

1.3. Date of the Interview: _____

1.4. Time of Interview: Starting time: _____ Finishing time: _____

2/ Household's Demographic Characteristics

2.1. Sex of household head: Male _____ Female _____

2.2. Age (in Completed years) _____

2.3. Marital Status: 1. Single _____ 2. Currently Married _____ 3. Widowed _____
4. Divorced ____ 5. Separated _____

2.4. Educational Level: 1. Illiterate (no formal education) ___ 2. Can read and write (informal education) _____ 3. Formal education (specify grade level) _____

2.5. Ethnic background: 1. Oromo ____ 2. Amhara ____3. Other (specify) _____

2.6. Religion: 1. Orthodox ____ 2. Protestant _____ 3. Catholic _____
4. Muslim _____ 5. Traditional belief ____ 6. Other (specify) _____

2.7. Number of permanent household members (including household head)

2.7.1 before five years _____ Male _____ Female _____

2.7.2 during the last twelve months _____ Male _____ Female _____

2.8. Please provide us the following information on the characteristics of your household members.

No.	**Name (optional)**	**Relation to household head** 1. Husband 2. Wife 3. Son 4. Daughter 5. Relative 6. Others (specify)	Sex 1- Male 2- Female	Age	**Educational level (for those aged 7 years and over)** 1- Illiterate * If formal education, specify grade level	**Ability to work** **1. Able** 2. Unable	Reason for departure 1. Education 2. Marriage 3. Death 4. Other (specify)
1							
2							
3							
4							
5							
6							
7							
8							
9							
2.9 Is there any member of the household who has left since the last five years? 1. Yes ___ 2. No ___ 2.10 If your response is yes, please give us the following information about the member who has left the HH							
1							
2							
3							
4							
5							
6							

2.11 How do you evaluate the trend of the following in your area?

	Increasing	Decreasing	Not changed	Unknown
Population size				
Forest				
Soil quality				

3/ Livelihood Assets

3.1. Do you own land? 1. Yes ____ 2. No _____

3.2. If your response to question no. 3.1 is yes, please give us the following details.

No.	Type of land owned	Size (in local unit)	
		Before 5 years	At present
1	Total land area		
2	Farm land		
3	Grazing land		
4	Other (specify)_____		

3.3. Do you own livestock? 1. Yes ____ 2. No ____

3.4. If your response to question no. 3.3 is yes, please give us the following details.

No.	Type of livestock owned	Size (in number)	
		Before five years	At present
1	Oxen		
2	Cows		
3	Sheep		
4	Goats		
5	Horses		
6	Donkeys		
7	Mules		
8	Heifers		
9	Calves		

3.5. If your response to question no. 3.4 is no, why?

1. Lack of grazing land 2. Lack of breeding animals

3. Livestock disease 4. Other (specify)_____

3.6. Distance from market center:

3.6.1 before five years: Hour _____ Minutes _____

3.6.2 at present: Hour _____ Minutes _____

3.7. Distance from main road:

3.7.1 before five years: Hour _____ Minutes _____

3.7.2 at present: Hour _____ Minutes _____

3.8 Regarding the health status of your family, what changes have you observed during the last 5 years?

1. It was fine and now well improved. ___ 2. It was fine and the same now. ____

3. It was fine but now not. ____ 4. It was not and is not fine. ____

3.9 If the response to question 3.12 is the 3rd or 4th choice, why?

1. Lack of income for treatment ___ 2. Health center is not found around ____

3. Treatment cost is high ____ 4. Other (specify) _____

3.10. Have you borrowed money from borrowing institutions

3.10.1 before five years? 1. Yes _____ 2. No _____

3.10.2 during the last 12 months? 1. Yes ____ 2. No. ___

3.11 If your response to question no. 3.10 is no, why?

1. I didn't want ___ 2. Absence of borrowing institutions ___

3. High interest ____ 4. Lack of collateral ___ 5. Other (specify) _____

3.12 Did you save some amount of money (grain) to use in the case of emergency

3.12.1 before five years? 1. Yes ____ 2. No. _____

3.12.2 during the last 12 months? 1. Yes ____ 2. No _____

3.13. Have you received remittance from some one living elsewhere

3.13.1 before 5 years? 1. Yes _____ 2. No _____

3.13.2 during last 12 months? 1. Yes ____ 2. No _____

3.14. Did you participate in community based organizations such as *idir, daboo, mahiber, senbete* and so on: 3.14.1 before five years? 1. Yes ____ 2. No _____

3.14.2 during the last 12 months? 1. Yes _____ 2. No _____

3.15. If your response to question no. 3.14 is yes, please give us the following details.

No.	Type of community based organizations	Do you participate? 1. Yes 2. No	3.16 If the response is yes, how do you evaluate your role of decision making in those organizations?		
			High	Medium	Low
1	*Idir*				
2	*Iqub*				
3	*Daboo*				
4	*Daadoo*				
5	*Mahiber*				
6	*Senbete*				

4/ Livelihood Strategies

4.1. What is your main source of income

4.1.1 before five years? 1. Only farming ___ 2. Only livestock rearing___

3. Both farming and livestock rearing___ 4. Other (Specify) _____

4.1.2. during the last 12 months? 1. Only farming ___ 2. Only livestock rearing___

