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HOUSEHOLDS PARTICIPATION AND EQUITY OF BENEFIT SHARING OF PAYMENTS FOR ECOSYSTEM SERVICES OF HUMBO CLEAN DEVELOPMENT MECHANISM PROJECT IN WOLAIYTA, ETHIOPIA

DESALEGN DAWIT

A THESIS SUBMITTED TO THE DEPARTMENT OF CENTER FOR ENVIRONMENT AND DEVELOPMENT

PRESENTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF ARTS IN ENVIRONMENT AND DEVELOPMENT

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School of Graduate Studies

This is to certify that the thesis prepared by Desalegn Dawit, entitled: *Households Participation and Equity of Benefit Sharing of Payments For Ecosystem Services of Humbo Clean Development Mechanism Project in Wolaiyta, Ethiopia:* and submitted in partial fulfillment of the requirements for the Degree of Masters of Art in Environment and Development complies with the regulations of the University and meets the accepted standards with respect to originality and quality

Signed by the Examining Committee:

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Chair of Department or Graduate Program Coordinator

The

Abstract

Households Participation and Equity of Benefit Sharing of Payments for Ecosystem Services of Humbo Clean Development Mechanism Project in Wolaiyta, Ethiopia

Desalegn Dawit

Addis Ababa University, Oct 2012

The Humbo Clean Development Mechanism project is the only project in the country among other burning issues of the government in climate change mitigation process through using payments for ecosystem services of forest regeneration. However its success depends on inclusion and exclusion norms, participation of the local households in forest management, fair share of benefits and costs, status of institutional setup and intuition of property rights. Thus, this study concentrates on the analysis of socio-economic determinants of local household participation, equity of benefit sharing and status of institutional setup on the service provision of the project. This study adopted descriptive statistics, Lorenz Curve, benefit cost analysis and econometric models to analyze survey data collected from 157 sample households of the project. The result shows that irregular participants gain more than their fair share of labor at expense of regular participants and, distribution and sharing of benefits and costs are not perfectly equitable. In addition to that level of participation negatively determined by gender discrimination, state of agro-ecology, level of annual net benefit share, distance to forest site, unwillingness to invest the fund on public goods and other source of income while attending on meeting and literacy level increased participation thereby increasing annual earrings of local households. Furthermore, the highest benefit shares from forest regeneration using Clean Development Mechanism of Payments for Ecosystem Services goes to the rich households and the poor earn less for their fair share of labor.

Key Words: Household Participation, Equity, Benefit and Cost, Payments for Ecosystem Services, Clean Development Mechanism, Humbo

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Acronym

ARDFCO	= Agricultural, Rural Development and Forestry Development Coordination Office
CBNRM	= Community Based Natural Resource Management
CDM	= Clean Development Mechanism
CIFOR	= Center for International Forestry Research
CSA	= Central Statistics Authority
CTO	= Carbon Offset Certificates
ES	= Ecosystem Services
ETB	= Ethiopian Currency Birr
FAO	= Food and Agricultural Organization
GEF	=Global Environmental Facility
GTZ	= Germen Development Agency
HANRP	= Humbo Assisted Natural Regeneration Project/Reforestation
HH	= Household
MA	= Millennium Ecosystem Assessment
MDG	= Millennium Development Goals
MLH	=Maximum Likelihood
NGOs	= Non-Governmental Organization
PES	= Payments for Ecosystem Services
REDD	= Reducing emissions from deforestation and forest degradation
SNNP	= Southern Nations Nationalities Peoples Region
UNFCCC	= United Nations Framework Convention on Climate Change
WVE	= World Vision Ethiopia

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Chapter One

1. Introduction

1.1. Background

In many developing countries CDM has been started after the commencement of Kyoto Protocol in 2005 to fund the natural regeneration/afforestation and reforestation so as to sink carbon from the atmosphere as climate change mitigation. This leads to the provision of ecosystem services through CDM project and it also needs payments in order to sustain the services (UNFCCC, 2008).

In addition to that CDM aimed to maintain sustainable development in developing countries in reducing the cost of complying with the provision of the Kyoto Protocol for developed nations by preventing unsafe interface with the climate system as climate change mitigation. This would facilitate efficient and equitable payments for ecosystem service for the entire world and especially for developing countries to establish their development technologies environment friendly (Board, 2004).

Likewise, regulation of ecosystems motivation and economic incentives are very important in PES. This is because environmental economics concentrates on efficiency of PES in order to force ecosystem service in to the market model in order to bring about sustainable development. Conversely, ecological economics need to adjust prioritization of ecological sustainability of economic institutions to the physical characteristics (Farley and Costanzia 2010).

However, forests provide a range of ecosystem services, which today have little direct cash-generating value but do have significant indirect economic value to people's livelihoods. But lack of cash compensation for the benefits from ecosystem services leads to forest degradation and deforestation, often with disastrous environmental and

social effects. Conversely, income from payments for ecosystem services, when appropriately structured, leads to the preservation and regeneration of forest resources. Carbon sequestration in forest systems is rapidly becoming the primary ecosystem service for which a sizeable market is emerging (Steven and Leslie, 2009).

A forest carbon credit represents either the removal of carbon from the atmosphere and storage in the form of biomass (e.g. wood and long-lived wood products) in quantities larger than would otherwise occur under "business as usual" (baseline) practices, or the reduction of the loss of biomass that would have normally occurred under the "business as usual". Economically rewarded functions of non-carbon ecosystems, poverty reduction and other socio-economic co-benefits are important in carbon credit amalgamation. However, a valid carbon project requires the development of specific project activities that reduce greenhouse gas emissions versus the business-as-usual standard (Steven and Leslie, 2009).

Carbon sequestration services are involved in numerous market transactions in the world and are the focus of several Payments for Ecosystem Service (PES) schemes. Carbon sequestration occurs when trees or other vegetation absorb carbon contained in the atmosphere during their growth. Conversely, forest destruction releases carbon into the atmosphere. As a consequence, carbon sequestration may involve two types of services: active absorption through reforestation or avoided emissions through conservation of forest cover (Mayrand and Paquin, 2004).

Although PES instruments primarily are developed to improve the efficiency of natural resource management and to realize environmental objectives, the effect on income redistribution is often an important side objective, especially in developing

countries since those who provide environmental services often constitute the poor groups in society, the same is true in the case of Ethiopia (Hengsdijk, et al, 2008).

1.2. Statement of the Problem

Ethiopia becomes the first country to be registered in Clean Development Mechanism (CDM) projects in Africa using Humbo Natural Regeneration project of forest. This shows that Africa had been left behind accounting only for less than 2% of the projects registered under CDM. But now the registered project is greater than 2.5% in Africa (Nussbaumer, 2006).

Its immense potential for carbon projects has not become well exploited due to the lack of efficient and easily accessible carbon market and fair payments for ecosystem services, especially for regeneration and existing forests. Not only this, integration of other ecosystems services like biodiversity, water, soil quality etc. but also has not yet been organized to bring about holistic potential carbon deal in the country level. The Humbo CDM project is one of the attempts of the country to bring about sustainable development with respect to social, economic, political and cultural reputation to the local community specifically and to the country as a whole.

