Addis Ababa University

School of Graduate Studies

College of Social Science

The socio-economic and environmental impacts of the implementation of carbon sequestration in Humbo Woreda, SSNPR, Ethiopia

Thesis Submitted to Center* for African Studies *in Partial Fulfillment of the Requirement for Masters in Human and Economic Development

By

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Approval

This undersigned certify that they have read and here by recommend to Addis Ababa University to accept the thesis submitted by Aklilu Bekele and entitled as "The socio-economic and environmental impacts of the implementation of carbon sequestration in Humbo, SNNPR, Ethiopia," in partial fulfillment of the requirements for the award of a Masters Degree in Human and Economic Development.

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Abstract

Carbon sequestration through forestry can help in the mitigation of global warming. For Africa, carbon sequestration also represents an opportunity to fund sustainable through financial inflows. However, with a low share of global carbon trade, there are strong concerns that African countries are losing out this valuable opportunity. Markets for environmental services have been growing in recent years wherein more and more people are willing to pay for benefits such as natural beauty, clean water, biodiversity etc. Carbon sequestration constitutes an important segment of this market. The major driving force for the growth of market for carbon sequestration has been the international effort to address the problem of global warming through the signing of the Kyoto Protocol which allows industrialized countries to take up carbon sequestration activities such as forestry projects in developing countries. The study focused on the socio-economic and environmental impacts of carbon project implemented in Humbo district SNNPR, Ethiopia. The analysis subsequently examined the nature and extent of community participation in the project implementation, the benefits that are envisaged from the project and other related issues based on the focus of the study. Quantitative and qualitative methods of research have been applied throughout the investigation. Accordingly, observation, in depth interviews, focus group discussions and questionnaires were used to gather information. The qualitative mode was employed to gather socially dynamic information on issues relating to beneficiaries' perceptions of the activities in order to gain a deeper understanding of the dynamics at play. On the other hand, the quantitative mode was used to test variables related to the research problem. The study results show that carbon project makes a significant contribution to carbon sequestration and therefore can generate carbon credits by selling it in the market through CDM project. The observed status of carbon project tree species and the results from socio economic results are promising to enhance local livelihoods. It also enhances access to wide varieties of environmental goods and services to local communities. Since the local communities have had poorly developed infrastructure, limited options for livelihoods and dependence on subsistence agriculture, the Carbon Project may prove to be beneficial to the local community by providing regular source of income in the form of carbon payments.

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ABBREVIATIONS

BCF	Bio Carbon Fund
CCBA	Community and Biodiversity Alliance
CCBA	Climate, Community and Biodiversity Alliance
CDCF	Community Development Carbon Fund
CDM	Clean Development Mechanism
CERs	Certified Emissions Reductions
CSD	Commission on Sustainable Development
DFID	Department for International Development
ETS	Emissions Trading Scheme
FCPF	Forest Carbon Partnership Facility
FMNR	Farmer Managed Natural Regeneration
GHGs	Green House Gases
HCP	Humbo Carbon Project
IPCC	Intergovernmental Panel on Climate Change
JIET	Joint Implementation and Emission Trading
MDGs	Millennium Development Goals

NGOs	Non-Government Organizations
PCF	Prototype Carbon fund
PES	Payment for Ecosystem Services
R-PP	Readiness Preparation Proposal to the World Bank's
SNNPR	Southern Nations Nationalities and Peoples Region
TCO2	Ton of carbon dioxide
UNDP	United Nations Development Programme
UNFCC	The United Nations Framework Convention on Climate Change
USAID	United States Agency For International Development
WV	World vision
WVE	World Vision Ethiopia
WVAU	World Vision Australia

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CHAPTER ONE

INTRODUCTION

African governments and civil society groups are looking for ways to mitigate global warming by reducing atmospheric concentration of greenhouse gases (GHG). A viable strategy in this regard is carbon sequestration through forestry activities. Carbon sequestration is the process of removing carbon dioxide from the atmosphere and storing it in other potential reservoirs such as lands, forests, and oceans etc. Forests can serve as effective sinks absorbing excess carbon dioxide ($C0_2$) from the atmosphere (IPCC, 2001). The Kyoto Protocol was adopted by the international community in 2005 and sets mandatory targets for industrialized countries to reduce GHG emissions by an average of 5.2 below their 1990 levels by 2008-12 (UNEP, 2004).The Clean Development Mechanism under the Kyoto Protocol offers a cost-effective opportunity to industrialized countries to reduce their carbon emission by taking up sustainable development projects in developing countries. It allows for sequestration projects (UNFCC,2002).Therefore, in 2005 World Vision Australia in partner with World Vision Ethiopia identified forestry based carbon sequestration as a means to stimulate on going community development and test new funding streams such as the CDM (Clean Development Mechanism).

The Humbo community- based forest carbon sequestration project is located 420 Kms south-east of the Ethiopian capital, Addis Ababa. World Vision's operations in the area have been established following the severe famine of 1984. World vision has a long history of community development work in Ethiopia, particularly in the areas of education, health and agriculture. Since the 1984 famine, World vision Ethiopia has had a strong focus on environmental issues with its development interactions, enabling staff to approach this project with a legacy of moving forestry and community development projects successful. The economic and environmental benefits of carbon sequestration projects are particularly relevant for Africa. African countries need increased investment to support poverty alleviation and infrastructure development. With high dependence on land and forest resource for subsistence, there is also a growing threat of widespread natural resource degradation. Accordingly, efforts to mitigate climate change through carbon sequestration projects can bring in money both to regenerate natural resources and raise

local incomes (Kituyi, 2002).However, little is known about the status of existing carbon sequestration projects in Africa.

1.1 Statement of the problem

The risk of global climate change as a result of rising greenhouse gas emissions is presenting a profound challenge to the international community. There is increasing concern about climate change and variability, which has led to a rapidly growing body of literature on impacts of warming on the economy, which may have adverse effects on agriculture. Changes in land use of the forest ecosystem have occurred as a result of climate changes and these have been documented by various researchers (Kifcon, 1994). It is therefore important to assess the role of forest carbon sequestration in the mitigation of climate change. The establishment of the potential socio-economic value of forests is critical for substantial and productive agriculture and therefore to food security. Sub-Saharan Africa, which includes Ethiopia, is hard-hit by climate change. This region experiences high temperatures and low (and highly variable) precipitation. Interestingly, the economies of this region are highly dependent on agriculture (Kurukulasuriya and Rosenthal, 2003). The levels and trends of forest changes have also been aggravated by the increase in human population around the forest ecosystem. Parts of the forest have been converted to agricultural activities and settlement leading to a net loss of the natural forest area. Nonetheless, the lands surrounding the forest area have the potential to sequester a certain amount of carbon that has socio- economic value. In recent years, carbon sequestration in the form of forestry projects has evolved in to a viable alternative to tackle global warming and climate change. It also constitutes valuable environmental services provided by forests, other important services being watershed protection, biodiversity conservation and ecotourism etc. As per the third assessment report of the Intergovernmental Panel on Climate Change-forests, agricultural lands, and other terrestrial ecosystems offer significant carbon mitigation potential (IPCC, 2001).

The IPPC report also states that in addition to reduction in atmospheric carbon dioxide, such projects may also provide other social, economic and environmental benefits such as sustainable land management and rural employment. Furthermore, such projects could only become sustainable if the socio-economic drivers for deforestation and other loses of carbon pools are addressed. Therefore, an understanding of the socio-economic processes, particularly the

potential benefits and risks of carbon sequestration projects, is essential before they are recommended for wider replication. Moreover, policy initiatives such as the Kyoto Protocol have introduced flexible mechanism that encourage carbon trading and promote forestry activities. However, the use of afforestation and reforestation activities as a means of achieving reduction in carbon emissions has been a controversial issue and is still being debated (Grace *et al*, 2003).

While political and technical issues have dominated such debates in the past, of late there has been a growing awareness on social issues in terms of impact on local communities. It is felt that analysis of the potential of such forestry activities to support local livelihoods could therefore make an opportune contribution to the clarity of this debate (Smith and Scherr, 2002). As the above discussion brings out, there is an urgent need to look at the socio-economic aspects of forests in the context of emerging markets for environmental services such as carbon sequestration. The lessons from such projects will constitute important research out comes, which will be used to inform the ongoing policy debates on the subject as well as to improve the effectiveness of various projects being implemented in different parts of Africa. The study will provide valuable feedback to all those who are involved in creating and regulating markets for environmental Services, viz. Governmental and non-governmental organizations, research institutions and common citizens.

1.2 Objectives of the Study

The overall objective of the study is to determine whether forest carbon sequestration projects are able to improve rural livelihood, and mainstream environmental conservation. Drawing insights from the issues highlighted above, the study focused on the following specific objectives:

- It is to identify and evaluate project design and implementation which could guarantee greater social and economic benefits to participants and further enhance local sustainable development

- It is to assess environmental benefits to the local community from carbon sequestration project.

- It is to investigate whether forest carbon sequestration project has an influence on the local community environmental resource management knowledge and use of forest especially in climate change mitigation.

1.3 Research Questions

This study attempted to determine whether carbon project program is really improving the livelihoods of the community and conservation of the forest. It has hence addressed the following research question:

This study addresses the following research questions:

1. What are the expected advantages of forest carbon sequestration projects implemented to the local communities of Humbo? Does it have meaningful social and economic values?

2. How does the implementation of forest carbon sequestration in Humbo impact on environmental resource management systems and environmental conservation of the local community?

3. What are other benefits that are envisaged from forest carbon sequestration?

1.4 Significance of the study

The study could yield the following benefits to different stakeholders

- It can form the basis for achieving the country‘s responsibility to the Kyoto Protocol by meeting the country‘s net emissions targets for CO_2 and other GHGs. On the other hand, the households surrounding the forest may plant trees for other purposes other than to sequester carbon. This in turn becomes a positive externality because when farmers plant trees, for example for conservation purpose, the trees also serves the purpose of sequestering carbon.
- It would sensitize the carbon project developmental programs as a mechanism for enhancing sustainable development.
- The study would help to understand the role that HCP can play in the mitigation of climate change via carbon sequestration which could, in turn can help in the proper management of the forest with positive implications for agriculture.
- Data obtained from this study would serve as a reference for further studies.

- Another significant aspect of this study is that carbon project development programs could lead to socio-economic and environmental improvements of the local community. It would offer an alternative solution to problems of failure of developmental programs and its implication for policy making.

- This study would help people in the community to participate in the process of identifying and prioritizing their needs, decision making, implementation and ensuring sustainability of development initiatives. This would help to check community needs variables that have significant negative effects on community development while appreciating those positively promote development.

1.5 Limitation and scope of the Study

There were some limitations in the process of undertaking this study. These include the following: Firstly, in order to build a theoretical framework on the topic, the review of the literature, books and publications was important step. However, insufficient studies and literature on the subject in Ethiopia particularly those relating to carbon project acted as limitations. Despite these limitations, the researcher attempted to draw lessons from the study that could serve as a point of departure for other researches on the topic.

Even though there are seven carbon project cooperatives in Humbo Woreda, this study was conducted at two cooperatives namely Abela Longena and Bosa Wanchi as there was a shortage of time and other resources. The study didn't include households who were not the member of the project. In such away, the study only focuses on benefits which are envisaged by local communities from the project and HCP implementation and design.

1.6 Organization of the study

This study is categorized into five chapters. The second chapter is all about review of related literature and the third chapter comprises description of study area and research methodology of the study. Moreover, the fourth chapter provides a detailed account of the empirical fieldwork undertaken in both case sites and presents research findings/results related to carbon project. Finally, the last chapter Provides conclusions and recommendations emanating from this research and suggests possible measures that could be used by different stakeholders in order to promote effective participation in community projects

1.7 Definition of terms

Afforestation - Planting of trees on agricultural or other non-forest land

Biomass is the total amount of live and inert organic matter above and below ground expressed in tons of dry matter per unit area.

Climate Change- Climate change refers to the variation in the earth‘s global climate or in regional climates over time scales ranging from decades to millions of years.

Deforestation - Permanent land use change from forests to other uses

Greenhouse gases – This include carbon dioxide, methane, nitrous oxide, and other gases that modify the heat retention capacity of the Earth's atmosphere

Intergovernmental Panel on Climate Change (IPCC): It was established in 1988 by the World Meteorological Organization and the UN Environment Program. The IPCC is responsible for providing the scientific and technical foundation for the United Nations Framework Convention on Climate Change (UNFCCC); primarily through the publication of periodic assessment reports.

Kyoto Protocol: An international agreement adopted in December 1997 in Kyoto, Japan.The Protocol sets binding emission targets for countries to reduce their carbon emissions.

Reforestation - Planting or natural regeneration of forests after harvesting, fire, or other type of forest disturbance (perturbation)

Sequestration - The removal of carbon from the atmosphere. It is the process of increasing the carbon content of a carbon reservoir other than the atmosphere. Biological approaches to sequestration include direct removal of carbon dioxide from the atmosphere through land-use change, afforestation, reforestation, and practices that enhance carbon in agriculture.

United Nations Framework Convention on Climate Change (UNFCCC): A treaty signed at the 1992 Earth Summit in Rio de Janeiro that calls for the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

1.8 Conceptual frame work

The evaluation framework used for analysis here considers whether carbon project program leads to an increase in local community welfare as shown in figure 1.The carbon project helps sequester carbon by tree planting, while it is switched from illegal activities. This helps to protect

and conserve forests. There are two types of carbon project impacts. Firstly it has an impact on environment. When carbon is sequestered through tree planting, it prevents soil erosion, increases rainfall and increases biodiversity. All these environmental goods and service have positive impact so as to benefit local community. Secondly, when carbon is sequestered through tree planting, it has socio economic benefit to local community. The main socio-economic benefits include carbon cash payments to the local community and agricultural productivity, both which contributed to household welfare.

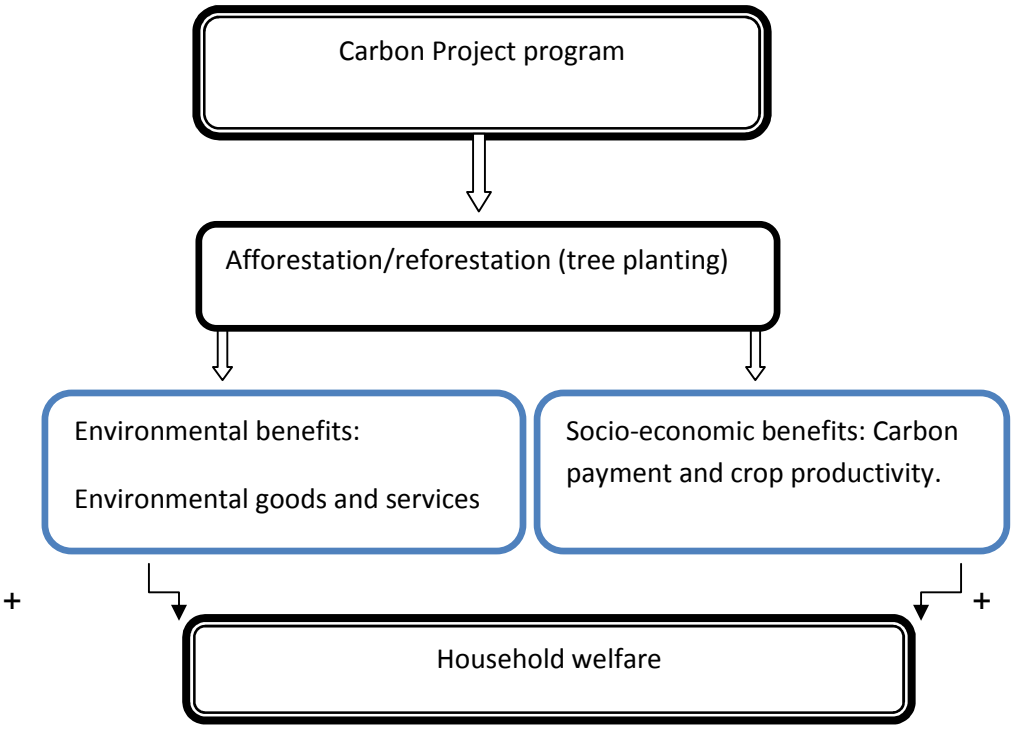


Figure1.1: Conceptual framework

CHAPTER TWO

LITERATURE REIVEW

This chapter critically reviews relevant literature dealing with the phenomenon under study, with a view to examining what has been done by earlier studies on this phenomenon. A literature review was undertaken to assists researchers to comprehend and extend their knowledge of the phenomenon under study. The purpose of a literature review is "to determine the extent to which the topic under study is covered in the existing body of knowledge" (Babbie & Mouton 2001:565).The researcher, therefore, reviewed vital theoretical orientations that were directly or indirectly correlated to carbon sequestration.

2.1 Global Warming

Global warming refers to an average increase in the earth's temperature, which in turn causes changes in climate. Global warming is a phenomenon by which a rise in temperature of the Earth is experienced. This happens because certain gases in the atmosphere (Water vapor, carbon dioxide, nitrous oxide, and methane, for example) trap energy from the sun. Without these gases, heat would escape back in to space and Earth's average temperature would be about 60^{o}F colder. Because of how they warm our world, these gases are referred to as greenhouse gases (Biswal,2006).

Greenhouses look like a small glass house. Greenhouses are used to grow plants, especially in the winter. Greenhouse works by trapping heat form the Sun. The glass panels of the greenhouse let in light but keep heat from escaping. This causes the greenhouse to heat up, much like the inside of a car parked in sunlight, and keeps the plants warm enough to live in the winter.

The earth's atmosphere is all around us. It is the air that we breathe. Greenhouse gases in the atmosphere behave much like the glass panes in a greenhouse. Sunlight enters the Earth's atmosphere, passing through the blanket of greenhouse gases. As it reaches the earth surface, land, water, and biosphere absorb the sunlight's energy. Once absorbed, this energy is sent back in to the atmosphere. Some of the energy passes back into space, but much of it remains trapped in the atmosphere by the greenhouse gases, causing our world to heat up. The greenhouse effect is important. Without the greenhouse effect, the Earth would not be warm enough for humans to live. But if the greenhouse effect becomes stronger, it could make the earth warmer than usual. Even a little extra warming may cause problems for humans, plants and animals (Biswal, 2006).

A warmer earth may lead to changes in rainfall patterns a rise in sea level, and a wide range of impacts on plants, wildlife and humans. When scientists talk about the issue of climate change, their concern is about global warming caused by human activities.

- **Carbon Sequestration and Global warming**

Carbon sequestration is the process of removing carbon dioxide from the atmosphere and storing it in other potential reservoirs such as land, forests, oceans etc. Intergovernmental Panel on Climate Change (IPCC, 2001) describes it as 'the process of increasing 'the carbon content of a (carbon) reservoir other than the atmosphere. Carbon sequestration has assumed significance in the face of rising global warming, which results from build up of green house gases such as carbon dioxide, methane, nitrous dioxide, and sulphur hexafluoride etc., in the atmosphere. These green house gases (GHGS) absorb heat radiated from the earth's surface and have been responsible for maintaining temperature on the earth's surface in the past. However, over the 20^{th} century, increasing concentrating of GHGs in the atmosphere has led to unprecedented at an average of 0.5% per decade, making 1990s the warmest decade and 1998 the warmest year in the instrumental record. There is evidence to show that there is a 10% decrease in the snow cover since the 1960s and that there has been a widespread retreat of mountain glaciers in non-polar regions during the 20^{th} century. Anthropogenic activities such as burning of fossil fuels and deforestation are the main reasons for the substantial increase in the concentration of GHGS in the atmosphere.