3. Both farming and livestock rearing_____ 4. Other (Specify) _____

4.2. What do you think about the trend of people's land holding in your area?

1. Increasing___ 2. Decreasing ___ 3. Not changed ____

4.3 If your response to question no. 4.2 is 'decreasing', what do you think is the reason?

1. Population pressure 2. Decline in the quality of land 3. Other (specify)_____

4.4 How do you rate the sufficiency of your land holding for farming

4.4.1 before five years? 1. Scarce ___ 2. Sufficient ____ 3. Excess _____

4.4.2 at present? 1. Scarce ____ 2. Sufficient _____ 3. Excess _____

4.5 Have you expanded your farming land into another area during the past five years to increase your farm size? 1. Yes _____ 2. No _____

4.6 If your response to question no. 4.5 is yes, please give us the following details.

No	Area of expansion	1. Yes 2. No	Reason for expansion in to those areas
1	Forest land		1. Land scarcity ___ 2. Low quality land ___ 3.Other(specify)___
2	Steep slope area		
3	Grazing area		
4	Other(specify)_____		

4.7 Have you fallowed your land

4.7.1 before five years? 1. Yes ____ 2. No_____

4.7.2 during the last twelve months? 1. Yes ____ 2. No _____

4.8. Which of the following mechanisms have you used to increase your agricultural output?

No.	Mechanism	Have you used	
		Before 5 years?	Last 12 months
		1. Yes 2. No	1. Yes 2. No
1	Manure application		
2	Mulching		
3	Fertilizers		
4	Improved seeds		
5	Herbicides		
6	Pesticides		

4.9. Did you practice soil conservation measures?

4.9.1 before five years? 1. Yes ____ 2. No _____

4.9.2 during the last twelve months? 1. Yes ____ 2. No ____

4.10. If your response to question no. 4.9 is yes, please give us the following details

No	Type	Before five years 1. Yes 2. No	This year 1. Yes 2. No
1	Terracing		
2	Tree planting		
3	Check dams		
4	Contour ploughing		
5	Other (specify)		

4.11 If you did not practice soil conservation measures, why?

1. I didn't want ____ 2. Lack of income ____

3. Lack of labor ___ 4. Other (specify) _____

4.12 When crop failure happened or your agricultural output is not sufficient to fulfill your needs, which of the following coping mechanisms have you used to overcome the problem?

No.	Coping Mechanism	Before five years	Since five years
		1. Yes 2. No	1. Yes 2. No
1	Selling oxen		
2	Selling other livestock		
3	Selling other household's properties		
4	Daily laborer		
5	Borrowing money or grain		
6	Selling fuel wood/ char coal		
7	Reducing amount of meals		
8	Assistance		
9	Migration to other area		
10	Other (specify)		

4.13. Has any member of your household migrated to other area to secure means of living? 4.13.1 before five years? 1. Yes _____ 2. No _____

4.13.2 during the last 12 months? 1. Yes ____ 2. No _____

4.14 If your response to question no. 4.13 is yes, to where? _____

To work what? _____

4.15 When does some member of the household migrate to other area?

1. When there is no agricultural work____

2. When life becomes difficult ____ 3. Other (specify)_____

4.16 Has any member of your household participated in any activity other than farming and livestock raising? 4.16.1 before five years? 1. Yes ____ 2. No _____

4.16.2 during the last 12 months? 1. Yes ___ 2. No ___

4.17 If your response to question no. 4.16 is no, why?

1. No employment opportunity ___ 2. Place where work is available is too far ___

3. Low wage for work ____ 4. To work only agricultural work ___

5. Other (specify) _____

4.18 If your response to question no. 4.16 is yes, why did the member want to work?

1. Low agricultural product ___ 2. Nearby location to urban area ___

3. Seasonality of agricultural work ___ 4. Low / lack of land _____

5. High employment opportunity to work ___ 6.Other (specify) _____

4.19 Regarding the type of your work, please give us the following details.

No.	Type of activity	Have you worked		How much have you earned	
		in 2001/02? 1. Yes 2. No	in 2006/07? 1. Yes 2. No	in 2001/02?	in 2006/07?
1	Trading livestock				
2	Trading grains				
3	Selling fuel wood				
4	Selling char coal				
5	Daily laborer				
6	Weaving				
7	Carpentry				
8	Pottery				
9	Petty trade				
10	Selling *tella & areke*				
11	Others				

4.20 Please give us the following details about your farm product.

No.	Type of farm product	Area cultivated (in local unit)		Amount produced (in local unit)	
		in 2001/02	in 2006/07	in 2001/02	in 2006/07
1	*Teff*				
2	Barley				
3	Maize				
4	Wheat				
5	Pea				
6	Bean				
7	Sorghum				
8	Oil seeds				
9	Others				

B/ Checklist for Focus Group Discussion

1. Trends of environmental resources in the area
2. Major shocks that are prevalent in the area
3. Major environmental problems in the area
4. Causes of environmental degradation
5. Types of community based organizations
6. Roles of community based organizations