Despite, this fact of Humbo CDM project, it is owned by community and organized in cooperatives, with the challenges of free riders, inefficient (irregular) participation in forest management, inclusion and exclusion (benefit distribution), and impressive need of local households to materialize carbon sale fund for individual purpose rather than investing it on public goods are the most crucial ones.

On the other hand, efficiency and equity of the ecosystem services payments in the study area with regard to benefit distribution and competency in changing the local HHs living standard and in reducing poverty using CDM project as climate mitigation was not clearly identified by the local community and scaled up to the other parts of the country.

Consequently, it is imperative to undertake this study by giving emphasis on efficiency and equities of Payments for Ecosystem Service (PES) at Humbo Assisted Natural Regeneration Project/Reforestation (HANRP) or Clean Development Mechanism (CDM) and other related problems. Specifically, it highpoints on the paradox of benefit cost distribution to characterize its efficiency, distribution of the benefit cost issues to portray its equity among the local community, state of local community participation in forest management, impact of property right and institutional setup in forest management and the role of CDM in reducing local household poverty.

1.3. Objectives:

The general objective of this study is to evaluate local household participation and equity of benefit sharing of Payments for Ecosystem Services (PES) in Ethiopia using the case of Humbo Clean Development Mechanisms (CDM) Project the efficiency and equities (equitable distribution of remuneration) of Payments for Ecosystem Services (PES) in Ethiopia using Humbo Clean Development Mechanism (CDM) Project in order to adopt the trends and to scale-up the program to potential sites of the country.

1.3.1. Specific objectives:

1. To analyze equitable distribution (sharing) of benefits and costs of CDM project to the local households
2. To analyze the level of participation of local households with the CDM project
3. To analyze how the property right and institutional setup affected the provision of the ecosystem services;

Research Question

1. Is there any inclusion and exclusion (distributional issues) problem with regard to benefits? Is there equitable distribution of the benefits and costs among the individuals?
2. Is the local household regularly participating with the CDM project?
3. How do property rights and institutional setup, affect the provision of services?
4. What are the significant impacts of income from carbon trade in alleviating local household's poverty?

1.4. Significance of the Study

The results of this study would enable to expand and undertake the community forest management program in the other part of the country in order to increase the coverage of the forest thereby increasing provision of ecosystem service and goods to the community and carbon sequestration. Examining the household participation and equity of benefit sharing of Payments for Ecosystem Services (PES) can help in rearranging the distribution of benefits among the community and would facilitate how to use the return they earned from carbon trade. Most of the time tragedy of commons is a bottleneck of effective and efficient management of common goods of

ecosystem service and goods. Therefore, the findings of this study may help in suggesting possible policy directions to expand the carbon project program of the frost ecosystem services and goods; and may enable the equitable distribution of the benefits, participation, and property right in the country wise. Finally, it may help in articulating almost the exact estimation for the expansion of CDM project and PES in the country and may help in leading to undertake further research.

1.5. Scope of the Study

The study was focused on examining the household participation and equity of Payments for Ecosystem Services (PES) in the case of the Humbo CDM project of Wolayta zone in the SNNP region. It was concentrated on household participation and equity of the PES in the faces of participation of the community, property right, distribution of benefit, free riders problems etc. But this may not exactly express appropriately to the overall parts of the country rather it would help as a model to scale up the program estimation error. Thus, the result of the study needs to be applicable to the study area and to areas where similar agro-ecological zones and socio-economic profiles.

Chapter Two

2. Literature Review

Even though divers PES strategies for natural forest regeneration have been successively operating for some time, there are barriers for wide application. Among this land tenure system, carbon right, destruction and deforestation of hotspots, uncertain and contested land right are the major one (Angelsen, 2009). Property right leads to conflict for example, in Indonesia community-company conflicts due to firm non-compliance occurred in 50 percent of cases surveyed (Engel and Palmer, 2005).

2.1. Definitions and concepts of Payments for Ecosystem Service (PES)

Payments for ecosystem services (PES) characterize a new, more direct way to promote natural resources conservation. It is stated as a voluntary, conditional agreement between at least one "seller" and one "buyer" over a well-defined environmental service—or a land use presumed to produce that service (Wunder, 2005).

According to Center for International Forestry Research CIFOR's field work, there are five criteria that designed on the bases of theoretical literature so as to use it as a working prescriptive definition of the PES principle (Wunder, 2005). It is a voluntary transaction in which a well-defined environmental service (or a land use likely to secure that service) is "bought" by a (minimum of one) buyer from a (minimum of one) provider if and only if the provider continuously secures the provision of the service – conditionality (Wunder, 2007).

2.1.1. Households Participation Adeptness of PES Schemes

Some features of PES systems may affect their ability to reach the environmental goal and adeptness – price at which the goal is achieved. Among these some of the following are the major ones. These are identifying beneficiaries and generating demand, generating revenues for services providers, establishing scientific knowledge and valuing ecosystem services, understanding the legal and policy environment, establishing an institutional structure, financing the PES system, managing transaction costs, etc. via household's participation in forest management processes and benefit from CDM project (Wunder, 2007).

For biodiversity buyers it may be best to keep a diversified portfolio, acting on both current and projected threats. A PES scheme needs to strike some balance between short-term efficiency in participation and fairness of benefit sharing among the community, the latter influencing long-run conservation viability. But it seems certain that neither the community that fully safeguards its environment nor the impoverished farmer too poor to do much damage will emerge on the scene as major sellers of environmental services (Mayrand and Paquin, 2004).

On the other hand, carbon sequestration services are reasonably well-defined and global in scope, with most demand originating from private firms in Europe and Japan. However, the price and value of services is still subject to much ambiguous, given the current status of the Kyoto Protocol, but the uncertainty disappeared later on (Kyoto Protocol, 2005). This raises the risk associated with this market and contributes to limiting demand for carbon sequestration services. Nevertheless, international organizations, private firms, governments and conservation NGOs are all active in this market (Mayrand and Paquin, 2004).

In the case of biodiversity services, it may be more difficult to identify beneficiaries who are willing to pay for the protection of ecosystems, species, or genetic diversity through participatory forest management. So far demand has mostly originated from international conservation organizations and the Global Environmental Facility (GEF). The most important limitation in that context is that financing may be provided in the form of one-shot deals that do not provide a continuous flow of payments over time (Mayrand and Paquin, 2004).

2.1.2. Equity

Equity indicates that assimilating and integrating local measurements, national monitoring estimates, international requirements and independent reviews to ensure participation and transparency among all involved. Equity is a concern whether rules and compensation are centralized or decentralized, but marginalized groups, such as indigenous organizations, may have more influence at the national – and international – scale, rather than in contested forests management system (Zbinden and Lee, 2005).