Intergovernmental Panel on Climate Changes estimates that in a 'business as usual' scenario, temperatures could further increase by $1.4^{O}C$ -$5.8\ ^{O}C$ over the next 100 years. This could cause severe climatic changes such as rise in sea levels, frequent floods and land slides, health impacts (e.g. epidemics, spread of infections displeases etc), loss to infrastructure, increase in soil erosion, pollution, increased desertification etc. (IPCC, 2001). A part from widespread loss of life, such severe changes in climate would threaten economic growth, particularly that of developing countries which may not have sufficient technical or financial capacity to adjust to these shocks. Therefore, climate change presents an extraordinary challenge to the global society. This needs to be addressed at the earliest. In this context, carbon sequestration in the form of forestry activities could become an important part of the strategy to combat global warming because:

- Deforestation and other associated changes in land use release about 1.8 billion tons of carbon per annum, which comprise about 20% of the total anthropogenic emissions of GHGS to the atmosphere every year. Therefore, any decrease in rate of deforestation or forest degradation will significantly reduce the emission of carbon dioxide into the atmosphere (Auckland et al, 2002).

- Afforestation and reforestation could create effective sinks for absorbing carbon from atmosphere. It is estimated that over the next 50 years, there is a potential to sequester about 100 billion tons of carbon, which is equivalent to about 10% to 20% of the probable fossil fuel emissions during that period (IPCC, 2001).

2.2 Sustainable Development and Environment

With out environmental protection, development can not sustain. Environmental security is a part of sustainable development without which development can not be holistic thing. The environment supports our life system. It includes every thing that we rely on during our lifetime such as air, water, metals, soil, rock and other living organisms. It is important to remember that the state of our environment is influenced by our behavior and that we have the opportunity to either nurture or mistreat it. The linkage between these two concepts goes back to the period of the conception of the idea of sustainable development itself. The idea of sustainable development came at a time when the exploitation of the earth was at its peak. In spite of the fact that natural resources (both renewable and non renewable) are limited, human beings continued to exploit it to the maximum extent. In this context, it is important to mention the Rio conference and some other development). The Earth summit produced a number of outcomes(Biswal,2006).

2.2.1 The Rio Declaration on Environment and Development

The 1992 Rio declaration on Environment and Development defines the rights of the people to be involved in the development of their economies, and the responsibilities of human beings to safeguard the common environment. The declaration builds upon the basic ideas concerning the attitudes of individuals and nations towards the environment and development, first identified at the United Nations conference on the Human Environment (1972).

The Rio Declarations states that long term economic progress is only ensured if it is linked with the protection of the environment. If this is to be achieved, then nations must establish a new global partnership involving governments, their people and the key sectors of society. Together, human society must assemble international agreements that protect the global environment with responsible development(Biswal,2006).

2.2.2 The convention on Biological diversity

The biological diversity of the world – the variability among living organisms – is valuable for ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic reasons. Biodiversity plays an important role in evolution and for maintaining the condition of life support system within the biosphere. If we are going to meet the food and health needs of a growing world population. Then it is widely recognized that we need to conserve and sustain our biological diversity (Biswal,2006).

The conversion on Biological diversity entered in to international law in 1994, with 153 nations signing up. At first, many of the developed nations, most notably the United States, were reluctant to sign because they tell that their biotechnology industry would be threatened. The convention states that participating nations have rights over their biological resources, allowing responsible and sustainable exploitation, but ensuring that biological diversity is conserved (Biswal,2006). .

2.2.3 Forest management

One of the key agreements reached at the 1992 Rio Earth summit was the principles of forest management. The principles of forest management stated that forests, with their complex ecology, are essential to economic development and the maintenance of all forms of life. Forests provide wood, food, and medicine and contain a biological diversity as yet not fully uncovered. They also act as reservoirs (sinks) for carbon dioxide, a greenhouse gas released into the atmosphere by human processes, which may be contributing towards global warming. As well as the scientific benefits of forests, they also provide a home to wildlife and fulfill our cultural and spiritual needs (Biswal,2006).

The principle of forest management assert the right of nations to profit form their own forest resources, but recommend that this should occur within a framework of forest protection,

management and conservation. The principles are not legally biding but provide recommendations on sustainable practice.

2.2.4 Agenda 21

Agenda 21, established at the 1992 United Nations Conference on Environment and Development, or " Earth summit " , in Rio De Janeiro , Brazil, is the blueprint for sustainability in the 21st century. Agenda 21 is a commitment to sustainable development, which was agreed by many of the world's governments. Nations that have pledged to take part in agenda 21 are monitored by the Intentional Commission on sustainable development, and are encouraged to promote agenda 21 at the local and regional levels within their own countries. Agenda 21 addresses the development of societies and economies by focusing conservation and preservation of our environments and natural resources (Biswal, 2006). .

The conventions, principles and declaration of the earth summit, provide guidelines to deal with the problems of poverty, hunger, resource consumption and the deterioration of ecosystems. Agenda 21 provides a format for this to happen, detailing an action plan for sustainable development and establishing targets for actions that combine economic development and environment protection (Biswal, 2006).

2.3 World Summit on Sustainable Development Johannesburg , 2002

The United Nations Conference on Environment and Development, held in Rio De Janeiro in 1992, provided the fundamental principles and the program of action for achieving sustainable development. The summit brought together an incredible range of interest from heads of state and government to leaders and experts from each of the major groups. The summit reaffirmed sustainable development as a central element of the international agenda and paved the way for the practical and sustained steps needed to address many of the world's pressing challenges . (Johannesburg declaration on sustainable development, United Nations, 2003). By any account, the Johannesburg summit has laid the groundwork and paved the way for action. Yet among all the targets, timetables and commitments that were agreed upon at Jonesburg, there were no silver bullet solutions to aid the fight against poverty and continually deteriorating natural environment. In fact, there was no magic and no miracle-only the realization that practical and sustained steps were needed to address many of the world's most pressing problems (Biswal,2006).

However, as an implementation-focused summit, Johannesburg did not produce a particular dramatic outcome. There were no agreements that will lead to new treatises and many of the agreed targets were derived from panoply of assorted lower profile meetings. But some important new targets were established, such as; to halve the proportion of people with out access to basic sanitation by 2050s; to use and produce chemicals by 2020 in ways that do not lead to significant adverse effects on human health and the environment : to maintain or restore depleted fish stocks to levels that can produce the maximum sustainable yield on an urgent basis and where possibly by 2015; and to achieve by 2010 a significant reduction in the current rate of loss of biological diversity (Biswal,2006).

2.4 United Nations Climate Change Conference 2005

The United Nations Climate Change Conference was held in Montreal, Canada in December 10, 2005. Key decisions were made that outline the path to future international action on climate change. Under the Kyoto Protocol, the process for future commitments beyond 2012 got underway. A new working group was established to discuss future commitments for developed countries for the period after 2012. It will start work in many next year (Biswal,2006).

Key decisions were made that outline the path to future international action on climate change. Under the Kyoto protocol, the process for future commitments beyond 2012 got underway. Developed countries committed themselves to fund the operation of the Clean Development Mechanism with other USD 13 million in 2006-2007. In addition to this, the second key to mechanism of joint implementation was launched. A major breakthrough was the agreement on the compliance regime for the Kyoto Protocol. The decision is key to ensure that the parties to the protocol have a clear accountability regime in meeting their reduction targets.

Adaptation to the impacts of climate change was also an important focus of the conference. It adopted a five year programme on adaptation to climate change impacts. This program paves the way for concrete steps to identify impacts and measures to adapt to climate change.

Technology was at the centre of discussion on effort to reduce emissions and adapt to climate impacts. Countries agreed on further steps on promoting the development and transfer of technologies. One technology that raised particular interest was carbon capture and storage. This is a technology which

involves storing carbon underground. It is estimated to have the potential of reducing the costs of mitigation by up to 30% (Biswal, 2006).

2.5 UNFCCC and the Kyoto Protocol

The United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) established the Intergovernmental Panel on Climate Change (IPCC) in 1988. Its role is to assess a range of information relevant for the understanding of the risk of human-induced climate change.

The UN Framework Convention on Climate Change (UNFCCC) is one of a series of international agreements and treaties on global environmental issues that were adopted at the 1992 Earth Summit at Rio. It provides the overall policy framework for addressing the climate change issue and so forms the foundation of global efforts to combat global warming.

The ultimate goal of the UNFCCC is: 'Stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic human induced interference with the climate system' (UNFCCC, 1992).

The UNFCCC does not yet specify what the stabilization level should be, with another 10 years probably needed before the uncertainties can be largely removed and an ideal target GHG level decided upon. The treaty promotes action against global warming in spite of the current uncertainty on the basis that it's better to be precautionary than wait until irreversible damage is done. The UNFCCC entered into force in March 1994 following ratification by 50 of its signatory parties. In 1995 the UNFCCC set out some guiding principles and general commitments for the international response to climate change. This was the first Conference of the Parties (UNFCCC, 1992).

- **Kyoto Protocol**

Kyoto Protocol is an agreement on global warming made under the United Nations Conference on Climate Change in Kyoto, Japan, in 1997. Kyoto Treaty was negotiated in Kyoto, Japan in December 1997, opened for signature on March 16, 1998, and closed on March 15, 1999. The agreement came into force on February 16, 2005 following ratification by Russia on November 18, 2004. As of September 2006, a total of 163 countries have ratified the agreement

(representing over 61.6% of emissions from Annex I countries). Notable exceptions include the United States and Australia. Other countries, like India and China, which have ratified the protocol, are not required to reduce carbon emissions under the present agreement.

The 1997 Kyoto Protocol of framework of UNFCCC is a key step towards the mitigation of climate change due to increased greenhouse gases accumulation in atmosphere. It was the first international agreement, which legally binds, developed nation to reduce worldwide emissions of greenhouse gases from these countries. The Kyoto Protocol, which was established for emission reduction target, states that the industrialized countries can achieve relatively inexpensive means of combating Climate change (Bruce, 1999). As a step towards this goal, different countries adopted the Kyoto Protocol in December 1997. The Kyoto agreement encourages rich nations to cut greenhouse gas emissions by an average of 5.2% below their 1990 levels over the next decade i.e.; by 2008-12. A country or company wishing to reduce or meet their Carbon Trading emission targets can do so by investing in clean projects, which would contribute towards offsetting their GHG emissions, but would also earn the investor some "credits" which would go towards a net carbon reduction. A typical CDM project would be substituting fossil fuel-based power generation with renewable energy or a project that would improve existing energy efficiency levels. Or, as in India, by investing in forestation or community tree planting projects, called "carbon sinks".

Article 3.4 caused a great deal of argument, as it did not specify what could be constituted as a valid sink or source and what 'additional activities' meant. The US took this article to mean that it could count forests, which already existed in its sinks, other countries argued that this was not fair and would allow countries like the US to do relatively little.

- **Kyoto Mechanisms:**

The Kyoto Protocol broke new ground by defining three innovative "flexibility mechanisms" to lower the overall costs of achieving its emissions targets. These mechanisms enable Parties to access cost-effective opportunities to reduce emissions, or to remove carbon from the atmosphere, in other countries. While the cost of limiting emissions varies considerably from region to region, the effect for the atmosphere of limiting emissions is the same, irrespective of where the action is taken.

All three mechanisms under the Kyoto Protocol are based on the Protocol's system for the accounting of targets. Under this system, the amount to which an Annex I Party (with a commitment inscribed in Annex B of the Kyoto Protocol) must reduce its emissions over the five year commitment period (known as its "assigned amount") is divided into units each equal to one tonne of carbon dioxide equivalent. These assigned amount units (AAUs)*, and other units defined by the Protocol, contribute the basis for the Kyoto mechanisms by providing for a Party to gain credit from action taken in other Parties that may be counted towards it own emissions target (www.unfccc.int).

The three Kyoto mechanisms are:

1. Joint Implementation,
2. Clean Development Mechanism and
3. Emissions Trading.

1. Joint Implementation

This is one of the so called 'flexibility mechanisms' are defined in Article 6 of the Kyoto Protocol designed to help rich (annex 1) countries meet their Kyoto commitment using methods other than directly via cuts in their own emissions. Under Joint Implementation, an Annex I Party (with a commitment inscribed in Annex B of the Kyoto Protocol) may implement an emission-reducing project or a project that enhances removals by sinks in the territory of another Annex I Party (with a commitment inscribed in Annex B of the Kyoto Protocol) and count the resulting emission reduction units (ERUs) towards meeting its own Kyoto target (UNNP, 2001).

2. The Clean Development Mechanism

The clean development mechanism allows governments or private entities in rich countries to set up emission reduction projects in developing countries. They get credit for these reductions as 'certified emission reductions (CER's)*. This system is different from the Joint Implementation as it promotes sustainable development on developing countries. The Clean Development Mechanism (CDM) is the entry point for developing countries (non-Annex I) into the Kyoto Protocol on Climate Change. The mechanism was established under Article 12 of the Kyoto

Protocol adopted by the Third Conference of the Parties to the Framework Convention on Climate Change on December 11, 1997 (UNNP, 2001).

The CDM arose out of the negotiations of the Kyoto Protocol in 1997. The United States government desired that there be as much flexibility in achieving emission reductions as possible and desired a possibility of international emissions trading to achieve cost-effective emission reductions. During the time it was considered a controversial element and was opposed throughout by environmental NGOs and initially by developing countries who felt that industrialised countries should put their own house in order first and feared the environmental integrity of the mechanism would be too hard to guarantee. Eventually, and largely on US insistence, CDM and two other flexible mechanisms were written into the Kyoto Protocol.

The purpose of the CDM was defined under Article 12 of the Kyoto Protocol. The CDM is meant to benefit both industrial and developing countries. For industrial countries, the CDM will provide access to emission reduction credits based on GHG abatement projects undertaken in developing countries where the costs of reducing emissions might be considerably lower than the costs of comparable reductions at home. The CDM provides developing countries with opportunities to become active participants in international efforts to curb GHG emissions. The CDM will provide a vehicle through which investment flows and the transfer of climate-friendly technologies can take place. The CDM will also set aside a portion of the proceeds from qualifying projects to pay administrative costs and help those developing countries that are the most vulnerable to the adverse impacts of climate change cope with the costs of adaptation.

The dual goals of the CDM are to promote sustainable development in developing countries, and to allow industrialized countries to earn emissions credits from their investments in emission-reducing projects in developing countries.

To earn credits under the CDM, the project proponent must prove and have verified that the greenhouse gas emissions reductions are real, measurable and additional to what would have occurred in the absence of the project.

To prevent industrialized countries from making unlimited use of CDM, Article 6.1 (d) has a provision that use of CDM be ‘supplemental’ to domestic actions to reduce emissions.

3. Emissions Trading

Article 17 of the Kyoto Protocol authorizes Annex B countries to engage in international emissions trading. This means that the Annex B countries will have the option of buying or selling some portion of their emission allowances. These allowances are called "assigned amount units" (AAUs) in the Kyoto Protocol.

Emissions' trading is one of the flexibility mechanisms allowed under the Kyoto Protocol to enable countries to meet their emissions reduction target. Countries/companies with high internal emission reduction costs would be expected to buy certificates from countries/companies with low internal emission reduction costs. The latter entities would also be expected to maximize their production of low cost emission reduction so as to maximize their ability to sell certificates to high cost entities. The overall outcome is that the emission reduction target is met, but at a much lower cost than would be incurred by requiring each entity to achieve the emission reduction target on their own (UNNP, 2001).

2.6 Carbon Sequestration Potentials Under the Kyoto Protocol

The preconditions are present in the K.P. for forestry to play a significant role in addressing the atmospheric carbon issue. That is, the K.P. recognizes forestry as an acceptable carbon sequestration vehicle, and forestry offers possibilities for significant carbon influence over the time period allowed. In addition, it should be noted that the use of forestry does not require the development of any new science or technologies. Societies know how to plant and manage fast-growing forests, and societies know where fast-growing forests will thrive and where they will not (UNEP, 2002).

Carbon Markets: Carbon transfers or trading would have as a by-product the generation of financial transfers, usually from developed to developing countries. Potential candidates for "Clean Development Mechanism" (CDM) projects include the developing countries of Southeast Asia, including China, as well as countries in south Asia, including India and Pakistan. Most of the countries of South America and Africa would also be eligible under the CDM. Additionally, Annex B countries such as Australia and Russia would be candidates for "joint implementation" (J.I.) projects. As the details and terms of the protocol are further defined and clarified, there is an issue with regard to the types of projects that are likely to be acceptable domestically and under the J.I. and the CDM. Newly established, planted forests will almost certainly be

acceptable for domestic carbon credits, as they would almost certainly be recognized as afforestation. Whether carbon captured by newly established forests would be eligible for transfer under J.I. and CDM remains a question. In part, it would relate to the question of how the K.P. might establish baselines. (UNFCC, 2003).

It is also uncertain under what conditions forest conservation and protection will be eligible to generate credits. Although deforestation will create carbon debits for developed countries, which have Kyoto targets, it is less clear how deforestation will be treated in developing countries, which have no targets. Furthermore, it is the developing countries where the problem of deforestation is significant. As it stands currently, deforestation in developing countries will simply be noted as part of the developing world's obligation to monitor its carbon releases. But there is no target by which to judge progress. However, if the K.P. recognized protection and conservation in developing countries, protection of forests that might otherwise be destroyed could generate credits that could be marketed to Annex B countries. The mechanism that might be used could be the J.I. or the CDM (IPPC, 2001).

In summary, for the J.I. and the CDM to be useful tools for promoting carbon sequestering forestry activities, those tools must be recognized in the K.P. If they were recognized, they could generate credits for Annex B nations. As noted, a decision on this tactic has not been made, and the question of what types of activities will receive credits and under what conditions remains to be clarified. The second point suggests that, for example, a country that is harvesting from a large managed, regulated (steady-state) forest may receive carbon credits associated with post-1990 reforestation activities and for the growth that occurs on the reforested areas during the compliance period, 2008–2012. It should be noted that under this interpretation no overall net forest growth need occur. These points are particularly significant for countries with large domestic forests under management, as they offer a large potential for carbon sequestration credits (IPPC, 2001).

2.7 Community Development and Participation

According to Ferrinho (1980), community development is the social movement, which occurs when somebody, symbolizing the values of human progress and people's felt interests, motivates the community as a unit of action. Similarly, Fitzgerald (1980) mentions that the term 'community development' has come into international usage to connote the processes by which

the efforts of the people themselves are united to those of government authorities to improve the economic, social and cultural conditions of communities and to the life of the nation and to enable them to contribute fully to national progress.

Since community development is interconnected to different elements and systems, the argument that comes to mind is how to enable the people in the community to improve themselves or even to contribute to the national progress because systems in communities are very complex, especially in the Third World countries. Tamas (2000) explains the concept of systems theory in community development as a set of elements in interactions or a group of things that have something in common. This includes any grouping with any sort of relationships. Some of the concerns in community development, i.e. assessing power and influence, understanding the dynamics of inter-groups relationships, and considering the change involved in a planning development activity, can be understood and described using systems theory. Tamas also noted that in large social systems such as communities, where there is some times entropy (force or tendency) related forces such as disunity, poverty or injustice. It is often difficult to maintain the highly ordered forms of cooperation and social cohesiveness that are needed to foster harmony. Without constant effort, such communities can become unpleasant places to live in. One of the tasks of community development is to help communities find ways of reducing or countering the tendency toward entropy, which exists in all systems. All development actors should learn the need for integration and collaboration as this leads to effective community development.