Annex II
Conversion Scales

A/ Conversion Scales to Compute Adult Equivalent Family Size

Age Group	Sex	
	Male	Female
<10	0.60	0.60
10-13	0.90	0.80
14-16	1.00	0.75
17-50	1.00	0.75
>50	1.00	0.75

Source: Institute Panafrican Pour le Development (1981) cited in Storck et al. (1991)

B/ Conversion Scales to Compute Man Equivalent Labor Force

Age Group	Sex	
	Male	Female
<10	0.00	0.00
10-13	0.20	0.20
14-16	0.50	0.40
17-50	1.00	0.80
>50	0.70	0.50

Source: Here (1986), Johnson (1982), Ruthenberg (1983) and Nair (1985) cited in Storck et al. (1991)

C/ Conversion Scales to Compute Tropical Livestock Unit

Animal Type	Unit
Cow	1.0
Heifer	0.5
Oxen/ Young Bull	1.0
Calves	0.2
Sheep and Goat	0.1
Horse and Mule	0.8
Donkey	0.4

Source: Storck et al. (1991)

Annex III/ Coefficient of Contingency Table

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17
X1	1																
X2	0.234	1															
X3	0.179	0.171	1														
X4	0.391	0.334	0.326	1													
X5	0.142	0.177	0.134	0.165	1												
X6	0.289	0.224	0.122	0.005	0.198	1											
X7	0.028	0.037	0.082	0.016	0.073	0.112	1										
X8	0.242	0.250	0.394	0.390	0.108	0.057	0.088	1									
X9	0.040	0.335	0.197	0.205	0.316	0.162	0.116	0.252	1								
X10	0.068	0.040	0.081	0.015	0.087	0.016	0.307	0.069	0.148	1							
X11	0.074	0.151	0.158	0.127	0.147	0.138	0.064	0.202	0.110	0.056	1						
X12	0.237	0.356	0.243	0.248	0.393	0.230	0.322	0.134	0.479	0.192	0.095	1					
X13	0.156	0.179	0.129	0.036	0.235	0.252	0.168	0.086	0.286	0.133	0.072	0.378	1				
X14	0.172	0.197	0.120	0.036	0.311	0.275	0.310	0.147	0.224	0.055	0.057	0.395	0.331	1			
X15	0.060	0.046	0.096	0.015	0.025	0.009	0.088	0.116	0.075	0.060	0.051	0.028	0.171	0.043	1		
X16	0.165	0.261	0.124	0.187	0.181	0.145	0.035	0.221	0.222	0.056	0.189	0.228	0.149	0.110	0.093	1	
X17	0.168	0.270	0.162	0.042	0.220	0.244	0.037	0.132	0.284	0.028	0.130	0.334	0.374	0.212	0.014	0.224	1

Xi's refers to variables defined in section 3.5

Source: Computed from survey data

Annex IV
Rainfall and Temperature Data of the Study Area

i) Rainfall Data

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1995	0	0	105.4	138.9	116.5	128.2	263.5	282	161.9	68.9	2	45.7
1996	52.7	0	150.6	130.4	257	399.7	389.7	213.5	158.4	98.4	23	24.7*
1997	7.1	0.4	46.3	215	295.2	258.7	344.3	186.6	142.6	276.7	47.5	3.6
1998	7.2	32.4	76.9	34.7	186	367.6	283.7	283.9	224.5	126.9*	29.3	18.3*
1999	3.6*	2.7*	1.7	79.6	286.4	259.1	306	343.2	276.2	138.9*	5.4	33
2000	0	0	1.4	71.9	268.8	274.2	280	352.5	320.7	150.8	106.2	16.7
2001	0	18.3	243.4	152.5	216.3	333.2	255.5	321	152.7	149	28.9	13.4
2002	25.7	3.6	77.5	69.2	115.9	291.6	292.3	177.5	219.3	24.6	10	46.4
2003	0	84.5	105.4	42.8	52.8	292.1	314.6	404.6	359.7	77.7	34	9
2004	10.2	0	100.8	95.7	229.0	418.8	493.6	441.2	386.0	212.0	11.6	45.3

* Months for which data were not available and the figures were computed by interpolation.
Source: National Meteorological Services Agency

ii) Temperature Data

Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	Minimum	11.0	12.1	13.0	11.5	10.1	9.0	8.9	x	x	x	x	x
2003	Maximum	23.1	25.0	24.0	23.9	25.7	17.5	17.4	17.4	18.8	22.0	22.1	22.5
2004	Maximum	23.5	24.3	24.8	23.7	22.3	18.7	17.9	18.5	19.2	20.7	20.9	22.6
	Minimum	x	x	x	x	X	10.7	10.3	11.0	10.6	11.0	11.4	11.2
2005	Maximum	23.4	26.1	24.4	24.4	25.7	19.6	18.9	18.9	19.2	20.4	21.3	22.4
	Minimum	10.9	12.1	12.8	13.5	12.9	11.6	11.0	11.1	11.4	11.1	11.3	11.1

x – Data Not Available
Source: National Meteorological Services Agency

DECLARATION

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

Name: Dula Etana

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