Conditionality is the key feature of PES: payments will only be made if the service provider complies with the contract. In practice, imperfect 'PES-like' transactions are more common than 'pure PES' that meet all the conditions (Wunder 2005). But 'voluntary provider participation' and especially 'conditionality' are essential features: PES represents a new paradigm of 'contractual conservation'. Unlike regulatory approaches (e.g., command and control tools, protected areas), PES schemes incorporate direct checks and balances on welfare and equity: if local people feel they will be disadvantaged by a conservation deal, they can simply decide not participate PES transactions have included conserving watersheds, protecting

biodiversity, preserving scenic landscapes and capturing and storing carbon (Landell-Mills and Porras 2002; Wunder *et al.* 2008b).

2.2. Benefits of Other Ecosystem Services

Ecosystem services (ES) are the benefits people obtain from ecosystems, among which it is possible to distinguish between supporting, provisioning, regulating and cultural services (Millennium Ecosystem Assessment, 2005). Accordingly ecosystem services classified in to four categories of benefits: 1) *provisioning services*, e.g. food, water, timber and genetic resources, 2) *regulating services*, e.g. the regulation of climate and flooding, 3) *cultural services*, e.g. recreation and aesthetic enjoyment, 4) *supporting services*, e.g. soil formation, pollination and nutrient cycling

Therefore, carbon fixation is the only of the three ES which, per definition, can be considered an ES (i.e., a climate regulation service). In contrast, biodiversity conservation is a human intervention directed towards the protection of diverse or characteristic ecosystems, organisms or genetic pools, the existence and interactions of which may provide specific ES. In turn, agro-forestry systems are a product of an active management of human-designed and potentially bio-diverse ecosystems, which can enhance critical ES (Corbera, et al, 2009), and also the forestry law explicitly recognizes four environmental services provided by natural forests and forest plantations: (a) carbon sequestration, (b) protection of watersheds, (c) biodiversity conservation, and (d) the provision of scenic beauty (Zbinden and Lee, 2005).

2.3. Distributions of Benefits and costs from PES

When local governance institutions are not downwardly accountable to the community and benefits are disproportionately captured by local elites. The distribution of local benefits and costs including opportunity costs of Community Based Natural Resource Management (CBNRM) can also be influenced by the nature of benefits generated and costs incurred and how individuals are able to gain access to them. In some cases the principles that govern the distribution of benefits and costs are built into CBNRM systems, as in Namibia (Roe, et al. 2009).

PES income is obviously only a stable source if the PES scheme is ongoing, which depends on factors such as financial sustainability and the satisfaction of buyers with the provision of environmental services and (Lee and Mahanty, 2009) in return the service is also becomes persistent if and only if the service providers satisfied.

2.4. The Role of Property Right and Effectiveness of PES

Introducing suitable property rights rules is essential for implementing PES systems. For example, common property asset trusts are one way to effectively do this. According to Coase Theorem if private property rights are clearly defined by enforceable contracts, then the generator and recipient of an externality can, through voluntary exchange, potentially reach an agreement that maximizes social welfare. Furthermore, the ultimate level of the externality generating activity will not be affected by the initial assignment of property rights. Many proponents do accept some role for government intervention, most stress defining property rights, creating enforceable contracts, and reducing transactions costs. They also frequently claim that

private sector PES schemes are more effective and efficient than public sector ones (Wunder et al., 2008).

For market-like PES exclusion is precondition for any structure of measurement and hence for market-like PES. In contrast non-excludable resources are open access by definition. Institutions are the resultants of property rights by making enforcement supports via sufficient monitoring expertise or technologies and hence a vibrant policy variable. There are various institutional arrangements that can lead to a Varity of types of property rights and different types of PES (Farley and Costanza, 2010).

However, property rights need not be private: for example, in Mexico, payments are made to Ejidos, which share certain property rights to forests, and Brazil's ecological value added tax makes payments to municipal governments. Sovereign national property rights are ubiquitous this issue. Some ecosystem services are on-site, with the same spatial distribution as the fund that generates them, and existing property rights to the fund generally provide rights to the service as well. Many regional and global ecosystem fund-services are currently open access, and excludability requires "propertization" — the creation of property rights where none currently exist (Farley and Costanza, 2010).

2.5. Establishment of Institutional Framework for the PES

Institutional arrangements are different in kind and can lead to different types of property rights and different types of PES (Farley and Costanza, 2010). The major recent innovation in the new forestry law number 7575 (FAO, 2011), that constitutes the legal and institutional framework for the PES system is the implementation of ''polluter pays'' and ''beneficiary pays'' principles to the financing of the national

forest strategy in Coast Rica. This represents a shift away from nationally funded subsidies toward market-based financing mechanisms (Zbinden and Lee 2005).

The forestry law explicitly recognizes four environmental services provided by natural forests and forest plantations: (a) carbon sequestration, (b) protection of watersheds, (c) biodiversity conservation, and (d) the provision of scenic beauty. Under this framework, private land and forest owners can be compensated for providing these services. The law also defines program financing sources, including a tax on fossil fuels, revenues from selling tradable Carbon Offset Certificates (CTOs), revenues from hydroelectric companies which benefit from watershed services, and state funds for forest conservation (Farley and Costanzia, 2010).

PES is founded on the assumption that ecosystem degradation is a result of the inability of conventional markets, which function well for private goods, to internalize ES economic value. In some circumstances, ES economic valuation may render ecosystem conservation more profitable than another land-use activity. However, leaving aside the methodological complexities characterizing ES valuation (Kumar, 2008), the complexity of establishing an institutional setting which accounts for these ES is rooted in the fact that these are often, but not always, public goods, that is they are non-rival and non-excludable. This means that one person's consumption does not affect what is left for others and that no one can be prevented from enjoying the good. As a result, it is difficult to determine who should pay for ES provision and, in some cases, who is entitled to such reward (i.e., who owns ES).

2.6. Free Riders Problem on the Distribution of Returns in PES

There are two conditions that enable an agent to free-ride: first, the principal cannot detect who is free-riding and second, the principal pays the group of agents according to outcome and this is shared equally between group members (Stadler and Castrillo, 2001). The extent of the free-rider problem thus depends on the measurability and detectability of the agents' efforts.

The potential for public goods free riders, and the suggestion that green marketing may be able to supplant traditional renewable policies, important research questions emerge such as: (1) Will customer driven markets for renewable really develop? (2) What factors influence individuals' incentives to free ride? (3) How might green marketing programs be designed to reduce free-riders problem. Most broadly, for a public good to be provided at an economically efficient level, the sum of all individual marginal valuations of the good (e.g., the marginal social benefit) should equal to its marginal cost (Wiser and Pickle, 1999).

2.7. The role of cooperative Organization in CDM Project

The over-exploitation of forest resources in Ethiopia has left less than 3 percent of the country's native forests untouched. In Humbo, a small town nestled against the rocky slopes of Ethiopia's Great Rift Valley; deforestation threatens groundwater reserves that provide 65,000 people with potable water, and has caused severe erosion resulting in floods and in some cases deadly mudslides. Climate change is likely to compound Humbo's vulnerability to natural disasters and consequent poverty. With a population that depends heavily on agriculture for its livelihoods, increasing droughts

and floods will create poverty traps for many households, thwarting efforts to build up assets and invest in a better future (UNFCCC, 2008).