On the other hand, participation in development is broadly understood and used in various ways. Oakley (1991) and Burkey (1993), noted in Penderis (1996), maintain that participation is primarily an umbrella term for a new form of development intervention and refer essentially to a self-transformation process and proactive 'learning by doing'. Roodt (2001) views genuine participation in development as people having the power to influence the decisions that affect their lives. This view maintains that poor and marginalized people have the power to influence the decisions that affect their lives (Williams, 1995) Sanderson and Kindom (2004) clarify that participation creates a specific type of knowledge within a participatory development discourse. Rational decision-making exercises positivist judgment and solution finding activities emerge from these participation processes. Paul, in Penderis (1996), views participation as a voluntary contribution in planning projects, including participation in decision making, in implementation

of projects, in monitoring and evaluation of development programs and in sharing of benefits. In terms of participation, Robinson (1994:34) notes that successful project intervention is related to a number of related variables; none of which in isolation is sufficient to achieve project objectives. Successful intervention of projects depends on genuine participation, strong and effective management, as well as skilled and committed staff. The importance of beneficiary participation in the planning, decision-making, implementation and evaluation of projects is crucial. Projects most likely to succeed are those where objectives correspond to the priorities of the poor, and where the intended beneficiaries are regularly consulted and involved in decision making at all stages of the process. However, research experience shows that real participation is difficult to achieve and has not yet obtained its rightful place in the process of development.

2.8 Sustainable Development and Carbon Forestry

The concept of sustainable development was brought to the global stage by the world commission on environment and development (WCED, 1987). The central idea behind the concept of sustainable development is to address the relationship between the environment and development.

"Sustainable development is development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). The concept lies on three central pillars: environmental protection, economic progress and social equity (May, 2004). These pillars are interlinked and need to be present together at three different levels: local, national and global (Auckland et al, 2002; IUCN, 1995). Development can not be sustainable if resources are deteriorating over time, nor when only the environmental issues are addressed. Improving living standards, ensuring social equity and promoting citizens; participation in decision-making are equally important components of sustainable development (WCED, 1987). Historically, developed countries had contributed to the increase of the GHGs concentration in the atmosphere with a disproportionately higher share of emissions per capital in comparison to developing countries. The achievement of climate stabilization is connected to emissions reduction in both developed and developing countries (Ferro, 2001). Therefore, one of the greatest challenges for climate change policy makers is to achieve the reduction of the global emissions, while respecting the concept of equity and addressing the needs of the developing nations (UNFCC,2004).

Through CDM and compliance carbon market of the Kyoto protocol industrial countries can reach green house gas reduction targets, by purchasing carbon credits from emission reduction projects in developing countries and at the same time contribute to their sustainable development. (Lovell 2008, UNFCC, 2004). In order to encourage adequate policies and attract more investment in carbon forestry in the future, it is important to understand the local impact of these projects on the components of sustainable development like living standards, social equity and citizen's participation in decision making process (WCED, 1987; Jindal, 2008).

Carbon forestry projects have been criticized mainly for disrespecting concept of equity and hindering sustainable development of the poor, by occupying the land and forbidding the forest use (Fern.2001). Some critics went all the way in comparing the carbon offset market with a new form of colonialism, so called CO_2 socialism (Eraker, 2002). A broader involvement of the local actors in design, implementation and evaluation of forest carbon projects (May, 2004) brings numerous advantages, such as recognition of the local people's legitimate rights over the resources, better communication and relations between community and government and improvement of community managerial capacities (May, 2004).

Careful attention to the distributional impact and the encouragement of locals are thus essential for achieving sustainable development objectives. Sustainability is actually strengthened by lowering the level of poverty, which leads to a decrease in the pressure of converting the forest into the agricultural land, or land for fuel and other goods production. This land use pattern is in direct conflict with forest conservation. Conversely, protection of the forests might be crucial to the wellbeing of the forest dependent nations and communities (Sunderline et al, 2003, 2005).

2.9 Sustainable development benefits

Sustainable development is an important issue for carbon sequestration projects. Many researchers have documented the livelihood and other development benefits of various carbon Sequestration projects around the world. For some examples see; (Rosa *et al*,2003); (Smith and Scherr,2002); and (Totten,1999). The Kyoto Protocol stipulates that all CDM projects including carbon sequestration activities should achieve sustainable development benefits for host countries (UNEP, 2004; Olhoff et al., 2004). Although most current carbon projects in Africa are not for compliance under Kyoto, they often follow these broad CDM guidelines. Research indicates that many carbon sequestration projects in Africa are helping to improve local incomes

through the sale of carbon credits. These examples signify the potential to achieve sustainable development and provide increased financial inflows for the host countries. For instance, in the Nhambita Community Carbon Project in Mozambique, local households will receive a cash payment of $242.60 per ha over the next seven years for carbon sequestered by various land-use activities.

Although the percentage of money paid to each household will vary from 30% of the total in the first year to 10% of the total in the seventh year, a simple average works out to $34.70 per household per annum (taking an average of one hectare of land per household). This represents a significant increase in cash incomes for most households and addresses their felt need of obtaining access to a regular income source (Jindal, 2004). Similarly, under TIST in Tanzania, local farmers receive carbon payments on the basis of the number of trees they can manage on their lands. Other benefits include increased access to fruits, timber, and firewood plus any other NTFPs the trees produce (for more details see http://www.tist.org/). These examples suggest that many carbon sequestration projects have potential to contribute to sustainable development in Africa and to provide increased financial inflows for host countries. More objective impact assessment studies will need to be undertaken before the full range and magnitude of benefits and costs is fully understood.

- **Biodiversity conservation and protection of natural resources**

Many natural resource management projects are not viable either because their benefits are uncompensated environmental services or because national governments and other local agencies do not have adequate funds to undertake conservation activities. Carbon projects can address these concerns in two important ways, first by paying for some of the services such as carbon sequestration, and secondly by providing financial assistance to national governments to invest in natural resource projects (Gutman, 2003). This is particularly relevant for Africa where precious natural resources are being rapidly lost for the need of conservation investments.

There is evidence that many carbon sequestration projects in Africa have been successful in improving the local resource base and in conserving biodiversity. A case in point is the World Bank BioCarbon Fund's Andasibe-Mantadia Biodiversity Corridor Project, which will protect several endemic species by linking fragmented parts of Malagasy rainforest in Madagascar. Similarly, the Forest Rehabilitation Project began in 1994 and promotes reforestation on 24,000 ha in Mount Elgon and Kibale National Parks, Uganda. The parks were widely deforested during

the political strife of the 1970s and 1980s when various ethnic groups sought refuge in them. The Forest Rehabilitation Project seeks to reverse this degradation by planting indigenous tree species and educating local communities on the value of conservation. In addition to carbon sequestration, these activities are helping to conserve the local biodiversity and protect endangered wildlife such as chimpanzees.

Project details are available at: http://www.facefoundation.nl/Eng/projectAfrica.html. On the other hand, the project may have also adversely affected local livelihoods by moving people out of the parks. This indicates the need to carefully balance the pros and cons of a carbon sequestration project.

- **Improved land productivity through soil carbon sequestration**

Sub Saharan Africa contains large tracts of degraded lands with extremely low agricultural productivity, especially in the Sahel. For instance, average crop yields in sub Saharan Africa are 1.5 t/ha for maize, 0.8 t/ha for sorghum and 0.7 t/ha for millet. This is due to poor soil quality, which occurs when soil organic carbon is lost to the atmosphere, thus leading to desertification. Estimates of the area of degraded land range from 3.47 to 3.97 billion hectares (Lal et al., 1998). Land degradation processes can be reversed through improved agricultural practices such as conservation tillage, soil erosion control, establishment of appropriate shrubs and woody perennials, soil fertility enhancement, and crop residue management. This not only restores soil quality by increasing its organic content but also aids in mitigating climate change by returning more and more carbon to the soil. Thus, carbon sequestration activities that improve soil carbon content have the potential to improve productivity of large tracts of land in Africa.

- **Impact on local ecology**

Carbon sequestration through afforestation and reforestation can often generate other locally valued ecosystem services such as more regular and higher quality water supplies and control of soil erosion and sedimentation (Scherr et al, 2004). In Western Sudan, for example, a carbon sequestration project has been working towards improving local rangelands. Rangelands are a mainstay of Sudan's economy, covering about 60% of the country and providing fodder for one

of Africa's largest concentrations of livestock. However, many rangelands have been badly degraded due to recurrent droughts and overgrazing.

The project aims to restore these rangelands through conservation activities such as planting trees and grass to stabilize sand dunes and create windbreaks, and developing participatory rangeland management plans. Similarly, the Western Kenya Integrated Ecosystem Management Project aims to improve the ecology of Lake Victoria Basin by taking up erosion control and watershed management activities on 900 square km. A key project component is to encourage adoption of agroforestry and other land management techniques that sequester carbon and pay local communities for the carbon credits. However, it is important to note that carbon sequestration projects may not always benefit the local ecology. Focus on single species plantations or fast growing exotics that are effective in storing carbon, can produce other adverse effects (IUCN and UNEP, 2002). Such plantations can often result in substantial losses in stream flow, and increased salinization and acidification (Jackson et al, 2005). For instance, a global study on hydrological effect of forest plantation projects found that annual runoff reduced by as much as 75 percent when grasslands were converted into eucalyptus plantations (Farley et al, 2005). Similarly, monocultures may threaten local biodiversity and destroy native species. In order to avoid such harmful effects, there is a need to plan carbon sequestration projects carefully and to encourage native plant species over exotics. Deciduous indigenous trees that shed their leaves in the dry season can be particularly appropriate for use in water scarce catchments.

2.10 Carbon sequestration in Africa

This section majorly relies on the work done by Rohit et al, (2006) on status of carbon sequestration in Africa where 19 carbon sequestration projects operating in 16 countries was expansively implemented in Africa. They found out that 7 out of the 19 projects were situated in East Africa states – (Kenya, Uganda and Tanzania). The projects followed a multi sector approach with the aim of winning more than one goal. A good example is the case Sustainable Energy Management project in Burkina Faso where the project offers carbon sequestration benefits through non-carbon energy sources such as photovoltaic by encouraging the local community to abandon wood fuel and charcoal as energy source.

Various organizations are involved in funding carbon investment in Africa. The World Bank has done an enormous work by launching three carbon funds which support eight carbon

sequestration projects through the Prototype Carbon Fund (PCF), Community Development Carbon Fund (CDCF), and Bio-Carbon Fund. Other organizations are United States Agency for International Development (USAID) FACE Foundation and the European Union. Most of these projects are undertaken through bilateral agreements by the government or national agencies and the private sector- international and local NGOs and projects being jointly implemented by research institutions or universities (Rohit et al, 2006).

Rohit et al, (2006) found that 13 projects were found in East Africa and has the potential of sequestering 35.23 million tonnes of CO_2 which will be sold to the international carbon market. This implies that commercialization of the projects is still low in Africa. Success of the projects has been reported in parts of Africa. Examples include Plan Vivo project in Uganda and the Nhambita community project in Mozambique where credit to private firms in Norway and United Kingdom based companies respectively and sharing the benefits with the local farmers. For instance, the first CDM reforestation project in Uganda is the Uganda Nile Basin Reforestation Project in the Rwoho Central Forest Reserve.

Its main objective is to increase carbon sequestration through a pine plantation mixed with indigenous species planted in grassland areas. It is believed that these sorts of projects will not only benefit the country in terms of CDM funding but will also respond to high levels of deforestation. This is important given the fact that the Ugandan government has identified forestry as one of the sectors capable of reducing poverty. A national forestry programme has been developed to ensure the conservation and management of the country's forests. These have been under severe pressure mainly due to agricultural conversion, demand for charcoal, overgrazing, and uncontrolled timber harvesting, and associated policy failures. It is reported that forest cover has shrunk from 45 per cent of the total land area in 1890 to 20,3 per cent today.9 The current rate of deforestation is estimated at about one per cent a year,10 and the annual cost of deforestation at US$3,8–5,7 million a year. According to the Project Design Document (PDD) submitted to the CDM executive, this project is part of a cluster of five similar projects aimed at overcoming the current barriers to establishing new timber plantations in Uganda, and allowing communities to benefit from the CDM. . (http://www.tist.org , www.carbonfinance.org).

The Uganda Nile Basin Reforestation Project comprises five small CDM reforestation projects, covering 2 137 hectares in the Rwoho Central Forest Reserve. The National Forestry Authority has already planted about 1 400 hectares. The main participants in this project are the National

Forestry Authority (NFA), the BioCarbon Fund of the World Bank, the DNA, international consultants, and local communities. The BioCarbon Fund signed an Emission Reduction Purchase Agreement in 2006, in terms of which it is supporting a project to plant trees in the Rwoho Central Forest Reserve. Three-quarters of the trees are to be Pinus caribaea (non indigenous pine trees. Carbon trading is receiving increasing attention in the Ugandan media, and numerous companies are seeking to participate in the trade of carbon credits and tap into what they believe will become a lucrative business. In line with this, the project has been motivated by the investment opportunities offered by carbon trade. (http://www.tist.org , www.carbonfinance.org).

2.11 Carbon trade

The carbon trade is an idea that came about in response to the Kyoto Protocol. The Kyoto Protocol is an agreement under which industrialized countries will reduce their greenhouse gas emissions between the years 2008 to 2012 to levels that are 5.2% lower than those of 1990 (UNFCC,2003).

The idea behind carbon trading is quite similar to the trading of securities or commodities in a marketplace. Carbon would be given an economic value, allowing people, companies or nations to trade it. If a nation bought carbon, it would be buying the rights to burn it, and a nation selling carbon would be giving up its rights to burn it. The value of the carbon would be based on the ability of the country owning the carbon to store it or to prevent it from being released into the atmosphere. A market would be created to facilitate the buying and selling of the rights to emit greenhouse gases. The industrialized nations for which reducing emissions is a daunting task could buy the emission rights from another nation whose industries do not produce as much of these gases. The market for carbon is possible because the goal of the Kyoto Protocol is to reduce emissions as a collective. . (www.investopedia.com)

On the one hand, the idea of carbon trade seems like a win-win situation: greenhouse gas emissions may be reduced while some countries reap economic benefit. On the other hand, critics of the idea suspect that some countries will exploit the trading system and the consequences will be negative. While the proposal of carbon trade does have its merits, debate

over this type of market is inevitable since it involves finding a compromise between profit, equality and ecological concerns. (www.investopedia.com)

- **Potential of Carbon Trading to Enhance Food Security in Sub-Saharan Africa**

Developed countries have mainly caused climate change, but developing countries bear a disproportionate share of the impacts. Impacts are expected to be most severe in low-latitude and less developed areas. Sub-Saharan Africa (SSA) is considered to be one of the most vulnerable regions for climate change, because of the high exposure and the low adaptive capacity of agriculture which is the most important livelihood (IPCC, 2007). Changes in the production capacity of agriculture and decreasing incomes have negative impacts on local food security (Jones and Thornton, 2003, Brown and Funk, 2008,).

Due to global change, agricultural area has increased also in SSA causing negative implications for the environment and natural resources while it has not been able to solve problems related to food security (Smith, 2007). Conversion of natural land to agriculture releases significant amounts of CO_2 emissions into atmosphere. In Sub-Saharan Africa, agriculture, land-use and forestry sector's share is currently 73 % of the total greenhouse gas emissions (WRI 2009). Future predicted greenhouse gas emissions from agriculture are estimated to increase 95 % between 1990 and 2020, mostly in the Middle East, North Africa and Sub-Saharan Africa (Smith, 2007). Carbon trading is a market mechanism to mitigate climate change. In carbon trading one party pays for another party in return for greenhouse gas emission reduction or for the right to emit (Capoor & Ambrosi, 2008).

The Kyoto mechanisms allow the countries with Kyoto commitments to meet their target of reducing greenhouse gas emissions in a cost-effective way and motivate developing countries to join global emission reduction (UNFCCC, 2009). Thus carbon trading offers an opportunity to increase climate equity. Treaties include potential to finance mitigation and adaptation to climate change and enhance sustainable development. The options to mitigate climate change concern practices which reduce emissions, increase sinks or avoid emissions. In agriculture sector many options despite of mitigation improve simultaneously soil productivity through improved management or land use change improving food security. Agroecosystems imply significant potential for terrestrial carbon sequestration. Carbon sequestration can be improved through adding biomass to the soil, reducing soil disturbance and conserving soil and water (Lal, 2004).

Such practices include soil fertility management, reduced tillage, diverse crop rotation, erosion control and irrigation management. Options which improve soil fertility enhance directly adaptation to climate change maintaining or improving agricultural productivity, thus meeting the food demand. In the long term sustainable soil management increase as well system's stability to maintain food security in unexpected circumstances climate change causes. Adopting mitigation options and selling emission reduction in carbon markets creates new income for local people increasing population access to resources through which adequate nutrition is achieved. Implementation requires, however, overcoming agroecological and socio-economic constraints. Agroecological and socio-economical factors contribute to which mitigation options are implemented in the region, who have access to participate international carbon trading as well as how and to whom are the emerging benefits distributed. In addition, knowledge is needed of the possibilities carbon trading can offer and the verification process as well as how different mitigation options can be implemented locally (Lal, 2004).

CHPATER THREE

RESEARCH METHDOLOGY AND STUDY AREA

This chapter deals with the methodological approaches used in conducting this study. It presents the research design, the study population, the sample size and sample procedure, data collection techniques, data presentation procedure. It also describes study area and its organizational structure.

3.1 Study Area

Humbo Carbon Project is located in Humbo Woreda, Wolayita zone, Southern Nations Nationalities and Peoples Region (SNNPR), in the south western part of Ethiopia. The project is expected to sequester 880,296 tones of Carbon dioxide equivalent (tCO_2e) for an operating lifetime of 60 years and a fixed 30 year crediting period with an average net anthropogenic greenhouse gas removals by sinks of 29,343.2 tCO_2e per year (source: WVE PDD, 2010). This figure implies that the amount of carbon sequestered will likely vary significantly depending on the year. A validation exercise was undertaken for Climate, Community and Biodiversity Alliance (CCBA) standards and has been rated Gold standard which gives confidence to carbon buyers that the project will deliver GHG reductions as well as both community and biodiversity benefits. Humbo Ethiopia Assisted Natural Regeneration project is restoring 2,700 hectares of a biodiversity native forest, while supporting local income and employment generation. Through assisted natural regeneration, the project is restoring indigenous tree species to the Humbo area, a mountainous region in the south western part of Ethiopia. (Source: Humbo Woreda Agricultural Office and Rural Development 2012).

The local community is actively engaged, with seven community cooperative societies being involved in the management regeneration areas and a system in place to monitor the project's environmental and social issues. The project is the first of its kind in Ethiopia in that it has employed farmer-managed natural regeneration (FMNR) techniques. The FMNR technique enables rural communities to assist re-sprouting of native species by identifying, selecting, and pruning existing tree and shrub root stocks in the soil. The Humbo Woreda (district) is among the most populated areas in the country. The Woreda covers an area of about 86,646 ha (Annex

I). The total population of the Woreda is about 140,507 of which 15% are female headed and the livestock amounts to about 108,000.The growth of the population is estimated at about 3% per annum(source: Humbo Woreda Finance Administration Office,2010).

The main crops grown in the Humbo Woreda are maize, sweet potato, teff and haricot beans, coffee, cotton, and peas. The population of the Woreda is predominantly engaged in farming with a land holding size of 0.25 ha. The main stay of the population hence is subsistence agriculture. Current report shows that the Woreda consists of 41 administrative units (source: Humbo Woreda Agricultural Office and Rural Development 2012)

The geologic formations of the Woreda belong to the Precambrian rock formation overlain by sedimentary rocks and volcanic ashes. The soils of the Woreda are mainly brownish red predominated by clay soil types. The Humbo Woreda lies within the 'kola' agroecological zone and it has a maximum temperature of 32^0 c and a minimum of 27^0 c, except at Bosa Wanchi village, where the maximum and minimum temperature are about 20^0c and 25^0c respectively. As result this village lies within the Woina Dega/Dega agroecological zone. The minimum and the maximum rainfall of this Woreda is about 200 mm and 600 mm respectively and rarely reaches 1200-1300 mm at Bosa Wanchi village (source: Humbo Woreda Agricultural Office and Rural Development, 2010).

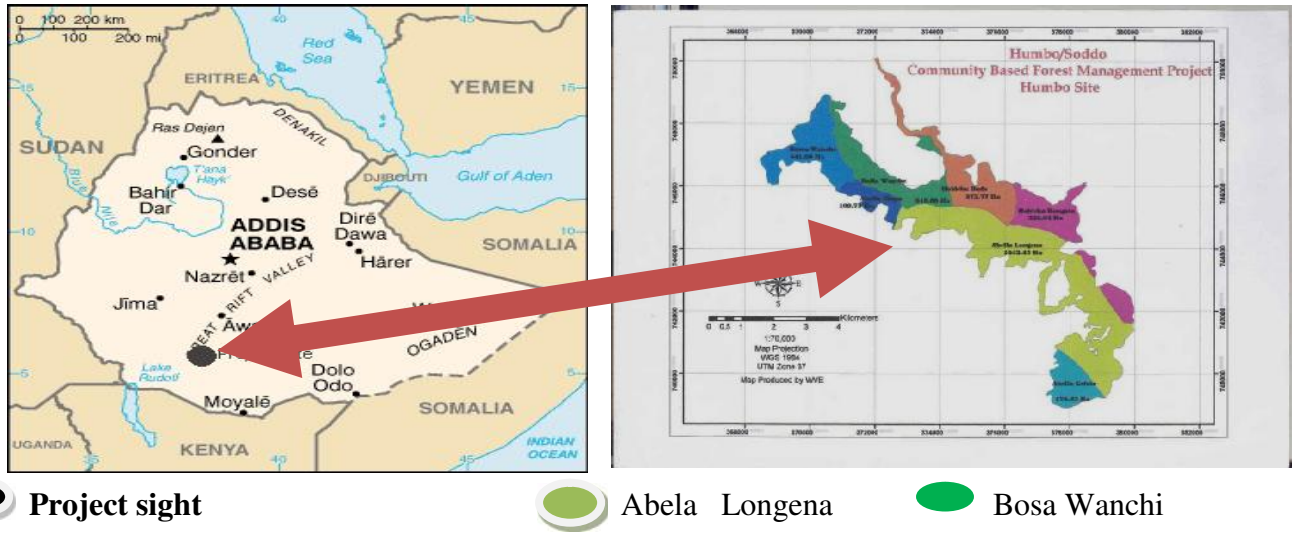
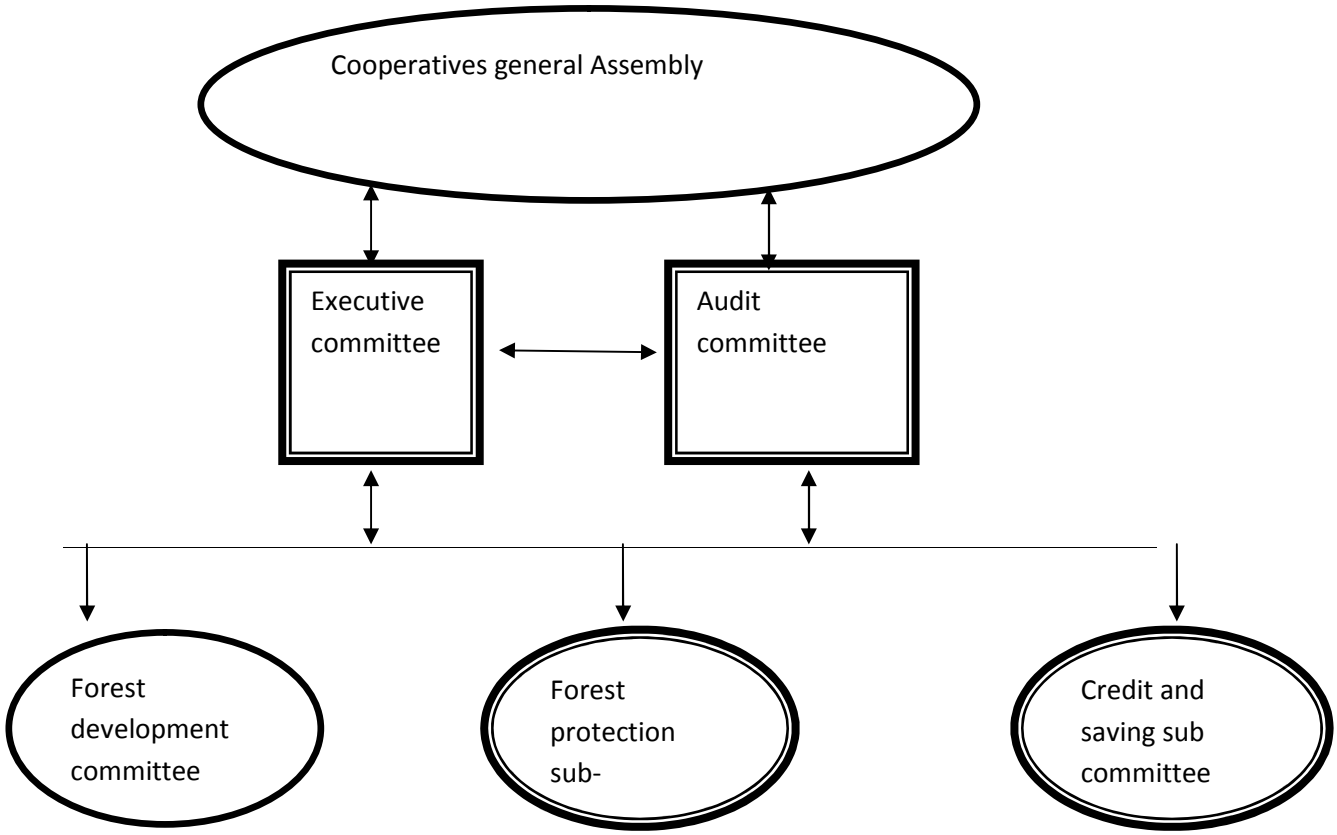


Figure 3.1 Map of project sight *(Source: Humbo Project PDD).*

3.1.1 Humbo Area Development Program

The project is managed at the field level through the Humbo Area Development Program with the program coordinator at the area level responsible for coordination and supervision of project activities. The carbon project areas are divided among the surrounding villages based on traditional boundaries and managed by the cooperative leaders. Each village has been allocated management area (Source: HACPD office, 2009).

3.1.2Community carbon project structure and governance



(Source: Humbo carbon project development program 2013)

Figure 3.2 community carbon project institutional structure and governance

The communities shall have the following organizational structure:

1. Cooperatives general Assembly

2. Executive committee

3. Audit committee

4. Forest development committee

5. Forest protection sub-committee

6. Credit and saving sub committee

Besides the above community structure and governance, the project employs field technical officers with high technical forestry skills who provide direct technical guidance in activity implementation including management planning, monitoring and forestry extension. Government forestry staff is also involved with technical training in forestry activities (Source: HACPD office, 2009).

3.1.3 **Duties and Responsibilities of Members**

Members shall have the following duties and responsibilities:

- To manage, conserve and protect the enclosed reforestation area in accordance with the internal rules to be agreed upon by the general assembly.
- Not to allow access to forest products both members and non-members within the protected (enclosed) area except for purposes that will be determined by the general assembly.
- Not to allow cutting of trees, livestock grazing, charcoal making etc
- Each household shall protect the forest on the basis of rotation. (Option 2, Forest protection shall be carried out by employed guards (watchers). Their payment shall be determined by the general assembly).
- To refrain from collecting forest products inside the reforestation area except as provided in the rules agreed upon by the general assembly.
- To contribute labor to various activities related to the reforestation area (e.g. tree planting, pruning, fencing etc.
- To inform the responsible authorities of the association when any person violates rules agreed upon by the members of the society.
- To attend meetings called by the society.
- To contribute labor and participate in any other activities required by the society.

(Source: HACPD office, 2009)

3.2 Research Methodology

Bryman (2001) refers to a research method as a technique for collecting data and Mouton (2001) highlights the importance of methodology as a procedure that a researcher uses to condense, organize and analyze data in the process of undertaking scientific research in social sciences. In this research, both quantitative and qualitative approaches are used.

Quantitative method was used to measure variables that were linked to the research problem in the case study area. The rationale behind using qualitative methodologies, in addition to quantitative data, was to increase understanding about the dynamics, opinions and perceptions of people in the case study areas about carbon sequestration through afforestation and reforestation programs and its impact in empowering the livelihood of local community and resulting in sustainable projects.

3.3 Data collection techniques

The survey was aimed at collecting information on socio-economic, environmental perspective and the benefits accrued from HCP. Data was collected from both sampled household and village based aspects. Semi- structured questionnaire (See Appendix 1), focus group discussions aided by checklist (See Appendix 2), as well as interview and participant observation were employed.

So as to meet the already stated research objectives and answer major research questions, a wide range of data was collected from both primary and secondary sources. Accordingly, first hand information was obtained through the above mentioned instruments while second hand information was collected through analysis of the existing documents, such as books, journal articles, websites, performance report papers, annual bulletin, research papers and etc.

3.3.1. Questionnaire survey

It is a highly structured data collection technique where each interviewee was asked an identical set of questions (Bryman ,2004). The questionnaire was composed of a mixture of open-ended and closed questions based on the key objectives of the research (See Appendix 5). This was refined on the basis of the information gathered from the interviews.

The questionnaire covered socio-economic and environmental perspectives of the households with regard to the use of and implementation of HCSP and the livelihood issue as well as the past

and the present status of the project (See Appendix 5). Survey questionnaires were administered on randomly selected households. The questionnaire was initially prepared in English language and translated into Amharic to make the questions understandable for both enumerators and respondents (See Appendix 6). This has been conducted face-to-face in order to increase the probability of response and flexibility in extracting information.

Two enumerators were involved in conducting the survey. They were given a half day training on the objective of the study, how to approach respondents, how to record responses and on detailed contents of the questionnaire. Pre-testing of questionnaire was done in order to see if the question sets are understood and address the problem under investigation.

3.3.2 Semi- structured interview

Semi-structured interviewing doesn't require a rigorous interview guide nor highly structured response categories. The interview around a set of pre-defined questions, which are presented to the interviewee in order to guide the conversation and obtain detailed information to answer the research questions.

The purpose of the interview was therefore to understand the number of issues regarding the implementation of HCSP and their expected impacts on local livelihoods (See Appendix 4). In this research, interviews were carried out with different stakeholders including two HCSP cooperative leaders, two World Vision environmental managers, two local governmental development agents (DAs) and one cooperative association (See Appendix 3). Selections were made in consultation with cooperative leader of carbon project. Based on his suggestions, the researcher approached the selected interviewees.

3.3.4 Focused Group Discussion (FGD*)*

Focused or non-schedule-structured interviews generally have the following characteristics:
- they take place with respondents known to have been involved in a particular experience,

- they are focused on the subjects' experiences regarding the situations under study. (Nachmias, 1996).

In many ways, focus group discussions played an important role in the qualitative research approach. One of the most prominent advantages of the focus group discussions is that it reveals

how the group participates and how they view the issues with which they have been confronted. Therefore, the purpose of these interviews was to understand the local and national context of HCSP Pilot Project as well as to collect qualitative data on selected carbon project activity such as: environmental parameters, local institutions, management of natural resources by local community, and access to government infrastructure etc (See Appendix 2).

Two focus groups were selected on the bases of their representation in terms of community participation and project activities in Bosa Wanchi and Abela Longena. Before selecting the focus groups, the researcher consulted Humbo Carbon Project cooperative leaders in order to facilitate the selection of appropriate focus groups. Participants of the focus groups included Carbon project committees of both the study sights. There were 6 participants in each focus group (See Appendix 1).

3.3.5 Observation

Participant observation technique was used on arrival to the study villages in order to overcome with the problem of orientation and familiarize in the community. The technique allowed the researcher to participate in the activities while maintaining the goal of the study (Frankfort-Nachimisas, 1997).In so doing gains confidence from each other and presence didn't interfere with natural course of the events. As a result, the respondents provided the researcher with honest responses to questions and not hide important facts (Kajembe and Luoga, 1996).

3.4 Sampling Technique

The target population for the study comprised households living in the two adjacent rural administrative units (villages); the rationale behind selecting the two sample villages namely; Abela Longena and Bosa Wanchi were chosen on the basis of their involvement in the project activities. Currently, there are about 863(724 male-headed and 139 female-headed) and 692 (511 male-headed and 181 female-headed) households in the two sample villages respectively (source: Humbo Woreda cooperative association Office, 2013).

As suggested by Gay regarding the sample size, for descriptive study, 10 to 20 % of the accessible population is enough (Gay 1983, cited in Kumar, 1999). The sampling intensity of 10% was used to guide the number of households' selection. The respondents were the head of households because they are responsible for making decision on the household activities and resource use. Accordingly, in this study 10% from each of the above population groups i.e., 73

men headed and 14 women headed households from Abela Longena and 52 men headed and 19 women headed households from Bosa Wanchi were selected by using stratified sampling methods.

Therefore, the total number of Households in two villages was 33 female-headed households and 125 male headed household (see table 3.1). As indicated above, the target population of the study was not homogeneous, i.e., there was certain variability both within and between the target population groups, which would tend to affect the representativeness of the sample. So as to reduce such an eventual sampling bias, households were stratified on the basis of their residential *kebele* and gender of the head of the household.

To determine the proportion of each stratum in the study population *(p)*, the following formula suggested by Kumar (1999:159) was applied.

S*x* = E *x/p,* Where S*x* = *the proportion of stratum x in the population (p)*

E *x*=*the number of elements in stratum x*

P=*total population size*

Accordingly, for instance, the proportion of female-headed households in Abela Longena was computed as:

Female-headed households (S*x)* = 139/863

= 0.16 (i.e. 16.10%) the proportion of each sample and gender category from both villages have been computed in Similar fashion. The sampling interval was determined by applying the formula below:

I = N/*n*

Where I= sampling interval

N=total number of population, &

n= sample size

Sampling interval (I) of the Abela Longena male-headed households: Bosa Wanchi

I=722/73 I=511/52

= 9.8 ~10 =9.8 ~ 10

Therefore, the sample units were identified at an interval of ten for both population based on the list of the registrations which was arranged alphabetically.

Finally, purposive sampling technique was used to identify some key informants from both rural community and the institution itself. Accordingly, two HCP cooperative leaders, two

environmental managers from World Vision Ethiopia, 12 carbon project committee members, two government development agents and one Woreda cooperative personnel were purposively selected and included in the study as sources of the information. In general, the total sample size selected by using both random and non-random sampling methods from the different target population groups of the study was about 177 (see Table 3.1).

Table 3.1 Target population and samples of the study

Stakeholders		Population		Total	Sample size		Total	Sampling method
		M	F		M	F		
Households	Abela Longena	724	139	863	73	14	87	Stratified
	Bosa Wanchi	511	181	692	52	19	71	Stratified
Cooperative leaders		2	_	2	2	-	2	Purposive
Carbon project committee		12	-	12	12	-	12	Purposive
Local development agencies		1	1	2	1	1	2	Purposive
World vision managers		2	-	2	2	-	2	Purposive
Woreda cooperative personnel		1	-	1	1	-	1	Purposive
Grand total of sample size							**177**	

3.5 Data Analysis Methods

As mentioned under Section 3.2 the major types of data collection tools that were used in the study included FGDs, sight observation, personal interviews and survey questionnaire. The raw data that was collected from both primary and secondary sources through the aforementioned data collection tools were subsequently edited and tallied manually; and entered in to computer software program of MS-excel. The analysis process was also made by making use of frequency

distribution tables, percentage, charts and other descriptive statistical methods. The data gathered were coded and arranged in the manner that the reader could easily understand and also the findings of the study were adequately stated.

3.6 Ethical Consideration

In this study, the ethical considerations include the following:

- To obtain consent for participation of respondents and gate keepers.
- Maintaining anonymity of respondents willing to participate. It is important due to the sensitive nature of this research as some aspects of the investigation pry into the respondent's privacy.
- Promising not to publish or release material or data to persons, groups and agencies not connected or involved in the conduct of this research without prior due authorization of the respondents.
- Refraining from giving any part or parts of research material such as photographs, video recording and audio-tapes used at any stage of data generations from this study, for publication, prosecution or advertisement without written permission from the subjects.

CHAPTER FOUR

RESULT AND DISSCUSSION

This chapter deals with analysis and presentation of data collected from field of study area. These results were analyzed, presented, and discussed in a tabular, graphical and pictorial order. Moreover, it has been presented in line with HCP implementation and design, socio-economic findings, the environmental perspectives and other related issue based on the focus of the study.

4.1 Demographic and personal profile of respondents

In terms of personal characteristics, all household respondents were requested to provide information relating to gender, age, educational level and occupation.

4.1.1 Gender

The Majority of the sample respondents in Abela Longena are male (83.9%) while the remaining (16.1 %) are female. Whereas 73.24% of the sample are male in Bosa Wanchi and 26.76% are female. Bosa Wanchi village had more female households' respondents compared to Abela Longena village (See Figure 4.1). The household respondents represented both gender, with males headed households dominating. This was expected because of patriarchal system of life, where a husband (usually men) is the head of household.

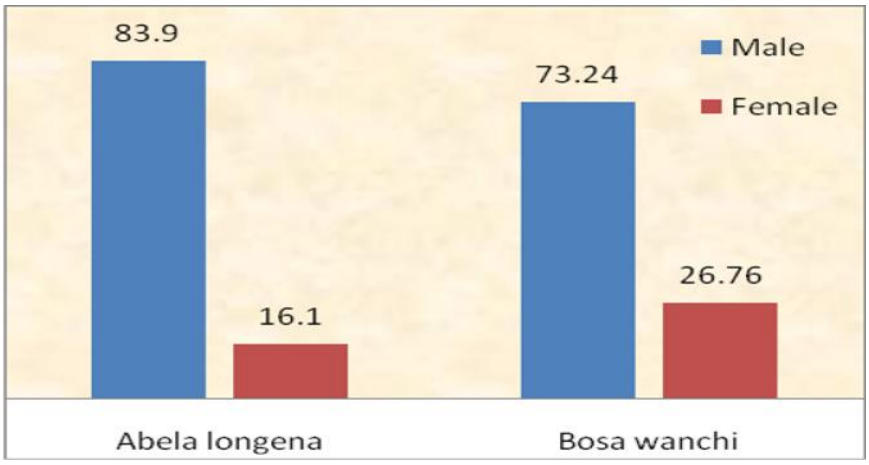


Figure 4.1.Percentage of respondents of the two genders in two villages.

4.1.2 Age

Regarding the age category, 38% of the respondents were aged between 18-30, 46.2% between 31-40, and 15.8% above 40. The majority 52% of sample respondents' fall under the age of above 30.As results shows the project includes all age groups except the age of below 18(See Table 4.1).