Under the Humbo Assisted Natural Regeneration Project, developed by World Vision and the World Bank, seven forest cooperatives were established on the Humbo Mountain to sustainably manage and reforest the surrounding land (climate-smart-agriculture, website accessed on 9/10/11; 11:34:24). The main role of the cooperatives is to manage the communal forests in close cooperation with the Ethiopian Agricultural, Rural Development and Forestry Development Coordination Office (ARDFCO), World Vision Ethiopia and World Vision Australia (UNFCCC, 2008).

More than 90 percent of the Humbo project area has been reforested using the Farmer-Managed Natural Forest Regeneration technique, which encourages new growth from tree stumps previously felled but still living. The protected areas of forest now act as a 'carbon sink,' absorbing and storing greenhouse gases from the atmosphere to help mitigate climate change. The project is the first large-scale forestry project in Africa to be registered with the United Nations Framework Convention on Climate Change (World Vision Ethiopia, 2006).

The cooperative societies of Humbo have started the work of area closure and protection of the vegetation from intruders and livestock damage. They were empowered to move from passive victims of climate change to active agents that can act to change the situation (UNFCCC, 2008).

2.8. Forest Carbon Trade; Markets for Carbon Sequestration

Carbon markets are essentially global in scope and most transactions involve international buyers. Markets for carbon sequestration services are well developed and highly competitive. This competition leads service providers to reduce transaction costs and to minimize the risk associated with the reliability of carbon credits (Mayrand and Paquin, 2004).

In their survey of PES schemes, (Mills and Porras, 2002) reviewed 75 examples of payments for carbon sequestration services and showed that the market was rapidly evolving on multiple trading platforms, with transactions occurring at various levels (regional, national, international) despite persistent uncertainty about the Kyoto Protocol entering into force (Mills, 2002).

In Chiapas, Mexico, the Bioclimatic Fund was established to manage funds collected under the Scolel Te project, a carbon sequestration scheme based on agro-forestry practices. More than 300 coffee and corn farmers participated in the project by planting trees on 20 percent of their land parcels on average to absorb carbon (Rosa, *et al.* 2003). In Bolivia, The Nature Conservancy, along with the Bolivian government, Amigos de la Naturaleza, and US-based energy companies, have developed the largest forest-based carbon project in the world (600,000 ha) to sequester 26 million tons of carbon over 15 years in the Noel Kempff Mercado National Park at a cost of US$9.6 million(Cohen S. 2002). In Argentina, the German Development Agency (GTZ) agreed to invest in a project to generate carbon offsets in La Plata/Fontana. Under this project, 120,000 ha of native forests will be protected to sequester 12.6 million tons of carbon (Mills, 2002).

Carbon sequestration services are also involved in numerous market transactions in the world and are the focus of several PES schemes. Carbon sequestration occurs when trees or other vegetation absorb carbon contained in the atmosphere during their growth. Conversely, forest destruction releases carbon into the atmosphere. As a consequence, carbon sequestration may involve two types of services: active absorption through reforestation or avoided emissions through conservation of forest cover (Mayrand and Paquin, 2004).

The Humbo Ethiopia Assisted Natural Regeneration Forestry Project in Humbo Woreda, Wolyta Sodo Zone, could be a case in point as it has potential to attract investment in carbon financing. The project, which has been under implementation since 2007, is located on the edge of the Rift Valley, one of the most significant natural features of East Africa. Developed by World Vision in partnership with the World Bank, it has restored 2,728 hectares of natural forest and organic coffee areas. It is not only the country's first CDM project, but also Africa's first large-scale forestation/reforestation project registered under the United Nations. It is expected to remove an estimated 880,000 metric tons of carbon dioxide from the atmosphere over the next 30 years (www.capitalethiopia.com/index 16/10/2011) and it is expected to provide an income stream of more than 700,000 dollars to the local communities over 10 years.

2.9. Empirical Review on CDM project

The Clean Development Mechanism (CDM) aims at a cost-effective reduction of GHG emissions and technology and capital transfer from industrialized to developing countries. The CDM has seen a true gold rush period, with thousands of projects

being developed in a few years. More and more governments and companies bet on the CDM to fill their compliance gaps. Experience from more than 300 PES schemes existing around the globe sows that it generate incentives for conservation and sustainable use by compensating resource users for benefits forgone of the local communities (Bettina *et al.*, 2010).

According to (Castro and Michaelowa, 2006) finding of many CDM projects have a serious CER underperformance. Consultants and validators tend to strongly overestimate the emission reduction potential of the projects. Each step of the CDM project cycle leads to a downward adjustment of Certificate for Emission Reduction (CER) levels. CERs forecast at the request for registration stage reached 85.2 million CERs per year. However, only 64.8 million CERs (76% of initial forecast) were actually issued. The local community gained for about $34,189 US from CDM project for the first time and this will be maintained for the next ten years with respect to land size and forest coverage of each cooperative organization according to the level of carbon sequestration of the forest (UNFCCC, 2008)