Table 4.1 Distributions of respondents by age category.

	Abela Longena		Bosa Wanchi		Total frequency	Total percentage
Age	frequency	Percentage	frequency	Percentage		
18-30	33	37.93	27	38	60	38
31-40	40	46.98	33	46.5	73	46.2
Above 40	14	16.09	11	15.5	25	15.8
Total	87	100.00	71	100	158	100

4.1.3 Educational status

As far as education is concerned, 25.32% of the sampled respondents had first cycle level qualification or below while the rest have completed some level of education ranging from primary level (46.20%), secondary (21.52%), and the rest 6.96% has received vocational training diploma. (See Table 4.2). First cycle qualification and below in the study area seem to be smaller as compared to those households with better educational status. These figures are also significant because educational status determines an individual's or a group's environmental awareness, knowledge, attitude, and skill.

Table 4.2: Educational status of household respondents

Educational level	Abela Longena		Bosa Wanchi		Total frequency	Total percentage
	frequency	Percentage	frequency	Percentage		
First cycle and below	19	21.8	21	29.58	40	25.32
Primary	43	49.4	30	42.25	73	46.20
Secondary	20	23	14	19.72	34	21.52
Vocational	5	5.8	6	8.45	11	6.96
Total	87	100	71	100	158	100.00

4.1.4 Occupational status

The majorities of household respondents 91.77% were farmers and involved in mainly mixed farming such as crops and livestock. Among other things, this figure shows how closely the livelihood conditions of the households in the study area are reliant upon the land and other natural resources. A smaller number i.e. (5.06%) participated in petty trade and the rest (3.17%) involved in handcraft (See Table 4.3).

Table 4.3 Occupational category of respondent

Occupation	Abela Longena		Bosa Wanchi		Total frequency	Total Percentage
	frequency	Percentage	frequency	Percentage		
Farmer	80	91.95	65	91.55	145	91.77
Petty trade	3	3.45	5	7.04	8	5.06
Hand craft	4	4.6	1	1.41	5	3.17
Total	87	100	71	100.00	158	100

4.2 Humbo Carbon project implementation and design.

Project implementation is the process of converting plans into action. Good planning in the development process requires not only a sound plan design but also active and conscious support from the overwhelming majority of the community and includes poor and marginalized groups (Ferrinho, 1980).

Considering the above theoretical background, a qualitative field survey was conducted to assess the local community participation in HCP projects in terms of planning and implementation. Focus group discussion indicated that the local community participated in the project activity starting from design and implementation time. With regard to the local community involvement in project planning and implementation, information obtained from the interview with world vision environmental manager there appears to be some involvement in the project planning and implementation stages. While WVE (World Vision Ethiopia) had been spearheading project design and implementation, at the initial stage communities were consulted and they provided their views at the project design stage.

As FGD result indicated, the communities' involvement only seemed to be related to the immediate benefits of the project. This means that beneficiaries participated because they were requested to collaborate in some types of project activity with the expectation that they would gain something in return. For example, informants of the Bosa Wanchi focus group indicated that during the implementation stage they were involved, as they would receive cash for work activities on the project site. In this regard, Oakley and Kahassay (1999) noted that collaborative participation can take place as a result of some persuasion or incentive, agreeing to collaborate with externally determined development projects, often by contributing their labor, and other resources in return for some expected benefits.

According to expert interview, one of the main roles of Humbo carbon project is that no decision regarding carbon project can be made without consulting the local community and reaching consensus. The local community is involved in the design, implementation and project evaluation. Therefore, sights, Abela Longena and Bosa Wanchi project areas were chosen and mapped by the villagers in collaboration with local leaders.

Most of the respondents mentioned HCP project was established in 2006 after extensive debate with the local community. The project is owned and managed by the communities who live adjacent to the forest. As significant number of respondents 91% acknowledged HCP is managed by cooperative leaders and belongs to local community while 9% said it belongs to the World Vision.

Majority of respondents 95% mentioned that the land in Humbo was severely degraded before carbon project implementation. While 4% and 1% of respondents pointed out that the land was moderately degraded and slight degraded, respectively (See Figure 4.1). According to household survey in both villages most respondents pointed out the land was degraded due to unregulated firewood and charcoal production.

Moreover, a few mentioned bush fire, encroachment by farmers to practice shifting cultivation and encroachment by farmers to expand settlements activities which led the area to be degraded.

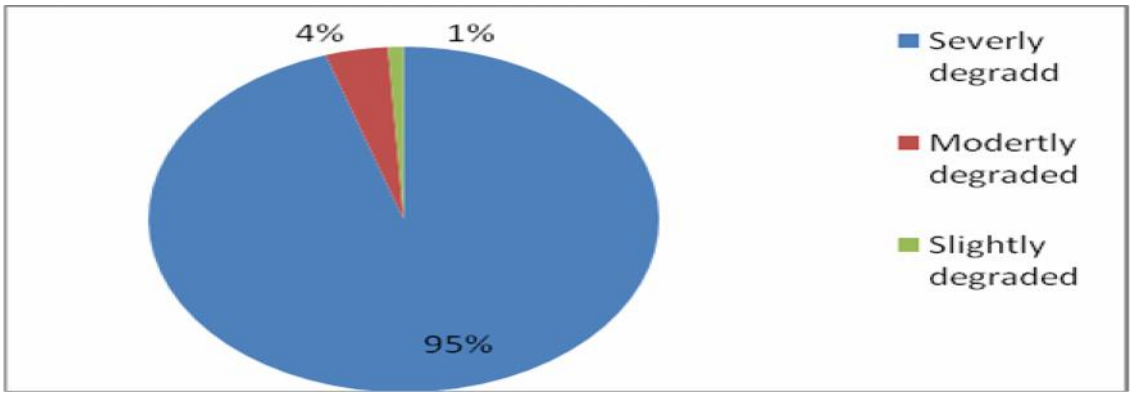


Figure 4.2 the condition of land in Humbo before the project implementation

The expert interview also pointed out that areas had no forest cover and soil erosion was very severe, soil productivity and stream water disappeared before the commencement of carbon project.

FGD results also showed before the implementation of carbon project, most forests in Humbo areas were considered as common property; consequently, every one had a right to use and most of the time illegal activities were practiced in the area for many years ,all these leads the area to be degraded.

The study noted that at the time of project inception, the project areas were under an open access regime where all community members living adjacent were accessing the area for livestock grazing, firewood collection and charcoal making. This open access regime had led to severe resource degradation and was not sustainable in the long-term.

The carbon project has therefore resulted in a regulated system with clear user rights for members of the cooperative society while at the same time establishing roles and responsibilities for sustainable resource management.

(Source: Humbo Project PDD 2006)

Figure 4.3 the degraded land of Humbo before the commencement of carbon project

In the management arrangement, communities take the whole responsibilities and accrued benefits from the project. The study found high level of satisfaction among respondents with carbon project practiced in Humbo. Small number of respondents showed not fully satisfied or indicated to be not satisfied at all (See Figure 4.4). The large number of respondents, who are satisfied, mentioned the local control and access to the resources was important. For those who mentioned not satisfied, the prominent reasons includes seeking more power and control over resources, and more tangible benefits have to accrue from carbon project.

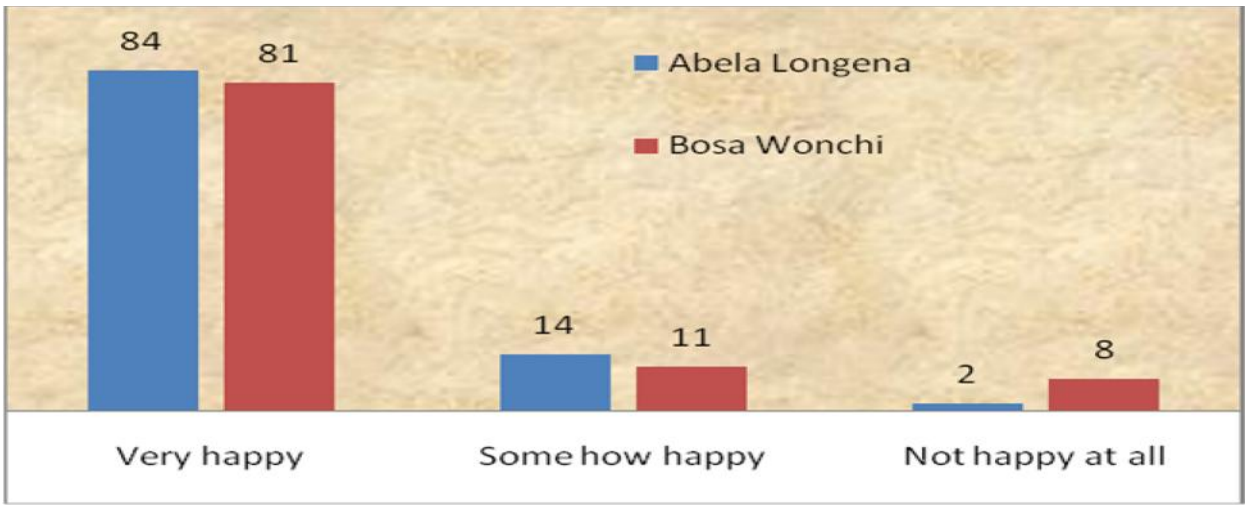


Figure 4.4 Percentage of respondents indicated to be very happy, some how happy and not happy with practiced carbon project in Longena and Bosa villages

4.2.1 Actors for the implementation of Humbo carbon project

The FGD results have shown that World Vision Ethiopia (WVE), in collaboration with World Vision Australia (WVAU), is the primary initiator (proponent) of the assisted regeneration carbon project and has played a prominent role in the formulation of the project, organizing the communities concerned and in soliciting as well as mobilizing funds for the project. World Vision (WV) is committed to continue supporting the project by giving technical and human power support and by facilitating the management and flow of funds to the community. The project management cost to date has been covered by WVAU. The ERPA (Emissions Reduction Purchase Agreement) has been signed by WVE and WVAU on behalf of the communities with the trustee. WV also signed sub-ERPA with the forest development and protection cooperatives and concerned district level rural development office based on the main ERPA. WVE is receiving carbon payments through WVAU on behalf of the community and disbursing the funds to respective cooperatives proportionately upon the amount of emissions they have reduced. This responsibility also entails that WVE has an active role in monitoring the project to ensure that the terms and conditions incorporated in the ERPA are adhered to during the implementation of the project and that the trustee receives reports.

According to Humbo cooperative office manager, the Woreda cooperative office is responsible for all matters related to corporative societies as mandated by Ethiopian law. The Office is

accordingly required to organize communities into viable cooperative societies. This includes assisting in development of documents that establish the cooperative society such as the constitution and assisting in registration. The Cooperative office also monitors and supervises activities of the cooperative societies. The Humbo Woreda cooperative office was particularly instrumental in developing by-laws that govern the forest development cooperative societies as well as train them in institutional governance and basic financial management. The cooperative office is also expected to guide in financial management and conduct annual financial audits of the cooperative societies.

According to interview World vision environmental manager, World Bank is the carbon buyer using financial resources from the Government of Canada which approved and authorized voluntary participation of the World Bank in November 2010.The project is largely funded by WVAU through WVE. The funds have helped in meeting the upfront costs from project identification through community consultations, project development, establishment of baselines, and development of the monitoring program up to signing of the emissions reduction purchase agreement. The World Bank Bio carbon fund has also provided financial support specifically for the consultants that conducted the feasibility, validation and verification exercises and community capacity building. The Ethiopian government through relevant departments has also provided in-kind support for project development and approval as well as members of the forest protection and development cooperative societies.

Humbo cooperative association manager also mentioned, in order to bring all the cooperative societies to form one umbrella organization, a union will be established to bring all the seven cooperative societies together. The Union will be the main link between forest cooperatives, local government, WVE and gradually with the carbon buyers. It is expected that all functions currently carried out by WVE will eventually be transferred to the Union, yet WV will continue to play an advisory role. In preparation for this role, WVE is building the capacity of the cooperatives and working closely with the zone and district level cooperative offices to ensure smooth running of activities. WV was expected to pull out of the project in September 2012 but still they couldn't put this into practice. As the result shows WV still didn't transfer its responsibility for the cooperative union. Above all this study reveled that all stakeholders are

doing for the betterment of the project and this shows there is positive relationship among local community, local government and project developers.

4.3 Socio-economic benefit from the project

According to interview with Humbo Woreda cooperative association expert there are many socio-economic synergies essential for well-being of local community accrued from carbon project as a result of increased access and participation in carbon project. There were profound socio-economic benefits attained by households as regards to carbon project. This involves mainly the collections of forest based products to be used for family consumption. Fuelwood and construction materials revealed most significant compared to other products. Fuelwood energy is the main sources for domestic energy in Abela Longena and Bosa Wanchi village. The observation isn't surprising, as it is common in most rural areas of Ethiopia which are not connected to national electricity system to relay on fuelwood as the only sources of domestic energy.

Cooperative leaders also pointed out in terms of direct household level the carbon project activity provide two most important benefits such as the supply of basic needs, safety-net during difficult time. Local communities who are a member of carbon project earn their livelihoods from subsistence agriculture and rearing livestock, With regard to economic activity household engaged in, the quantitative field survey findings indicated Abela Longena 28.2% of the respondents in Abela Longena are engaged only in crop production, 7% only in livestock, 47.1% both in crop production and livestock, 2.4% selling of forest product and 15.3% in causal employment.

About (35.2%), (11.4%), (45.8%), (1.4%) and (7.2%) of respondents in Bosa Wanchi engaged in crop production, livestock, both crop production and livestock, selling of forest product and causal employment respectively (See Figure 4.5). Crop production was the main activity for both villages undertaken by the households followed by livestock production and a few household engaged in selling forest product and casual employment. But most households preferred to combine some economic activities together so as to earn living. As the result indicates those who are engaged in casual employment and selling forest product also participated in crop production. The result indicates that they are engaged in different economic activities for food and income purposes.

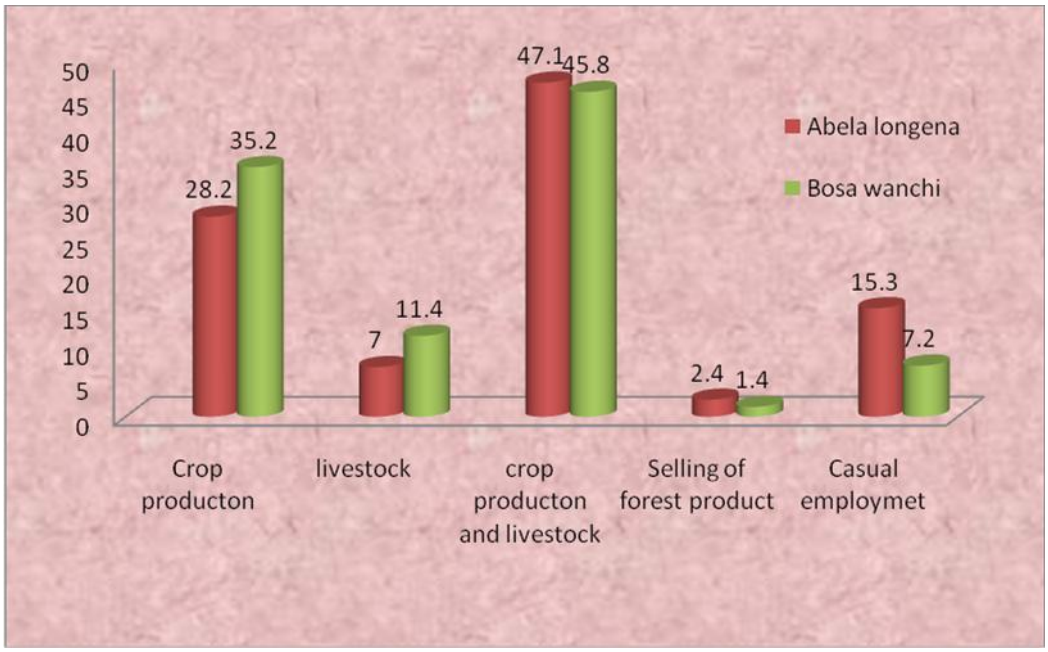


Figure 4.5 Percentage of respondents and annual income sources for household's livelihood of both villages.

The FGD results have shown that the introduction of savings and credit cooperative society, which provides loans to members of the project. Therefore, the project members started to take loan and participating in different income generating activity such as bee keeping, poultry and rearing cattle in groups and individually.

On the other hand, based on the practiced carbon project activity there is no revenue sharing mechanism between government and carbon project members. The study noted significant members of respondents to be aware of the revenue belong to the carbon project members. It was found that 99% of the respondents in both villages to be informed that the money earned from carbon project belongs to the local community.

This shows the degree of awareness and participation, communication and transparency between the community and local cooperative institutions of both villages. The revenue from carbon trade exists in both villages. Both villages benefited from carbon fund as well.

Table 4.4 Money earned from carbon trade in both villages

	Money earned from carbon trade in three years time.			
village	2009	2010	2011	Total in birr
Longena	216,442.51	295,403.85	408,292.90	920,137
Bosa	77,214	70,214	97,084	244,512

According to the expert interview the carbon trade payment will differ among the villages. The amount will be calculated according to the impact that carbon sequestration achieved by the project during the year. In three years time Abela Longena village earned birr 920,137 and Bosa Wanchi received birr 244,512 carbon payment (See Table 4.4). The carbon credit buyer is the Government of Canada through the World Bank Bio carbon Fund. The Bio carbon fund brings with it rich experience accumulated over the years working with forestry carbon projects in particular function as earlier pointed out. The society shall keep 30% of the net profits of the society as a reserve fund. The amount of money deducted from the net profit as a reserve fund shall be deposited in a saving account opened in the name of the society.

Presently, Abela Longena has birr 252,000 deposit in the saving account and Bosa Wanchi has birr 45,000. This is very significant benefit and has increased the motive for community forest conservation effort. The collected income is being used in both villages for development projects, for example, to improve infrastructure carbon project management activities such as patrol costs and costs associated with facilitation of carbon project cooperative institution.

The money from this fund should be used in such a manner to bring benefits to the entire community. All the interviewees think that the money from the carbon fund is managed in a fair manner by their cooperatives leaders and the money has been audited by the professionals, they are invested in the real priorities. Furthermore, they defined the further list of priorities, among the others: flourmill, Grain store, and credit fund were the most mentioned. According to the survey, the majority of interviewees think that the local community benefits from forest protection. The result showed that most families perceive the benefit of the project at the community and the family level

They pointed out carbon project activity has brought socio economic transformation in the areas of improved agriculture, food and fruits, environmental rehabilitation and carbon payment. In this regard, during the field survey, quantitative data was collected to assess the perception of the beneficiaries' in terms of project benefits to support their family. Of the sample, 91% of the respondents indicated that the project supported their family, while only 9% responded that the project did not support their family because families did not receive any individual payments. . According to carbon project committee interview, starting from 2013 the project will make direct payments to the individual households.

According to interview with cooperatives leaders the community conservation areas are under monitoring by different groups of 5 to 10 community members, the so called security guard. The number of people in each group was decided according to the size of a protected block. The members of the security guards were recruited from the members the project. Cooperative leaders and forest protection sub committee were in charge of recruiting the members of monitoring patrol. The role of these groups is to conduct the preventive illegal activities. The security guards are salaried from the community fund. According to the interviewees, the project creates income and job opportunities to local community.