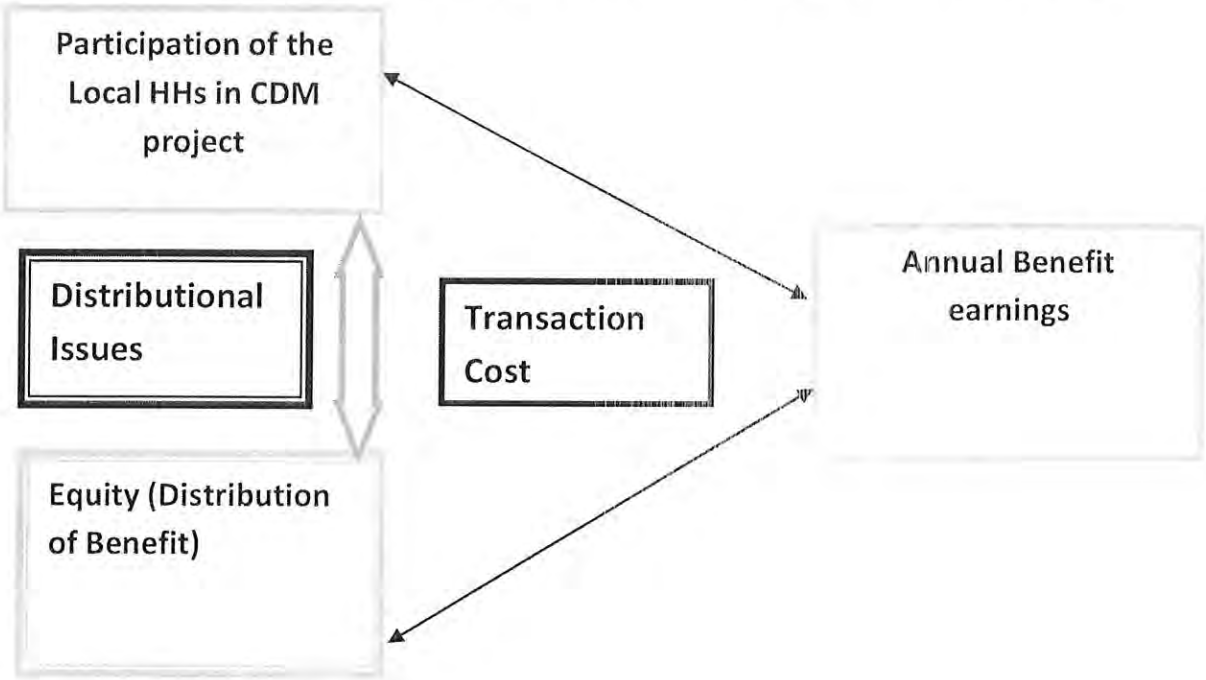
2.10. Conceptual Framework of ES

As shown in Figure 1, there is a built-in tension in PES schemes between the simultaneous objectives of local household participation in CDM project, benefit from the project and equitable distribution of benefit. In order to be bring about effective and regular participation of the local households, payments need to be optimized and targeted to higher value land and other sources of incomes need to be considered on top of different determinants of socio-economic characteristics. This involves higher transaction costs and the risk of creating inequities since targeted payments are more

costly to manage, and higher value land tend to belong to wealthy land owners. On the other hand, in order to convey enough amount of benefit, PES schemes need to reduce transaction costs like travel time, forest monitoring, etc. (Meshack *et al, 2006*). This can be done through untargeted payments concentrating on large land users and reducing higher costs that spent by poor HHs. This may be done at the expense of smaller, often poor land users, and of decreasing active participation of the local HH in PES schemes.

Lastly, PES schemes will be more equitable if untargeted payments are used. Equity also involves supporting numerous, small land users and consequently raising transaction costs (Bishop and Mills. 2002). Figure 1 therefore shows the difficult trade-offs involved in developing PES schemes of CDM project.

Figure 1 A CONCEPTUAL FRAME WORK OF TRADE-OFFS IN PES SCHEMS



Source: (Bishop and Mills, 2002)

Chapter Three

3. Methodology

3.1. Description of the study area

Wolaita Zone is one of the zones found in the Southern Nations Nationalities and Peoples Region. Currently it has 12 Woredas and 3 reform towns. Its capital Soddo is found at 360km from Addis Ababa. Humbo is one of the Woreda in the zone. The capital town of the Woreda is known as *Tabala*. It is about 420km from Addis Ababa.

Location

The woreda is located in the Great Rift Valley region. It is bordered in south by Lake Abaya which separates the Woreda from the Oromia Region. On the other hand, it was bordered in the southwest by Gamo Gofa Zone. On the west it is bordered by Offa, on the north by Soddo Zuria, on the northeast by Damot Weyede and on the east by River Bilate which separates the woreda from Sidama Zone.

Climate Condition

The climate zone of the woreda is divided in to two agro ecological zones; *Woyna Dega* and *Kola*. From these *Woyna Dega* accounts for about 30 percent and *Kola* 70 percent. The average monthly temperature is varying between2^0c and 32^oc. The maximum rainfall is conventional from Jun to September and it ranges from 843mm to 1403mm annually.

Population

The Woreda has 43 *Kebeles* with total population of 152,495 and it is relatively densely populated as compared to other Woreda. There are about 25,023 HHs of which 3758 and 21,265 are female and male headed HHs respectively (CSA, 2007).

Economic Activity and Vegetation

Economic activity of the Woreda is based on agriculture as in case of Ethiopia. Agriculture is the major stay of the people. The livelihood of the people depended directly or indirectly on agriculture. Agricultural production such as, livestock and crop production are the main sources of income and employment to the society. Mixed farming of crop and livestock is a common practice.

The total area of the Woreda is about 86,646ha. Crop production is the basic economic activity in the area. The major crops grown in the area include *teffe*, maize, haricot bean, sweet potato, Taro casava, yam, coffee, cotton, chick pea, etc. Crops such as maize, cotton, sorghum etc are the major cereals and cash crop and they occupy the largest proportion of cultivated land. Vegetation coverage of the woreda is about 20% of the total area. This include different kinds of endgenous and exotic tree plants, agro-forestery trees, bushs and shurabs such as *Acacia Albida, Eucalyptus, Cordia Abyssinica, coffee, Mango, Avocado, Shiferaw*,etc

Livestock production is one of the important activities in the study area. Farmers in the study area keep animals such as cattle (oxen, cow, heifers, and bulls), small ruminants (goat and sheep), donkey, horse, and chicken. Livestock plays great role in income generating activities next to crop production.

Land shortage is an acute problem in the study area due to population growth. An average land holding of households in the Woreda is 0.5 hectare. If the population growth continues at the high rate, many people will be landless after certain years. Those who own a very small farm size will take the responsibility of feeding majority. Therefore, dependency will become a serious problem. In Wolaita area, farmers generally divide their farm/field in to several plots, using each one for a different purpose (Tilahun Amede et al, 2001).

3.2. Data Source and Methods of Data Collection

Primary Data

The study was carried out by using primary sources of data from farmers by using pre-tested structured questionnaires and other concerned bodies such as Cooperative leaders, World Vision (WV), Agriculture and Rural Development Office etc.

Under the primary data collection, focus group discussion (FGD) and key informant interview (KI) were used for the purpose of obtaining the deep information in the PES, property right, benefits and costs distribution, the rate of participation etc. By having the designed and structured questions the selected target population was interviewed through using the face-to-face interview methods and fostered by observational methods in order to record verbal answers to various questions that are not answered by the respondents clearly.

Secondary Data

Secondary data were collected from the Woreda Agriculture and Rural development office, cooperatives, land use and administration office, natural resource management process. These include total population size, amount of fund from carbon sell,

establishment capital and member. Finally, the data was obtained from different years of important sources of newspaper and published materials from the concerned bodies.

3.3. Sample Size Determination

A common goal of survey research is to collect data representative of a population. The researcher uses information gathered from the survey to generalize findings from a drawn sample back to a population, within the limits of random error (Wunsch, D. 1986). Therefore, in this study the following formula was used to calculate the sample size

$$n = \frac{z^2 p(1-q)}{e^2}$$

According to (Kothari, 2004) one method may be to take the value of $p = 0.5$ in which case 'n' was the maximum and the sample will yield at least the desired precision. But in this study the number of total population is not more than 2000. Therefore, it was used by taking a p value of 0.05.

n=the sample size

P=in the absence of similar previous study and to achieve the maximum possible sample size, 5% out of the total cooperative member receive the benefit from CDM project was assumed.

$\mathbf{Z}^2$= Number of standard errors units at 95% confidence level, which is found from the normal probability table to be 1.96

$\mathbf{e}^2$= Margin of error or limit of accuracy which will be tolerated i.e. .03

Based on this the total numbers of observation used on this study is 157 HH heads. With this population using sample size determination table, margin of error .03,

alpha=.05 and t=1.96 for an approximated HH of 1746 in the three cooperatives the sample size is approximately calculated to be 157.

3.4. Sampling Procedure

Since the population of the study area are certain it is possible to sample the target population to the target unit based on the household list or sampling frame from the total population. The source list of the Woreda population was obtained from the Woreda Cooperative Development office.

The sample size was designed by using different parameters in order to measure the driving force of payments for ecosystem service (PES) and its application. It was parameterized by setting different independent variables that causes dependent variable.

The data are collected with the randomly selected cooperatives of three *Kebeles* from the Woreda. From these three *Kebeles* 157 farmers/beneficiaries were selected by using probability proportional to size or proportion of the population. This can be depicted by using the following table:

Table 1. Sample Size of the study by using Population Proportion

Name of Kebele (Forest Development Cooperative)	Total cooperative Member	Sample Size
Abela Longena	839	76
Abela Gefeta	346	31
Bossa Wanche	561	50
Total	1746	157

Source: Own Calculation using Probability Proportion of Population, 2012

3.5. Methods of Data Analysis

The data was analyzed using both descriptive and econometric analysis to obtain the required information on the study.

3.5.1. Descriptive Analysis

Descriptive statistical methods like mean, variance, standard deviations, and frequency distribution, ratios, and percentage, graphical and tabular analysis was used to examine and assess the study by using SPSS 16 and STATA 9.

Benefit – Cost Analysis (BCA)

Benefit-Cost Analysis (BCA) is used for appraising CDM project using regenerated forest by comparing the economic benefits with the economic costs of the activity to examine household participation efficiency of the project. It is also used to evaluate the economic merit of a project. Furthermore, BCA was used to assess returns, to examine the worth of public investments from the benefit. Finally, BCA targets to examine potential actions with the objective of increasing social welfare concerning the CDM project.

The formula for BCA is: $PV = \frac{P_t}{(1+r)^t}$ (1)

Where; PV= is the present value of the amount invested in CDM;

P_t = is the ETB(dollar) value of the future amount in time *t of CDM project*;

r = is the discount rate; and

t = is the year in which P_t is realized.

Opportunity Cost: Contingent Valuation

Opportunity cost refers to the value of the lost opportunities of local households due to the existence of forest. Forest non-use value (non-market), together with forest opportunity cost, were estimated using contingent valuation and income from agriculture for its ecosystem services provision. Contingent valuation determined willingness-to-pay (WTP) to prevent the destruction of forest and to facilitate regeneration/reforestation by the World Bio-carbon fund and local households are willing to pay for the forest management and guarding service in annual base in the form of contribution. At the same time, local households are willing to accept some amount of compensation for the existence of forests to offset the foregone cost (Barrio, 2009).

Gini coefficient

The Gini-coefficient is a measure of inequality of a distribution (benefit or income). It varies from zero (perfect equality) to one (perfect inequality). It is widely used to measure inequality in the distribution of income (Alejandro, 2006) from different sources. The Gin index is defined as a ratio of the areas on the Lorenz Curve diagram. If the area between the line of perfect equality and the Lorenz curve is A, and the area under the Lorenz curve is B, then the Gini index is A/(A+B). Since A+B = 0.5, the Gini index, G = A/(0.5) = 2A = 1-2B. If the Lorenz curve is represented by the function Y = L(X), the value of B can be found with integration and:

$$G = 1 - 2\int_0^1 L(X)dX \qquad (2)$$

$$G_b = 1 - \sum_{i-0}^{n-1}(Y_{i+1} + Y_i)(X_{i+1} - X_i) \qquad (3)$$

G_b = Gini coefficient of benefit distribution

$Y_{i+1} - Y_i$ = Cumulative proportion of beneficiaries of the CDM project

$X_{i+1} - X_i$ = Cumulative proportion of benefits that beneficiaries secured

N = number of beneficiaries

Gini coefficient provides important information based on the Lorenz curve shape but it needs careful analysis (Todaro, 1998).

3.5.2. Econometric Analysis

An econometric analysis refers to the use of different econometric and statistical tools or models for testing hypothesis related to some of the objectives of the study. Related test statistics was selected based on the specific techniques that used.

Model Specification

Logistic regression, also called a logit model, is used to model dichotomous outcome variables (Wooldridg,2000; Gujirate, 2004). It could be better used to test the problems of inclusion or exclusion in benefit distribution and may explain the variables on the study. Therefore, linear regression model is specified as Y is function of X_i i.e. $Y= f(x_1, x_2, x_3...x_n)$. Y is a dependent variable that refers to inclusion or exclusion of individual HHs in the CDM project and X_i is an independent variables, which means that Y(INEX) = f(actual land holding size=LASI, age of the respondent=AGE, investing benefit individually or on public goods=INVEPUB, level of education of the respondent=EDU, size of family=FASI, sex of the participant=SEX, other source of income=OSINC, marital status of the respondent=MAST, livestock holding of the respondent=LIVSTKTLU, random

error=U_i). Therefore, an econometric model specification for inclusion or exclusion in CDM project in a matrix notation is estimated by

$$\log\left(\frac{INEX}{1} - INEX\right) = \beta_0 + \beta_1 EDU + \beta_2 LASI + AGE + \beta_4 SEX + \beta_5 MAST + \beta_6 OSINC + \beta_7 INVEPUB + \beta_8 LIVSTKTLU + u_i) \quad (4)$$

Table 2: Description and expected sign of variables used in logistic regression

Variable	Description of Variables	Expected Effect
INEX	Dummy variable of the probability of HH being included (1) or excluded (0) with CDM project benefit distribution which is explained variable.	Dependent Variable
EDU	Years of education of the individual 0=illiterate, 1=primary, 2=junior, 3=secondary, 4=preparatory;	+
LASI	Actual land size of the HH head;	+/-
AGE	Age of the head of HH;	-/+
SEX	sex of the respondent; male (1), Female (0);	-/+
MAST	marital status of the head of HH;	-/+
OSINC	having other source of income (1) and otherwise (0)	-
INVEPUB	Investing benefit on public goods (1), otherwise (0).	+/-
LIVSTKTLU	Livestock holding of the HH in TLU	+
U_I=	random error term	

Heckman's Method

Heckman's procedure has a great importance in correcting problems of sample selection (Green, 2003) by having two equations to do this. The first one is the level of participation of the HH either to involve in the CDM of forest management or not. This is carried out by using probit model and which leads to have the Mills invers ratio – implies that selection equation. The equation formulated as follows;

Let $\mathcal{R}_i^*$ be the variation in earnings in the form of net benefit due to the participation with the CDM project and the retained gain from the forest to local HH head and other unknown HH head i and nothing that $\mathcal{R}_i^*$ is not observable which is called as latent variable.

$$\mathcal{R}_i^* = \alpha x_i + u_i \quad (5)$$

Where "x_i" is the vector of exogenous variable that affect the level of HH participation on CDM project or not, and u - implies that the random error. Farmers who are in need of participation either to work or not whatever the $\mathcal{R}_i$ is not observable. Following this the conclusion will be formulated as follows:

$$\mathcal{R}_i = 1 \quad se \quad \mathcal{R}_i^* > 0$$

$$\mathcal{R}_i = 0 \quad se \quad \mathcal{R}_i^* \leq 0 \quad (6)$$

If the individual is willing and participates ($R_i = 1$), the retained benefit from the forest is less than that provided by the CDM project. Therefore, net benefit from the forest as log of NB_i*; then,*

$$NB_i = \beta X_i + v_i \quad (7)$$

Where X *is* the regressor or explanatory variable that causes the level of benefits from the CDM and v_i is the random error.