According to household survey in both villages most respondents pointed out agricultural productivity is increased after the implementation of HCP. But agriculture is subsistence in nature with hardly any excess production to sell. The major problem is exacerbated by frequent failure of crops in the dry season. When asked if they produce enough food to sustain their family the whole year, 51% replied Yes, 49% No. Those respondents who said No, mentioned during food scarcity time, the project provided them food grain through purchase in cheap price. The result indicates some farmers do not produce enough food on their farm to sustain their family and buy food grains from market and from the grain store of the project during hard times.

4.4 Environmental Based Benefits at Village Level

This study revealed significant appreciation to environmental improvements associated with practiced carbon project. All households' respondents mentioned the environmental improvements as important benefits at village level. Their judgments were based on increased water sources, which are flowing from mountains areas, increased rainfall, and recovery of

eroded land as results of increased vegetation cover and improvements in agricultural production. Since multiple answers are possible one respondent may choose all improvements which have been observed at village level (See Figure 4.6)**.**

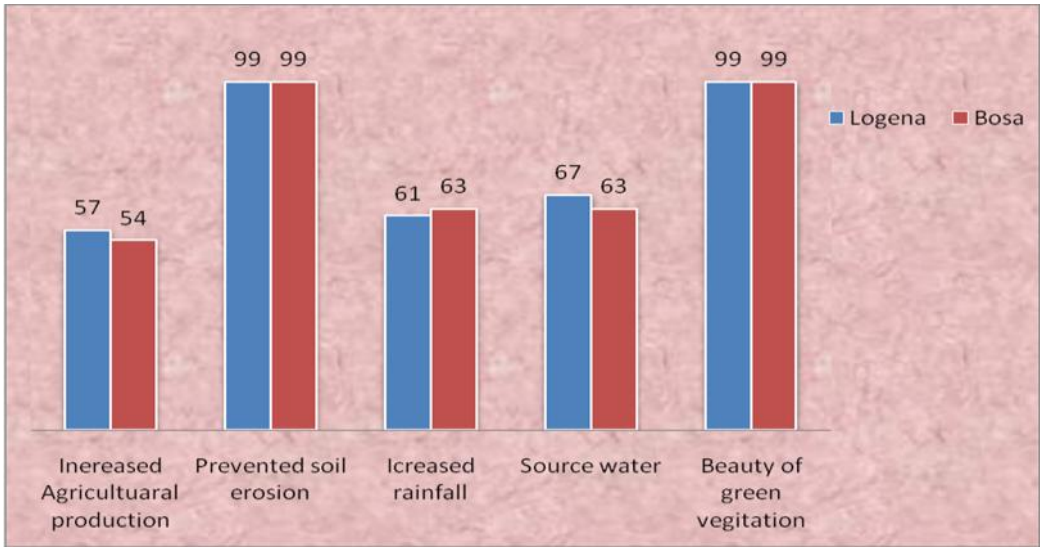


Figure 4.6 Percentage of respondents and environmental benefits observed at both villages.

The respondents were attributing the change with reduced illegal activities and disturbance to the carbon project. These perceptions were supported by expert interview and carbon project conservation committee. All respondents also mentioned that the condition of biodiversity has improved at both villages. This is due to the growing forests are dense and species regenerating vigorously. Moreover, grazing and cutting trees are totally controlled. In addition to this, in Abela Longena villages some people have replaced the usage of firewood with stoves.

On the other hand, they all explained activities like effective protection with intensive patrol and boundary demarcation, conducting forest management and conservation operations played a greater role to attain these environmental improvements.

Source: (picture taken by the researcher April, 2013).

Figure 4.7 Humbo carbon project after the commencement of the project.

According to expert interview improvements in air quality generated by reforestation extend beyond the sequestration of CO_2. He mentioned that reforestation benefits air quality in other ways. For example, trees also play a role in intercepting and filtering particulate matter in the air. Moreover, when reforestation is practiced it will be a home for valuable wildlife habitat. In turn, wildlife habitat generates forest litter, which is an important part of the food chain and enriches the soil. A forest's tree canopy moderates the temperatures of rivers and streams, which aids the survival of aquatic species. Providing habitat for endangered and threatened species is another potential benefit. He also mentioned carbon project can help remediate former degraded lands by improving water quality. Tree roots stabilize degraded land soil, which was susceptible to soil erosion. The following remark was given by one of the informants.

> *"In my father's time, there was a huge forest including fruit trees. We used to go to the mountain to collect fruit to eat and to sell. We also used to go and hunt wildlife and this was a benefit. When the trees were dense, downstream it was like a glory. But it was lost during the past time. It was a mad history. But because of this carbon project –our environment is getting more and more beautiful. All the things that we lost are coming back. Now the forest is protected, the lost life is coming back and we are expecting things to go well. We now cut grass and carry it to livestock. Temperature is decreasing and rainfall is increasing. In brief, now we enjoy good thing from the carbon project".*

All in all, there are promising results indicating carbon project activity enhance tree species diversity and local livelihoods. This study has revealed carbon project program has potential to recover the land from previous degradation through community based forest conservation. The results were observed based on trees species diversity, stocking, regeneration potentials and re growth of previous threatened species.

The expert interview also mentioned the ecosystem services decried from a forestation and reforestation other than preservation of carbon sink, like watershed and soil protection and biodiversity conversation, would also potentially enhance the socio-economic benefits of carbon project. He explained these ecosystem services indirectly contribute to a livelihood and well-being of the under privileged local communities. Meanwhile, the beneficiaries were asked to evaluate the impact of carbon project benefits for the community. Majority (80%) of respondents replied that the project has had a large impact on the community in terms of infrastructure, environmental rehabilitation and community development project. A total of 20% responded that the project had little impact, while only 1% replied that the project had no impact on the community.

4.5 Awareness about climate change and global warming

As far as awareness on issues related with climate change is concerned, 85.4% of those interviewed were aware of issues to do with climate change, 10.8% were unaware and the rest 7% were uncertain (See Table 4.5).

Table 4.5 Awareness of climate change issue

Variable	Abela Longena frequency	Percentage	Bosa Wanchi frequency	Percentage	Total frequency	Total percentage
Aware	75	86.21	60	84.50	135	85.44
Unaware	9	10.34	8	11.27	17	10.76
uncertain	3	3.45	3	4.23	6	3.80
Total	87	100.00	71	100	158	100.00

When asked about the perception as to whether carbon project can help in reducing global warming, 59.5% of the respondents agreed strongly, 25.9% agreed, 12.7% neutral another (1.9%) strongly disagreed. This implies the majority of the local people are aware of the fact that carbon project can be used to reduce global warming (See Table 4.6).

Table 4.6 perception of carbon project in reducing global warming

Variable	Abela Longena		Bosa Wanchi		Total frequency	Total percentage
	frequency	percentage	percentage	percentage		
Strongly agree	52	59.8	42	59.2	94	59.5
Agree	23	26.4	18	25.3	41	25.9
Neutral	11	12.6	9	12.7	20	12.7
Strongly disagree	1	1.2	2	2.8	3	1.9
Total	87	100	71	100	158	100

At present, global warming is a matter of grave concern. Since the late 19^{th} century, the global temperature has increased by $0.3\text{-}0.61^{0}$c, and, globally, sea levels have risen 10-15cm over the past 100 years (IPPCC, 1995) due to over population, especially in African countries, natural resources are under extreme pressure, which, cumulatively, is causing environmental problems.

4.6 Forest Management Skills, Knowledge and Education

The level of community knowledge, on the general environmental topics and especially on the forests role in climate change has improved as a result of the project. Even though 83% of interviewed people in the survey said they were aware of the forest role in climate change mitigation, only 8% gave the correct explanation. Sometimes the people found it hard to express themselves, which resulted in the ambiguous answers.

However, from the answers the researcher was able to notice a certain level of understanding of environmental process, like the interrelation between forest and water availability, forest importance in wind protection and oxygen production and similar. All the people who correctly answered this question were taking training about climate change, this again supports the idea that project has a positive influence on the local environmental knowledge.

As the survey question was formed to particularly examine the understanding of the concept of carbon project and what it signifies, high percentage of people were able to give a correct answer to this question. The most common answer was a simplified explanation of tree planting activity to get carbon payment. Some mentioned carbon project is a process of reducing emission of CO_2 from atmosphere to mitigate climate change. A few respondents were trying to relate the concept with the pollution problem in industrialized countries.

This again supports the idea that project has a positive influence on the local environment knowledge. Further more, 64% of interview answered that the main reason to protect the forest at present is the ecosystem services that the forest provided, 36% said it was payment from the project (See Figure 4.9), this result shows the change in the main incentives to conserve the forest. It appears that the community started recognizing the forest's ecosystem services as an important precondition for the community development and welfare.

4.7 Other benefits envisaged from carbon project

4.7.1 Human capital benefits in the villages area.

Human capital refers to the issues of education and skills accrued by members of community pertaining to the carbon project activities. In both study villages focus group discussion results indicated that they benefited from various training in relation to forest management and conservation. For example, some members have received training in tree nursery, beekeeping activities, and entrepreneurship skills. Some members of the communities have also benefited from agro forestry training courses.

Moreover, the project organizes the environmental education program for all members; it involves importance of the natural resources and risk of the fire and other human induced activities. Each of the community members are eligible and supported to take part in the forest protection. This indicates that the practiced carbon project is also improving human capital through various training which was not provided before the existing carbon project. Expert interview and carbon project committee mentioned that the training was facilitated by world vision and Humbo agricultural office.

4.7.2 Socio-political benefits of the project:

According to Swart and Venter (2001), development related NGOs and civil society associations share similar characteristics in terms of moral, political and social commitments towards alleviating poverty and human suffering. With this in mind, qualitative field survey methods such as focus group discussions identified relationship building as a social benefit, and they pointed training as part of the social benefits because it increased awareness and facilitated information exchange and networking.

It involves networks among the community and how well villages are able to negotiate with external environment. Furthermore, the qualitative data provided additional information about the perceptions of people concerning the social benefits of the projects. All the informants agreed that they have socially benefited from the projects in one way or another.

According to the informants at there was not a good relationship among the beneficiaries prior to the project implementation. As the result of the project intervention, the relationship among beneficiaries has strengthened. According to the informants, a sense of unity and cooperation was created among one another.

The interview with Humbo cooperative manager and stuff members acknowledge the increased socio-political attributes in their villages. They mentioned that carbon project activity has strengthened local institution.

The following remark was given by one of the informants.

> *''We all were nobody before, because we were despised. We did not have any access to natural vegetation. Each of us had wishes to help ourselves and make our families self sufficient, but we were caught in deprivation. We could not borrow money from the bank because we did not have any asset to show as collateral. But after we formed cooperatives in our villages to facilitate carbon project, we started thinking collectively and our status increased. Our unity made us legible to borrow some money from the local cooperative credit fund and saving account. We have taken a loan and now we are becoming somebody from nobody. Above all, we believe that we will not be borrowers but we will be lenders in the future because our social capital is increasing.''*

In this regard, the writings of Puntam (1993) highlight the role of social capital in development. He notes that social capital as institutions, relationships and networks shapes the quality of societies' social interactions and enables them to prosper economically. In terms of development activities, such social capital has the potential to bring about meaningful sustainable results. This view, and in accordance with the research findings, fits in with the beneficiaries understand social benefits in this case study area.

4.8 Project sustainability

A self-sustaining participatory development process is based on the mobilization of local resources, and infers continuity after project completion. In this sense, participation is fundamental to developing a self–sustaining momentum of development, which will insure

continuity of activities when outside support terminates (Penderis, 1996). Focus group discussion pointed out, HCP might be counter productive in the long run, as it influences the change of the forest conservation rationale livelihood to the monetary value of ecosystem services. This kind of equity approach adopted by the project is expected to have sustainable results in the project long-term ran ,up to 99% of interviews were aware of existence of the protected part of the forest, while 99% of them voluntarily came under the carbon project.

It emphasizes the increased role and responsibilities of the community on one hand, and the decreasing role and responsibilities of facilitators or development actors on the other hand. This should be done to ensure mutual trust and improve capabilities of community members to prepare the community for new challenges.

This entails people talking together, developing a collective intelligence, a form of 'communal wisdom', which integrates past, present and future experiences (Barton, 2000:150). One of the means of ensuring sustainability is to strengthen the collaborative efforts of the beneficiaries and the facilitators, work hand in hand and empower them before transferring the project to the target beneficiaries.

According to interview with cooperative leaders, membership to the cooperative societies (carbon project) is open to all genders groups including men, women and the youth. Majority of members are however men, since membership is based on head of household and most households are male headed. There is a provision however to recruit youth to be members of the cooperative societies. Women are not specifically targeted for leadership of the cooperative societies but have been advised by a project evaluation team to include them.

They established that members are appointed to sub-committees based on their knowledge and experience and this could be an opportunity for capable women and youth to be elected to leadership of the cooperative societies. Moreover, the existence of cooperatives in both villages is a crucial in process of involving the local people under carbon project. The offices of the study cooperative leaders are situated in project area, near to the project and the villages. This makes possible the everyday exchange of the information among leaders, committees and local community.

With regard to project sustainability, the quantitative field survey findings indicate that 95% of respondents indicated that the projects would be sustainable in the future, while only 5% responded that the project would not be sustainable. Similarly, the respondents were asked how

the sustainability of projects be maintained , the majority (76%) responded that the community would take responsibility, this is also supported by expert interview on the deliberate effort to train community members is yet another important step that WVE has instituted to ensure that communities take on project management. .Where only 13% said that don't know what would happen to the projects in the future. A total of 10% indicated that more project funds would come from the donors to continue project activities, while only 1% said that the project would come to a halt after the withdrawal of the facilitators.

4.9 Potential Risks and adverse impacts of the project

A qualitative field survey was conducted to assess the perceptions of local community on the potential risks and adverse impacts of the carbon project. Many respondents mentioned that the project may introduce wide disparities in socio-economic status of various households that may result in local conflicts and unrest. With most households being extremely poor, any household that gets an employment opportunity with the project or some other economic benefit, suddenly becomes very different from others and rises up the economic hierarchy. This does not only affects its standard of living but also generates tension amongst other households that are left behind.

According to cooperative association manager, the communities' institution promoted by the project is almost non-existent. While most of the project activities are supervised by World Vision at the moment, the long-term sustainability of the project will depend upon how well cooperative union (the local institutions) can take responsibility for managing these activities,

According to expert interview, although women play a major role in carbon project activity particularly in the area of tree nursery and other important activity, they still need to be integrated into the project activities as well as have a representation in the people's institution to have any formal say in the project of both villages.

In addition, an increase in density of forest cover may also increase the number of wild animals in the area, which are already perceived as a major threat by most people since the wild animals started destroying crops on the farm. Moreover, fire and drought are often threats to the forest.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

Humbo carbon project supports high levels of biodiversity and provides sundry ecosystem services to the local communities. In addition, as a medium carbon density land cover type, it can provide a global service as carbon store helping to mitigate climate change. The results of this study illustrate the potential socio economic value of carbon storage helps the local community. The study shows that carbon project makes a significant contribution to carbon sequestration and therefore can generate carbon credits in Humbo. It is also expected that much revenue can be earned by selling carbon credits in the carbon market through CDM project. Local community participation in carbon project is a key to stop alarming degradation. This is a win-win situation; if afforestation and reforestation is better practiced, the local communities have better access to natural resources they need for their own welfare and survival.

The observed status of carbon project tree species and the results from socio economic study are promising to enhance local livelihoods. It also enhances access to wide varieties of environmental goods and services to local communities. The carbon project offer returns in cash, consumptive use, to indirect use synergies which act as motivation for protection and conservation of forest.

The study provides bench mark information which might be useful to support sustainable management of carbon project and local livelihood improvements in Humbo and elsewhere. The payment from carbon project has been perceived by the local people as benefit for both the local community and the individual households.

The management of the money in community fund is also seen as fair. Furthermore, the local people agreed to invest the carbon payment on real priorities of the villages. The general impression is that the community level of knowledge of environmental conservation topics has increased. The meetings and trainings are organized in order to enhance the mainstream forest conservation. Even though it is still necessary to use very simple explanations when explaining the environmental processes, the increase in environmental knowledge, particularly in the climate change field is obvious.

According to the project managers, before the project started, local community did not have any knowledge on the environmental topics and global climate trends. Potential of communities to develop in a sustainable manner is influenced by raising the level of consciousness and local integration enhancement through communities' environmental education. Before the carbon project the hereditary knowledge on forest importance became weak, which resulted in local community having a less traditional attitude towards the environment.

However, the sacred value of the forest, together with the ecosystem services were the main reasons for protecting the forest in the present, and now the primary motivations are the ecosystem services and of course carbon payment. Furthermore, the carbon project activities have a potential to improve rural livelihoods and the local community welfare, as well as to enhance the mainstream forest conservation. The standing forest is more valuable in environmental, financial and cultural terms than when it is cleared for other purpose. The observed local participation and awareness on various management arrangements such as attending meetings in project related issues, forest patrol operations and prevention of forest fire incidences were fascinating. The cooperative association has opened channels for local community to communicate their priorities to the government decision makers and project developers. In addition this improved government, project developers and local communities' relationships in conservation and development arenas.

In general, the results from this study have found that, carbon project programme provided room for sustainable development of natural resources in different aspects. It ranges from existing policy framework which empowers local community to manage the forest and implement the activities based on local community interest to improving access to socio-economic returns. Implicitly, the sustainability can be signified also from established structural aspects, such as village by laws and effective carbon project committees which might increase accountability in carbon project activity with outcome on improving local livelihoods.

The practiced activity seemed to offer significant returns either in cash, consumptive use and hence, poses an opportunity to meet both developmental and conservational goals. In short the findings shows forest conservation can enhance economic development because un- degraded ecosystems supply valuable goods and services.

5.2 Recommendation

- Even though socio-economic benefits and environmental benefits have shown promising results through carbon project activities, more efforts need to be made to increase tangible benefits to the household level. This can be done through encouragement of alternatives income generating activities such as supporting household agricultural production, beekeeping projects, agro forestry, value adding to the project and agricultural products. At village level, the findings suggest strengthening of local institutional capacity to implement locally based goals and objectives as well as to negotiate better benefits from forest conservation.

- Appropriate economic institutions and mechanisms need to be established for the CDM to result in equity and sustainable development. The effects of global warming in Ethiopia show serious consequences on the economy. The quantification of carbon sequestration, by this study, can direct policymakers, researchers, and administrators in bargaining for the price of international greenhouse gas reduction, which can advance the economic, social and environmental development of Ethiopia. The study may also be useful to possible investors in CDM projects in different parts of Ethiopia.

- Another important aspect of this study is that it is also possible to use the farms to sequester carbon from the atmosphere by practicing agroforestry, as this has proved to be a vital element of carbon sequestration. Policy makers should put in place measures to ensure that most farms are titled so as to encourage people to plant more trees.

- A strong long-term political commitment by the government to prevent logging, deforestation, to manage and protect the remaining natural forests (natural production forests and protected areas) is required as a high priority.

- The problem of market for carbon and finding a buyer should be addressed extensively.

- The local community should be discouraged from destroying the natural indigenous forests.