Understanding u_i and v_i have a normal bivariate distribution with average zero and deviation σ_u and σ_v and correlation coefficient ρ (Green, 2003) and that NB_i is observed only when R_i is larger than zero, the estimated value will be well-defined as :

$$\in (NB_i|\mathcal{R}_i > 0) = \beta X_i + \rho\sigma_v\lambda_i \quad (8)$$

Where λ (lambda) is the Mills inverse ration, therefore:

$$\lambda_i = \frac{\phi\left(\frac{\alpha r_i}{\sigma_u}\right)}{\Phi\left(\frac{\alpha r_i}{\sigma_u}\right)}, \quad (9)$$

Where Φ is standard normal distribution function and ϕ is standard normal density function.

The selectivity bias may occur, other than the HH that potentially participate in the CDM program of forest regeneration as far equation (6) as concerned. And the Mills

Ratio implies in equation (7) that the removal of selectivity bias using either the HH that interested in working/participating or not with the CDM and this would result in the factors of net benefit distribution equation.

The selection method used the two step methods of Hekit model by using the maximum likelihood estimation (Green, 2003) indicates that measuring using MLH would result unreliable estimates of the model when the variance of random error is heteroskedastic. To solve this problem the test for all independent variable was carried out. The net benefit distribution gain equation variables are the subsection of the selection equation – which is the level of participation of the local HH with CDM project.

The marginal effect of *x on y* is constant is not realistic for many economic relationships for many reasons (Wooldrg, 2005). And hence the explanatory variables become not directly interpreted for the selected models of probit.

The first stage of Heckit method of probability of participation is:

$$y_i = x_i b + u_i \qquad (10)$$

Where y_i is participation, x_i is covariates(x_1, x_2, x_3, . . .x_n), u_i is an error term. Then, the inverse Mills ratio, is calculated from the first step, and then incorporated into the second step. The equation for rate of participation is depicted as follows;

$$LPR_i = b_0 + b_1 EDU + b_2 LASI + b_3 RELGS + b_4 NBEN + b_5 DIPR + b_6 AGE + b_7 ATME + b_8 FASI + b_9 OSINC + b_{10} MAST + b_{11} WTA + b_{12} INC + b_{13} WTP + b_{14} CPCDM + b_{15} BPCDM + u_i \qquad (11)$$

Table 3: Description of Determinant of rate of participation of an individual in CDM project

Variable	Characterization	Expected Effect
LPR	Level of participation of the head of HH with CDM project; regular Participation(1), otherwise = 0	Dependent variable
EDU	Class of years of education of the individual;0=illiterate, 1=primary, 2=junior, 3=secondary, 4=preparatory	+/-
LASI	actual land size of the HH head in hectare	-/+
RELGS	religion of the head of HH; 1=orthodox, 2=protestant, 3=Muslim 4=catholic, 5= others	-/+
NBEN	net benefit that the individual derives from the participation with CDM project in ETB	+/-
DIPR	Distance to the project site from home in Km;	-
AGE	Age of the head of HH in years;	+/-
ATME	attending on community meeting with the concern of forest management =1, otherwise =0	+
FASI	the total number of the family;	+/-
OSINC	having other source of income (1) and otherwise (0)	-
MAST	marital status of the head of HH; 1=married, 0= otherwise	+/-
WTA	Willingness to accept the burden while making use of the forest for the future generation (1) and otherwise (0);	-/+
INC	Annual income of the head of the HH in ETB from different source;	+
WTP	willingness to pay for forest guard (1), otherwise (0);	+
CPCDM	Cost of participation in terms of ETB	-/+
BPCDM	Benefit of participation in terms of ETB	+/-
Ui	Random error term	

The inverse of Mills ratio is the ratio between the standard normal Probability Density Function (pdf) and standard normal Commutative Density Function (cdf), each evaluated at *c*.

$$E(y|y > 0, x) = x\beta + \sigma\lambda\left(\frac{x\beta}{\sigma}\right), \qquad (12)$$

Where $\lambda(c) = \phi(c)/\Phi(c)$ is inverse of Mills ratio

The other dependent variable is that distribution of benefits and cost among the HHs which affect the service provision due to several factors like participation, income, age, family size, sex, cost of living, transportation cost and other individual household characteristics etc.

In this study, cost and benefit distribution (log of net benefit) the dependent variable (LNNBEN) and other determining factors have been described in (Table 4) below. Therefore, using Hekit method equitation of net benefit sharing among the local households per year is in the form of natural logarithm can be explained as follows;

$$LNNBEN_i = \beta_0 + \beta_1 AGEC + \beta_2 SEX + \beta_3 EDU + \beta_4 LASI + \beta_5 RELGS + \beta_6 AGE + \beta_7 FASI + \beta_8 MAST + \beta_9 WTA + \beta_{10} INVEPUB + \beta_{11} INC + \beta_{12} WTP + \beta_{13} \lambda_i + v_i \quad (13)$$

Table 4: Description of Determinant of net benefit distribution of an individual in CDM project

Variable	Characterization	Expected Effect
$LNNBEN_I$	Logarithm of net benefit	Dependent variable
AGEC	Agro ecology of the HH resident;1=*Weynadega*, 0=*Kolla*	+/-
SEX	Sex of the respondent; male (1), Female (0);	+/-
EDU	Years of education of the individual;0=illiterate, 1=primary, 2=junior, 3=secondary,4=preparatory	+/-
LASI	Actual land size of the HH head in hectare	-/+
RELGS	Religion of the head of HH; 1= orthodox, 2=protestant, 3=Muslim, 4=catholic, 5= others	-
AGE	Age of the head of HH in years;	-/+
FASI	The total number of the family;	+/-
MAST	Marital status of the head of HH;1=married, 0=otherwise	+
WTA	Willingness to accept the burden while making use of the forest for the future generation (1) and otherwise (0);	-
INVEPUB	Investing benefit on public goods (1), otherwise (0),	-/+
INC	Annual income of the head of the HH in ETB per year;	-
WTPG	Willingness to pay for forest guard (1), otherwise (0);	-/+
CPCDM	Cost of participation in terms of ETB	-/+
BPCDM	Benefit of participation in terms of ETB	+/-
Λ	Mills Invers Ratio ;	
V_I	Random error term	

3.6. Determinants of Cost and Benefit Distribution and Participation in the CDM Project

Cost and benefit distribution and participation of an individual HHs with CDM project of PES in specific period may depend not only on the amount of transfer of money but also on different socioeconomic characteristics of the local HH and other determining factors. It is not possible to include a complete set of variables that could affect the distribution of benefits and costs, inclusion/exclusion of the HH and participation/satisfaction of individual HHs in CDM project of PES.