- To see more realistic picture on community perception of the benefits coming from carbon payment. The project has to pay the carbon payment directly to the households.
- Various agroforestry activities must be promoted so that the project has a potential to raise the productivity of agricultural land. This will not only increase the overall production but may also improve the situation of food security in the area, which is very important for the local people. However, success of agroforestry will depend on how well the people are able to adapt new agricultural practices. Therefore, the government and other stakeholders have to work hand in hand in order to carry out agroforestry activities.
- Facilitating successful implementation of carbon sequestration projects in Africa requires having adequate national institutional capacity. The Kyoto Protocol requires each developing country to establish a Designated National Authority (DNA) to promote carbon projects that are aligned with national development priorities beneficial for local communities, and in support of general sustainable development goals (UNEP, 2004). The DNA serves as the point of contact between international investors and local service providers. One important factor in establishing a DNA is its institutional sustainability, reflected in its capacity to ensure a coherent, justifiable and transparent assessment of carbon projects and to generate enough revenue through these assessments to finance itself. However, there is a concern that many countries in Africa lack institutional capacity to recognize, package and promote potential opportunities for funding carbon projects. Not only there is an absence of supporting policy and legal frameworks, but some countries even lack a general awareness about carbon payment processes (Kituyi, 2002). Therefore, it is imperative to invest in capacity building of these national governments. Although organizations like UNDP and UNEP are already involved in capacity building initiatives, much remains to be done. .
- On the other hand, a downside of this strategy is a possible escalation in project overheads, which may be unacceptable to international investors. Therefore, apart from donor led efforts, host countries should also be willing to invest in capacity building. A beginning in this direction can be made through developing national level CDM/carbon programs in line with national development plans and Poverty Reduction Strategy Papers. This would ensure that carbon projects meet the goal of sustainable development for poor African countries

- African countries in general need more investments to support local livelihoods and economic development programs. Although carbon investments cannot fulfill all investment needs of these countries, nevertheless they can make significant contribution towards sustainable development in the region. Some of existing carbon sequestration projects in Africa shows that many projects are already moving towards this goal. However, Africa doesn't benefit from such projects. Multilateral donors like the World Bank would need to push for more carbon investments in the region, which may also induce other investors to follow suit.
- Finally, African countries will also need to remember that carbon projects essentially represent an emerging market and not a grant-in-aid scheme. Only those countries that are well prepared and capable of participating in this competitive market will be able to seize this new opportunity.

5.3 Areas of further research

As far as for the objectives of this study are concerned they have been covered satisfactorily. However, some other interesting areas have been identified which necessitates some attention in further research. This area includes the investigation of how carbon payment is calculated, the opportunity cost of standing forest and when it is cleared for agriculture and identifying tree species whether they are endogenous trees or not. Secondly this study was limited in two carbon project cooperatives. There is a need to assess the Socio-economic and environmental impacts of the whole Carbon project implemented in Humbo.

BIBILOGRAPHIES

Aukland L., P.M. Costa, S. Bass, S. Huq, N. Landell-Mills, R. Tipper, and R. Carr.2002. Laying the Foundations for Clean Development: Preparing the Land Use Sector. A quick guide to the Clean Development Mechanism. International Institute for Environment and Development (IIED), London.

Babbie, E & J. Mouton. (2001).The practice of Social Research. Oxford: Oxford University Press.

Bass, S; Dubois, O; Moura costa , P; pinard, M; tipper, R; and Wilson, C,(2000): "Rural livelihoods and carbon management." International Institute for environment and Development Natural Ressorce Issues , paper No 1,IIED, London

Biswal, N. (2006).Human rights,Gender and Environment.New Delhi.Viva Limited company

Brown, M., and C. Funk. (2008). Food Security Under Climate Change. Science 319:580-581.

Brown, S. and G. Gaston. (1995). "Use of forest inventories and geographic information systems to estimate biomass density of tropical forests: Application to tropical Africa." Environmental Monitoring Assessment 38, 157–168.

Bruce J. P; Lee H; and Haites E. F; (1996): "Climate Change 1995: Economic and Social Dimensions of Climate Change," Contribution of Working Group III to the Second Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge Univ. Press, New York.

Bryman, A. (2001). A social research methods. New York: Oxford University press.

Bryman, A.(2004). Social research method, 2nd ed. New York: Oxford University Press.

Burkey, S. (1993). People first. United Kingdom: Biddles LTD.

Capoor, K., Ambrosi, P. (2008). State and Trends of the Carbon Market 2008.Washington D.C. The World Bank

Chichilinsky, G. (1996). An axiomatic approach to sustainable development. Social Choice and Welfare 13 (2): 231–257.

Corbera, E., (2005). Interrogating development in carbon forestry activities: A case study form Mexico, School of Development Studies, University of East Anglia, PhD thesis.

EFAP, (1994) Ethiopian Forestry Action Program: The challenge for development. Final Report, Volume II, Ministry of Natural Resources Development and Environmental Projection, Addis Ababa

Eraker, H. (2002). CO2lonialism in Uganda. *Nor Watch Newsletter*. No. 5, 2000. http://www.norwatch.no/index.php

FAO, 2001. Global Forest Resources Assessment 2000, FAO, Rome, Italy.

FAO, 2009c. Role of forests in climate change. FAO, Rome, Italy. http://www.fao.org/forestry/53459/en/

Farley, K., le Maitre, D., McCarl, B., and Murray, B., (2005). Trading water for carbon with biological carbon sequestration. *Science*, 310(23).

Fern, K.(2001). Sinks in the Kyoto protocol, A dirty deal for forests, forest people and climate change. Fern, Brussels, Belgium.

Ferraro, J. and A. Kiss. (2002). Direct Payments to Conserve Biodiversity. *Science*. Volum 298, 29 November 2002. www.sciencemag.org

Ferrinho, H. (1980). Towards the theory of community development. Juta & comp. Ltd

Fitamo, M. (2003). Community based organizations (CBO) and development in Ethiopia. Thesis, MA. University of Cape Town, Cape Town, South Africa

Fitzgrerald, M. (1980). Urban community development in South Africa. Johannesburg: McGraw-Hill.

Frankfort- Nachumias .C and D. Nachimas,(1997). Reaserch method in the social science , 5th Edition. St Martins press New York.

Grace, J., Krujit, B., Freibauer, A., Benndorf, R., Carr, R., Dutschke, M. Federici,S. Mollicone,D. Sanz, M.J. Schlamadinger, B. Sezzi,E. WaterlooM. Valentini,R. Verhagen,J and . Putten,BV (2003.) *Scientific and Technical Issues in the Clean Development Mechanism*. CarboEurope Cluster, The European Commission.

Gutman, P. (ed.) (2003). From Goodwill to Payments for Environmental Services: A Survey of Financing Options for Sustainable Natural Resource Management in Developing Countries. World Wide Fund for Nature (WWF).

Houghton, A. (1991).Tropical Deforestation and Atmospheric Carbon Dioxide Climatic Change 19, 99-118 1991.http://gaia.agraria.unitus.it/ceuroghg/ghg.html

Ife, J. (1995). Community Development. Australia: Addison Wesley Longman LTD.

IPCC (Intergovernmental Panel on Climate Change), (2007), Climate Change 2007. The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Summary for Policy Makers.

IPCC, (1995). *Economic and Social Dimensions of Climate Change: Contribution of Woking Group III to the Second Assessment Report of the IPCC*. Intergovernmental Panel on Climate Change (IPCC), Cambridge University Press, UK

IPCC, (2000). Land Use, Land Use Change and Forestry. A special report of the IPCC, Cambridge University Press, Cambridge.

IPCC, (2001). "Climate Change Impacts, Adaptation, and Vulnerability. Cambridge University Press." Climate Change (2001)

IPCC, (2001). Intergovernmental Panel on Climate Change's Synthesis Report. Climate Change 2001, IPCC.

IPCC, (2007). IPCC Fourth Assessment Report, Working Group III. Chapter 9, Forestry.

IPCC, (2007). Synthesis report, IPCC, Geneva, Switzerland. pp. 104.

IUCN, (1995). A Sustainable World: Defining and Measuring Sustainable Development. Edited by Thaddeus C. Trzyna and Lulia K. Osborn. The World Conservation Union, and the International Center for the Environment and Public Policy, California Institute of Public Affairs, California, USA.

Jindal, R. (2004). Measuring the socio-economic impact of carbon sequestration on local communities: An assessment study with specific reference to the Nhambita pilot project in Mozambique. MSc thesis, University of Edinburgh, UK.

Jindal, R. (2008). Miombo community land use and carbon management, Nhambita pilot project. Special reports, Impact assessment of the Nhambita Community, Carbon Project, in Final report Mozambique, 4-1.

Jones, P.G and Thornton, P.K. (2003). The potential impacts of climate change on maize production in Africa and Latin America in 2055. Global Environmental Change 13:51-59.

Kifcon, J. (1994): "Kakamega Forest: The official guide," Kenya Indigenous Forest Conservation Programme, Nairobi, Kenya.

Kituyi, E. (2002). Attracting Clean Development Mechanism Projects: Prerequisites for African Governments in Clean Development Mechanism. African Centre for Technology Studies, Nairobi, Kenya. Volume 1, Number 1, July 2002.

Kumar, R. (1999) Research Methodology: a step-by-step guide for beginners. SAGE

Kurukulasuriya, P., and S. Rosenthal, (2003): "Climate Change and Agriculture: A Review of Impacts and Adaptations." ''Climate Change Series 91. Environment Department Papers," World Bank, Washington, D.C.

Lal, R. (1998). *Potential Soil C Sequestration in Sub-Saharan Africa*. Paper presented at the Workshop on Carbon Sequestration in Soils and Carbon Credits: Review and Development of Options for Semi-Arid and Sub-Humid Africa, held in 1999 at the United States Geological Survey (USGS) EROS Data Center, South Dakota, USA.

Lal, R. (2004). Soil Carbon Sequestration Impacts on Global Climate Change and Food Security. Science 11. 304: 1623 - 1627.

Lal, R. (2004). Soil Carbon Sequestration Impacts on Global Climate Change and Food Security.Science11.304 Lovell, H., Bulkeley, H., Liverman, D. M., (2008). Carbon offsetting: Sustaining Consumption? Environment and Planning A (Special issue on the carbon economy)

May, P. (2004). Local sustainable development effects of forest carbon projects in Brazil and Bolivia A view from the field, Environmental Economics Programme.

Mouton, J. & H. Marais. (2001).Basic Concepts in the Methodology of Social

Nachmias, C.F., and D. Nachmias. (1996). *Research Methods in the Social Science*. Fifth edition.

Oakley, P. (1991). Projects with people: The practice of participation in rural development. Geneva: International Labour Office.

Pandey, D. (2002). Global climate change and carbon management in multifunctional forests. Current Science. 83(5), 593-602.

Penderis, S. (1996). Informal settlement in the Helder Berg basin: people, place and community participation. University of Stellenbosch (MA thesis). Cape Town. *Practitioners-Researchers*. Blackwell Publishers, UK. publications Ltd, London

Putnam, R. (1993). Civil traditions in modern Italy. Princeton University Press.

Richards K., and Stokes C., (1995): "Regional Studies of Carbon Sequestration: A Review and Critique," Mimeo, Pacific Northwest Laboratory, Washington, DC.

Robson, C. (1993). Real World Research, A Resource for Social Scientists and Practitioners-Researchers. Blackwell Publishers, UK.

Rohit J., Swallow B., and Kerr J., (2006). Status of carbon sequestration projects in Africa: Potential benefits and challenges to scaling up. WP 26 Nairobi. World Agroforestry Centre.

Roodt, M.(2001). Participation, civil society and development: development theory, policy and practice. (eds). Coetee, J, Graff, J; Hindrick, F& Wood, G. South Africa: Oxford University Press.

Rosa, H., Kandell S., and Dimas L., (2003). Compensation for Environmental Services and Rural Communities: Lessons from the Americas and Key Issues for Strengthening Community Strategies. PRISMA, El Salvador. (www.prisma.org.sv)

Sanderson, E., & Kindon, S., Progress in participatory development: Opening up the possibility knowledge through progressive participation. Progress in development studies, (April 2000). Vol. 4. Issue 2 p114. EBSCO publication (accessed on 06/04/04).

Scherr, S., White A., Khare A., Inbar M., and Molar A., (2004). For Services Rendered. The current status and future potential of markets for the ecosystem services provided by forests. ITTO, Technical Series No. 21. International Tropical Timber Organization.Science.Pretoria:Human Science Research Council.

Smith, J. and S.J. Scherr. (2002). Forest carbon and local livelihoods: Assessment of opportunities and policy recommendations, CIFOR Occasional Paper no. 37, Bogor Barat, Indonesia.

Smith, P., D. Martino, Z. Cai, D. Gwary, H. Janzen, P. Kumar, B. McCarl, S. Ogle, F. O'Mara, C. Rice, B.Scholes, O. Sirotenko, M. Howden, T. McAllister, G. Pan, V. Romanenkov, U. Schneider. S. Towprayoon. (2007.) Policy and technological constraints to implementation of greenhouse gas mitigation options in agriculture. Agriculture, Ecosystems and Environment 118 (2007) 6–28

Sunderlin, W., Angelsen, A., Wunder, S. (2003). Forests and poverty alleviation.In Food and Agriculture Organization of the United Nations (FAO) (ed.), pp.61-73.

Tamas,A. (2000). System theory in community development. www.tamas.com/samples/source%252520docs/%System252520Theo%C920in%25252__CD.pdf (accessed on 08/25/04).

Totten, M. (1999). *Getting it Right: Emerging Markets for Storing Carbon in Forests*. World Resource Institute, Washington D.C., USA.

UNEP, (2004). *CDM Information and Guidebook*. Second edition. Edited by Myung-Kyoon Lee. Contrbutors – J. Fenhann, K. Halsnaes, R. Pacudan, and A. Olhoff. UNEP Riso Centre on Energy, Climate and Sustainable Development, Riso National Laboratory, Denmark

UNFCCC, (2002). The Clean Development Mechanism. United Nations Framework on Climate Change Convention (UNFCCC). (http://unfccc.int/cdm/index.html)

UNFCCC, (2004). Land-use, land-use change and forestry, Decision11/CP.7, UNFCCC/SBSTA (Marrakech Accords).

UNFCCC, (2009). Kyoto Protocol – Mechanisms – Clean Development Mechanism http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php

UNFCCC, (2003). Caring for Climate: A Guide to Climate Change Convention and the Kyoto Protocol. United Nations Framework on Climate Change Convention (UNFCCC), Bonn, Germany. (http://unfccc.int/resource/cfc-guide.pdf)

United Nations Environment Programme (UNEP), (2002). *The Clean Development Mechanism*. UNEP Collaborating Centre on Energy and Environment, Riso National Laboratory, Roskilde, Denmark.

United Nations Third Conference of the Parties of the Framework Convention on Climate Change (1997). Kyoto Protocol to the United Nations Framework Convention on Climate Change. United Nations, December 10.

WCED, (1987). Our Common Future or the Brundt land Report. United Nations World Commission on Environment and Development, WCED.

WCED, (1987). Our Common Future. Report of the World Commission on Environment and Development, Oxford: Oxford University Press.

Williams, S. (1995). The Oxfam handbook of development and relief. United Kingdom: Oxfam. Limited

APPENDIXES

Appendix1: List of Focus Group Discussion Participants

Sn	Name	Village	Responsibilities
1	Ayele Dola	Bosa Wanchi	Audit committee
2	Abera Tito	Bosa Wanchi	Carbon project committee member
3	Merkineh Jage	Bosa Wanchi	Vice president of the project
4	Mengistu Mekuria	Bosa Wanchi	Carbon project committee member
5	Yemane yisehaq	Bosa Wanchi	Carbon project committee member
6	Lebena Serito	Bosa Wanchi	Carbon project committee member
7	Ergena Tilahun	Abela Longena	Executive committee
8	Ergena Soreso	Abela Longena	Vice president of the project
9	Balgud Deo	Abela Longena	Saving and credit committee
10	Bulo Mena	Abela Longena	Forest protection sub committee
11	Leqa Lencha	Abela Longena	Audit committee
12	Zekarias Arico	Abela Longena	Carbon project committee member

Appendix2: Checklist for Focus group discussion

1. How do local people perceive climatic change and global warming?
2. How the community members perceive the role and function of HCSP?
3. Is every community member obliged to protect the forest?
4. What was the local community knowledge about the climate change and carbon sequestration before the project started? What is the situation now?
5. Apart from the community and people involved in the project, who else has an interest in the forest?
6. Is community association in charge of the money coming from the sold credits for reforestation and afforestation?

7. Please specify the payment scheme and the amount of money coming from the HCS? What is the percentage going to the community fund?

8. In your opinion, will payments be delivered to the local farmers?

9. Do you think that the community will continue protecting the forest after the project ends?

10 In your opinion, what are the main factors contributing to the success of your project?

11. What kind of relations exists between HCSP and the community?

12. How much money does the community get from CS scheme annually?

13. Are there any direct payments to the individual households?

14. How much money is invested for the local community for infrastructures facility?

15. Do you know where does the money to the community fund come from?

16. What are the future planed investments?

17. What kind of relationship exists between HCSP, the community members and the local administration?

18. How does non-governmental organization involve in the project ?What major roles have they played in development and poverty alleviation of local community.

19. Who is supporting HCSP and why? Is it a global agenda?

20. What are the benefits households and village get from the project?

21. How did Local communities involve in Carbon Sequestration project (CSP) implementation and design (planning)?

Appendix 3- List of interviewed stakeholders

Number	Name	Responsibilities
1	Mr.Beyene Genebo	Cooperative leader
2	Mr.Tekile Tantu	Cooperative leader
3	Mr.Genebo Bedana	Vice president of Humbo Woreda cooperative association
4	Mr.Alena Ashengo	DAS
5	Mr.Hailu Tefera	WV Environment expert
6	Mr.Meseret Melelo	DAS
7	Mr.Kebede Regasa	WV Environmental expert

Appendix 4: Checklist for interview

1. What was the condition of Humbo before the implementation of Carbon project (CP)?

2 What was the situation of local community and local livelihoods before the commencement of the project?

3. What are the main challenges and threats to carbon project (CP) and local livelihoods?

4. Possible interventions to enhance carbon project activity and improve local livelihoods

5. What is the role of carbon sequestration in reducing global warming?

6. What is the relationship between Carbon sequestration and food security in the village?

7. How do you explain Environmental conservation and protection in your village?

8. Have you experienced famine or drought while living in this village? If so, what are the direct and indirect benefits from HCSP support which might enable you to attain food security and/or improve your and your family‘s nutritional status?

9. What kind of relationship exists between HCSP, the community members and the local administration?

Appendix 5:Checklist for Household questionnaire

In center for African Studies at Addis Ababa University, I’m conducting a study entitled “Investigating the Socio-economic and environmental impacts of carbon sequestration implemented in Humbo Woreda.” For this study your valuable information and suggestions are required. These information and suggestions will be proved helpful for the local community and national interest. All the information provided by you in this regard will be kept strictly confidential. Your cooperation will be highly appreciated.

Questionnaire identification

Questionnaire No …… Date……

Name of enumerator: …….. Code……. District …… Code…….

Village……. Code…….

SECTION 1: Back ground information

1. (a) Name of respondent……
2. Gender of respondent 01=Male 02= Female
3. Age of the household head

01= 18-30 years 02= 30-40 years 03= Over 40 years

4. What level of education have you attained?

01=First cycle and below 02=Primary level

03=Secondary level 04=preparatory level 05Vocational school

5. Occupations 01Farming 02Petty trade 03Handcraft

04Retired 05Others (specify……

SECTION B: Questions on HCP implementation and design

2.1 When did carbon project start in your village? …….

2.2Who owns the project?

01World Vision 02Local communities 03 Others, please specify…….

2.3 What was the condition of your village before the implementation of the project?

01Highly degraded

02Moderately degraded

03Slightly degraded 04 I do not know

2.4 If it was degraded, (any answer from the above questions) what activities led to these degradations? (Multiple answers possible)

01Bush fire

02Encroachment by farmers to practice shifting cultivation

03Encroachment by farmers to expand settlements

04Intensive and unregulated firewood and charcoal production

2.5 Do you think the condition of biodiversity has improved after the implementation of the carbon project in your village?

01 Yes 02No

2.6 If your answer to question 2.5 is 'yes', what are the factors that have led you to this judgment? (Multiple answers possible).

01 The growing forests are dense and species regenerating vigorously

02 Illegal activities such as grazing and cutting are totally controlled

03 Lots of people have replaced the usage of firewood with stoves

04 Others, please specify_____

2.7 Are you happy with the current carbon project?

01 Very happy; no need for improvement

02Some how happy; needs some improvement

03 Not happy at all; needs major improvements

2.8 If your answer to question 2.9 is either b or c or both what do you think should be done to improve the carbon project? (Multiple answers possible).

01 More incentives should be given to villagers

02 More power and control over resources should be given to local people

03 Local institutions should be empowered

04More communication, transparency and accountability

2.9 What do you understand by participation in community based project? (Multiple answers possible). 01Attending meetings 02 Involved in group works 03 Part taking in decisions, sharing benefits and risks with others 04 I do not know what it means

2.10 How do you participate in HCS project activities?

01Voluntarily 02involuntary 03others, please specify_____

2.11 Was there any law that prohibited the cutting of forest before the project has commenced its operation?

01Yes 02 No

Explain: _____

2.12. What is the main reason of not cutting the forest at present?

_____

2.13 Have you voluntarily come under the project forest conservation measures?

01Yes 02No

2.14. In your opinion, how does the forest protection influence the village?

01Benefit 02 Loss 03 other, please specify

2.15 Did you take a part in community meetings with project management?

01Yes 02No

2.16 Do you actively participate in discussions about the forest management plan?

01Yes 02 No

2.17 Do you think the sustainability of this project will be maintained? 01 Yes 02 No

2.18 If your answer for question number 2.17 is 'yes' how is it going to be maintained in the future? 01 I expect more money to come from another place to run the project

02 It is a community responsibility to continue 03 It will stop 04 I do no what would happen

SECTION 3: Questions on Socio-economic benefits

3.1 What is the main economic activity the household head is engaged in? (Multiple answers possible).

01Crop production 02 Livestock 03 Crop production and livestock 04 Selling of forest products 05Casual employment 06 Other (specify) …….

3.2What is the main reason for engaging in the above activity? (Multiple answers possible).

01Income 02food source 03other (specify)……

3.3 What is the main source of food for your household?

01 Own-farm production 02through purchase 03other (specify)

3.4 Do you produce enough food to sustain your family the whole year?

01Yes 02No

3.5 If your answer for question 3.4 is "No", how do you sustain your family during food scarcity time?.....

……..

3.6 Do you think the practiced carbon project activity can increase agricultural productivity in your village?

01 Yes 02 No

Explain…….

……

3.7 Did your village receive carbon payment? 01 Yes 02 No

3.8 If your answer for question number 3.7 is 'Yes' for what purpose the money was used?

01 Project development 02 shared among the community 03 Others, please specify

3.9 Is the carbon project important to support you and the family?

01Yes 02No

3.10 If your answer to question 3.9 is yes, please rank according to important in livelihood support beneficial at household level

01Fuelwood energy 02Medicinal use 03Food and Fruits
04Beekeeping activities 05Money earned from carbon trade

3.11 Are there any carbon project revenue benefit sharing mechanisms between village and government?

01Yes 02No

Explain……...

3.12 How do you find the distribution of the income from HCP at the village level?

01Faire 02Unfair 03 Others, please specify

SECTION 4 Question on Environmental benefits.

4.1 Do you think the condition of biodiversity has improved after the implementation of the carbon project in your village?

01Yes 02No

4.2 If your answer to question 2.5 is 'yes', what are the factors that have led you to this judgment? (Multiple answers possible).

01The growing forests are dense and species regenerating vigorously

02 Illegal activities such as grazing and cutting are totally controlled

03 Lots of people have replaced the usage of firewood with stoves

04Others, please specify_____

4.3What specific activities are performed to attain this improvement? (Multiple answers possible).

01Effective protection with intensive patrol and boundary demarcation

02Conducting Forest management and conservation operations are jointly conducted

03Local people are getting what they need from the project regularly

04 Others, please specify_____

4.4 Are there other benefits that are accrued from carbon sequestration project at village level?

Yes No I've no idea

4.5 If your answer for question number 4.4 is 'yes', which benefit has been observed at the village level? (Multiple answers possible).

01Improvement in agricultural production

02Prevention of soil erosion

03Prevention of shortage of water

04 Increased rainfalls

05Natural beauty of biodiversity

4.6Are you aware of issues to do with climate change?

01Aware 02Unaware 03 Uncertain

4.7 Do you think that planting trees can help reduce global warming?

01Strongly agree 02 Agree 03 Neutral 04Disagree 05 strongly Disagree

4.8Do you know how carbon project is contributing to cleaning air pollution?

Yes No

Explain_____

4.9 How do you evaluate the benefits of environmental goods and services at your village?

01 Large impact 02 little impact. 03 No impact

Appendix 6 - Survey questionnaire in Amharic

የተጠያቂዎች መረጃ

በአዲስ አበባ ዩኒቨርስቲ በአፍሪካ ጥናት በ “Human and Economic Development” **የት/ት መስክ በ ሁምቦ ወረዳ የተተገበረው “የካርቦን ፕሮጀክት በማህበረሰብ ኢኮኖሚ እና አካባቢ ላይ የሚያሳድረውን ተጽኖንን ለመመርመር” በሚል ጥናት እያካሄድኩኝ እገኛለሁ፡፡ የእርሶ መረጃ እና አስተያየት ለዚህ ጥናት ከፍተኛ አስተዋጽኦ አለው፡፡ ትክክለኛ መረጃ እና አስተያየት መስጠት ለአካባቢው ማህበረሰብ እና ለአገር የጐላ ጠቀሜታ አለው ተብሎ ይገመታል፡፡ ስለዚህ ሁሉም እርሶ የሚሰጡት መረጃ በጥብቅ በሚስጥር ይያዛል፡፡ በቅድሚያ ለትብብረዎት እጅግ ከፍተኛ አድናቆትን እገልጻለሁ፡፡**

- **የመጠይቅ ቁጥር----------** **ቀን ----------**

- **የመገጋቢ ስም ----------**
- **መንደር----------**
- **ወረዳ ----------**

ክፍል 1 እውነተኛ መረጃ

1.1 **ፆታ** 01 **ወንድ** 02 **ሴት**

1.2 **ዕድሜ** 01 **ከ**18 **ዓመት በታች** 02 **ከ**18-30 03 **ከ**30-40 04 **ከ**40 **ዓመት በላይ**

1.3 **የትምህርት ደረጃ** 01 **የመጀመሪያ ሣይክል እና ከዚያ በታች** 02 **አንደኛ ደረጃ**

03 **ሁለተኛ ደረጃ** 04 **መሰናዶ** 05 **ቴክኒክና ሙያ**

1.4 **ሥራ** 01 **ግብርና** 02 **አነስተኛ ንግድ** 03 **የእጅ ሙያ**

0.4**ጡረታ** 05 **ሌላ ካለ ይጥቀሱ**

2. <u>የካርቦን ፕሮጀክት አፈጻጸም ጥያቄ</u>

2.1በወረዳዎት የካርቦን ፕሮጀክት የተጀመረው መቼ ነው? _____

2.2 የፕሮጀክቱ ባለቤት ማነው?

2.3 ይህ ፕሮጀክት ከመፈጸሙ በፊት በመንደራችሁ የነበረው ሁኔታ እንዴት ነበር? (ከአንድ በላይ መልስ መምረጥ ይቻላል።)

☐ 01. በከፍተኛ ሁኔታ ተራቁቷል

☐ 02. በመካከለኛ ሁኔታ ተራቁቷል

☐ 03. በትንሹ ተራቁቷል

2.4 የተራቆተ ከሆነ (ለጥያቄ 2.3 ማንኛውም መልስ) ለዚህ መራቆት ምክንያት ሊሆን የሚችለው የትኛው ነው?(ከአንድ በላይ መልስ መምረጥ ይቻላል።)

☐ 01. የሳር ቃጠሎ

☐ 02. የአርሶ አደሮች ምርት ለማምረት ሲባል የቦታ ለውጥ በየጊዜው ማድረግ

☐ 03. አርሶ አደሮች ይዞታቸውን ለማስፋፋት የሚያድርጉ ድርጊት

☐ 04. ከፍተኛ እና ቁጥጥር የሌለው የማገዶ እንጨት እና የከሰል ምርት

2.5 በመንዳራችሁ የካርቦን ፕሮጀክት አፈጻጸም በኋላ የእጽዋት እና የእንስሳት ሁኔታ ተሻሽሏል ብለው ያስባሉ?

☐01. አዎ ☐ 02. አይደለም

2.6 የ2.5 ጥያቄ አዎ ከሆነ ይህንን ሀሳብ ለመስጠት ያደረጉት ነገር ምንድነው?

☐ 01. የሚያድጉ ደኖች ጥቅጥቅ ያሉ እና በከፍተኛ ሁኔታ ዘራቸውን የሚተኩ ናቸው።

☐ 02. ሕገ ወጥ ድርጊቶች እንደነ ግጦሽ እና የደን ቁፍቁፋ ሙሉ በሙሉ ቁጥጥር ስር ውሏል

☐ 03. ብዙ ሰዎች የማገዶን እንጨትን ከመጠቀም ይልቅ ምድጃን መጠቀም ጀምሯል

□ 04. ሌላ ካለ ይጥቀሱ

2.7 አሁን ባለው የካርቦን ፕሮጀክት ደስተኛ ነዎት?

□01. በጣም ደስተኛ ነኝ ማሻሻያ አያስፈልገውም

□02. በከፊሉ ደስተኛ ነኝ ግን ማሻሻያ ያስፈልጋል

□03. ሙሉ በሙሉ ደስተኛ አይደለሁም ብዙ ማሻሻያ ያስፈልጋል

2.8 የ2.7 ጥያቄ መልስ ለ ወይንም ሐ ወይንም ሁለቱም ከሆነ የካርቦን ፕሮጀክቱን ለማሻሻል መደረግ ያለበት ነገር ምንድነው ብለው ያስባሉ? (ከአንድ በላይ መልስ መምረጥ ይቻላል፡፡)

□ 01. ለማኅበረሰቡ ተጨማሪ ማበረታቻዎች መሰጠት አለበት

□ 02. የበለጠ ሀብት ቁጥጥር እና ስልጣን ለአካባቢ ሕብረተሰብ መሰጠት አለበት

□ 03. የአካባቢ አስተዳደሮች ስልጣን ሊሰጣቸው ይገባል

□ 04. የበለጠ ግንኙነት፣ ግልጽነት እና ተጠያቂነት ያስፈልጋል

2.9 በማኅበረሰብ አቀፍ ልማት ላይ መሳተፍን እንዴት ያዩታል

□ 01 የስብሰባ ላይ ተሳትፎ

□ 02 በቡድን ሥራ ላይ መሳተፍ

□ 03 በተለያዩ ጉዳዮች ላይ ወሳኔ መስጠት የጥቅም ክፍፍል ፣ ችግሮችን ማስወገድ

□ 04 ሀሳብ የለኝም

2.10 በካርቦን ፕሮጀክቱ ሥራ ውስጥ እንዴት ነው የተሳተፉት?

□ 01. በፈቃደኝነት □ 02. ያለፈቃድ □03. ሌላ ካለ ይጥቀሱ

2.11 ፕሮጀክቱ ከመጀመሩ በፊት የደን ጭፍጨፋን የሚከለክል ሕግ ነበረን?

□ 01. አዎ □ 02. አይደለም

ያብራሩ?

2.12 በአሁኑ ጊዜ ለደን ሞፍጨፋ ዋና ምክንያት ምንድነው?----------

2.13 የደን ጥበቃ ፕሮጀክትን በፈቃደኝነት ይቀላቀላሉ?

□ 01. አዎ □ 02. አይደለም

2.14 በእርሶ አስተያየት የደን ጥበቃ ፕሮጀክት በመንደሩ ላይ የሚያሳድረው ተጽኖ እንዴት ነው?

□01. ጠቃሚ □ 02. ጎጂ

2.15 በፕሮጀክት አመራር የማህበረሰብ ስብስባዎች ላይ ይሳተፋልን?

□ 01. አዎ □ 02. አይደለም

2.16 በደን ቁጥጥር እቅድ ውይይት ላይ በንቃት ይሳተፋልን?

□01. አዎ □02. አይደለም

የማህበረሰብ-ኢኮኖሚ ነክ ጥያቄዎች

3.1 የቤተሰብ አባወራ የሚሳተፍበት ዋና የገቢ ማስገኛ ምንድነው? (ከአንድ በላይ መልስ መምረጥ ይቻላል፡፡)

□ 01. እህል በመዝራት □02. የእንስሳት እርባታ □ 03. የደን ምርቶች ሽያጭ

□ 04. ቋሚ ሠራተኝነት □05. የቀን ሠራተኛ □ 06. ሌላ ካለ ይጥቀሱ

3.2 ከላይ በተጠቀሰው ሥራ ላይ የተሳተፈበት ዋና ምክንያት ምንድነው?

□ 01. ገቢ □ 02. የምግብ ምንጭ □03. ሌላ ካለ ይጥቀሱ

3.3 ለቤተሰቦት ዋና የምግብ ምንጭ ምንድነው?

□01. የግል የእርሻ ምርት □02. በግዢ የሚገኝ ምርት □03. ሌላ ካለ ይጥቀሱ

3.4 አመቱን በሙሉ ቤተሰቦትን ለመመገብ በቂ ምርትን ያመርታሉ?

□ 01. አዎ □ 02. አይደለም

3.5 የ3.4 ጥያቄ መልስ አይደለም ከሆነ በምግብ እጥረት ወቅት ቤተሰቦትን እንዴት ይመግባሉ?

3.6 በእርስዎ አመለካከት የተተገበረው የካርቦን ፕሮጀክት የግብርና ምርት እንዲሻሻል አድርጓል ብለው ያምናሉ? ☐ 01 አዎ ☐ 02 አይደለም

ያብራሩ _____

3.7 እርስዎ በሚኖሩበት መንደር የካርቦን ክፍያ ተፈፅሟል?

☐ 01 አዎ ☐ 02 አይደለም

3.8 የጥያቄ ቁጥር 3.7 መልሶ አዎ ከሆነ ገንዘቡ ለምን ጥቅም ውሏል?

☐ 01 ለአካባቢ ልማት ☐ 02 ለአባላት ተከፋፍሏል ☐ 03 ሌላ ካለ ይጥቀሱ

3.9 የካርቦን ፕሮጀክቱ እርሶን እና ቤተሰቦትን ለመርዳት ጠቃሚ ነውን?

☐ ሀ. አዎ ☐ ለ. አይደለም

3.10 የ 3.9 መልሶ አዎ ከሆነ በቤተሰብ ደረጃ ለኑሮ ድጋፍ ካላቸው ጠቃሚታ አንፃር ሚከተሉትን በደረጃ ያስቀምጡ፡፡

☐ 01. የማገዶ እንጨት ☐ 03. ምግብ እና ፍራፍሬዎች

☐ 02. ለመድኃኒት ጠቀሜታ ☐ 04. የንብ እርባታ ሥራዎች

☐ 05. ከካርቦን ንግድ የሚገኝ ገንዘብ

3.11 በመንደር ደረጃ ከካርቦን ፕሮጀክት የሚገኝ ገቢ ክፍፍልን እንዴት ያዩታል?

☐ 01. ፍታዊ ነው ☐ 02. ፍታዊ አይደለም

4. አከባቢ ነክ ጥያቄዎች

4.1 በመንዳራችሁ የካርቦን ፕሮጀክት አፈጻጸም በኋላ የእጽዋት እና የእንስሳት ሁኔታ ተሻሽሏል ብለው ያስባሉ?

☐01. አዎ ☐ 02. አይደለም

4.2 የ 4.1 ጥያቄ አዎ ከሆነ ይህንን ሀሳብ ለመስጠት ያደረጉት ነገር ምንድነው?

☐ 01. የሚያድጉ ደኖች ጥቅጥቅ ያሉ እና በከፍተኛ ሁኔታ ዘራቸውን የሚተኩ ናቸው፡፡

□ 02. ሕገ ወጥ ድርጊቶች እንደነ ግጦሽ እና የደን ጭፍጭፋ ሙሉ በሙሉ ቁጥጥር ስር ውሏል

□ 03. ብዙ ሰዎች የማገዶን እንጨትን ከመጠቀም ይልቅ ምድጃን መጠቀም ጀምሯል

□ . ሌላ ካለ ይጥቀሱ

4.3 ይህንን ማሻሻያ ከግብ ለማድረስ ሊሰሩ የሚገቡ ሥራዎች ምንድናቸው?(ከአንድ በላይ መልስ መምረጥ ይቻላል፡፡)

□ 01. ከፍተኛ ሰፊራ እና የድንበር ወሰን ጥበቃ

□ 02. የደን ቁጥጥር እና ጥበቃ ሥራዎች በጋራ መስራት

□ 03. የአካባቢ ሰዎች ከፕሮጀክቱ የሚፈልጉትን ነገር በየጊዜው እንዲያገኙ ማድረግ

□ 04. ሌላ ካለ ይጥቀሱ _____

4.4. በካርቦን ፕሮጀክት ውስጥ የሚገኙ ሌሎች ጥቅሞች አሉ?

□ 01. አዎ □ 02. አይደለም □ 03. ሀሳብ የለኝም

4.5 አዎ ከሆነ በመንደር ደረጃ የታየ ጥቅም ምንድን ነው? (ከአንድ በላይ መልስ መምረጥ ይቻላል፡፡)

□ 01. የግብርና ምርትን ማሻሻል

□ 02. የአፈር መሸርሸርን መከልከል

□ 03. የውሃ እጥረትን ማስወገድ

□ 04. መሰረተ ልማትን ማሻሻል

□ 05. አረንጓዴ በማየት እርካታን ማግኘት

4.6 የአየር ንብረት ለውጥ ጉዳዬች እና ችግሮች ያውቃልን?

□ሀ. አዎ □ለ. አይደለም

4.7 የካርቦን ፕሮጀክት አለማቀፍ የሙቀት መጨመርን ለመቀነስ ይረዳል ብሎ ያስባሉን?

□ 01. አዎ □02. አይደለም

4.8 ደኖች ያካባቢ ብክለትን በማስወገድ አስተዋጽኦ እንዴት እንደሚያደርጉ ያውቃሉ?

□01. አዎ □02. አይደለም ያብራሩ

4.9 የካርቦን ፕሮጀክቱ ለአከባቢ ማህበረሰብ ጥቅም አንጻር እንዴት ይገመግማሉ?

□ 01. ተጽኖ የለውም □ 02. ትንሽ ተጽኖ አለው □ 03. ከፍተኛ ተጽኖ አለው

DECLARATION

I declare that the thesis entitled: The socio-economic and environmental impacts of the implementation of carbon sequestration in Humbo, SNNPR, Ethiopia, is my own work, it is a record of my research work and has not been presented to any institution or to publication. All sources used or cited have been duly acknowledged as complete references.

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