3.7. Hypothesis and Definition of Variables

The data are collected to cover the necessary information of inclusion/exclusion of an individual with CDM project, factors that affect the level of local HH participation and earnings/net benefit distribution which would further influence equity of Payments for Ecosystem Services (PES) of CDM project by using econometric analysis and specified independent variables.

Dependent Variable

It is a dependent variable and other explanatory variables may have a negative or positive impact with the variable (Guajarati, 2003). In this study the dependent variables are the following;

⇒ **Net Benefit Sharing/Distribution (LNNBEN):** It is a continuous variable measured in terms of natural logarithm of money. Poor farmers living in ecologically fragile, economically marginal and environmentally degraded areas are potential service providers. PES could also bring additional income to these

farmers, help reduce income variability and generate other social and cultural benefits. But this depends on their location and the characteristics of their livelihood systems (FAO, 2007).

⇒ **Level of Participation (LPR)**: It is dummy variable. Participation in carbon trade or forest management is sometimes become only the duty of poor farmers and the rich may not care about all the things (Pagiola et al. 2004).

⇒ **Inclusion/exclusion of the HH (INEX):** this is dummy variable of the probability of HH being included (1) or excluded (0) with CDM project benefit distribution.

Independent (Explanatory) Variables (Xi)

These are variables that are assumed to influence efficient and equitable distributions of benefits and the status of participation on CDM using forest management.

Land Size (LASI): This is the total land area that the farmer actually owns in the study area. It is a continuous variable measured in hectares. For the poor who do own land, generally small landholdings are another factor that excludes them from participation in PES projects - if they provide the service from their own land i.e. Smaller farms often provide hhouseholds with their basic income and subsistence (Erica and Sango, 2009).

Age of the household head (AGE): It is a continuous variable measured in years. Age is a proxy measure of farming experience of households especially on ecosystem services provision. Aged household are believed to be wise in resource use but younger HHs were more likely to plant tree and forest management (FAO, 2011), and it is expected to have a positive effect on dependent variable.

Family Size (FASI): It is a discrete variable measured in adult equivalent (Storck *et al.*, 1991) i.e. the availability of active labor force in the household, which affects farmers' decision to market participation of the forest management in order to make the forest to provide the required service. Since forest management for which PES is the function of labor, availability of labor is assumed to have positive relation with the service provision and in return of payments.

Education of the household head (EDUi): Intellectual capital or education, measured in terms of formal schooling the household head is a continuous variable and assumed to have a positive effect on participatory forest management (FAO, 2011) making the forest to provide services and equitable and efficient PES decision. So it may have either positive or negative relationship with explained variable.

Sex of the household Head (SEX): It is a dummy variable of the form 1=male; 0=female. Obviously both men and women take part in mixed farming and forest management and planting tree. Generally, men contribute more labor in managing forest and planting more trees than women (FAO, 2011), cultivating, pruning, etc. Women also participate mainly in pruning, fencing etc. However, it is male who participate dominantly in such activities. Therefore, it is assumed that male headed household participates more in forest management to take the turn on explained variable and vice versa for females.

Using Benefits individually or investing it on Public Goods (INVEPUB): the 'poor' are not a unitary group and the distribution of local benefits determines who gains and in what way from PES schemes (Erica Lee and Sango Mahanty, 2009). So, this may exacerbate the problems of free riders within the community if the

distribution of benefit is unfair and this variable may affect either positively or negatively

Agro ecology of the respondent residence (AGEC): it is dummy variable and assumed to cause the dependent variable in different ways and its impact may be positive for *Kola* and negative otherwise. It applies ecological principles to design sustainable farming methods and helps to restore ecosystem services (Farley, 2012) provision

Marital Status (MAST); this implies that the state of marriage of the head of the HH either married, unmarried, widowed or divorced. For the married HH heads have more concern on participating forest management but due to inability to meet (Paul *et al*, 2012) economic needs of their household some participate irregularly and assumed to affect in both ways and it is dummy variable.

Religion (RELGS): the religion of the respondent may affect the level of inclusion and participatory forest management of the HH with the CDM project concerning forest regeneration in positive way by stopping deforestation and protecting biodiversity (Angelsen, 2009).

Attending meetings (ATME); it is dummy variable that measures either an individual participate in meetings of forest management and ecosystem services provision decision making process or not. And regular meeting is crucial in decision making process of cooperative members either increasing or decreasing net earnings of the local households (Francisco, 2008). It is expected to affect positively on the participation of forest management and decision making issues thereby rising of net benefits.

Inclusion/Exclusion (INEX): it is dummy variable that is used to know the state of presence and absence of the local HH from the CDM project benefit distribution due to different factors such as cost of participation and transaction. High costs, segregation of local officials and knowledge gap prohibit the inclusion of local communities in PES-like systems and CDM (Angelsen, 2009).

Distance to Project (DIPR): this is measured in terms of Kilo meter from the residence of the respondent to the project site which may affect the level of participation of the HH negatively. Irregular participants reported that far distance from the residence area affected the level of participation (Liu, 2001).

Cost of Participation (CPCDM): it is continuous variable and measured in terms of money per year in direct and indirect ways including opportunity cost and higher costs of participation leads to loss more (Pfaff *et al. 2008*), and anticipated to affect negatively.

Benefit of Participation (BPCDM): the benefit of the HH that is derived from the CDM project in terms of direct and indirect ways. It is in monetary term and for the higher level of participation the level of benefit increased (Pfaff *et al. 2008*), expected to affect positively.

Willingness to Accept (WTA); it is dummy variable either the HH is willing to accept compensation for benefits foregone (FAO, 2011) and burden of forest management while leaving the forest resources for the future generation.

Willingness to Pay (WTPG): this is also dummy variable that the HH either willing to pay for the forest guarding (keepers) in terms of money per year in the form of

contribution for their satisfaction (FAO, 2011) that they derive from the forest in different ways.

Annual income of the HH (INC); this is the level of income of the HH from different sources (Lopez-Feldman, 2006) with the exclusion of the CDM project benefit per year. It is assumed to affect the level of net benefit from the CDM negatively by reducing the level of HH participation.

Other Source of Income (OSINC): it is dummy variable, income that gained by the HH head other than the CDM and farm activity (Lopez-Feldman, 2006). This is assumed to affect the level of participation negatively.

Chapter Four

4. Results and Discussion

4.1. Demographic Characteristics of HHs and their Income Source

From the total 157 observation of the study 35 were female and 122 were male headed HH from three *Kebeles*, and all were used for the analysis. The average age of the sample HH is 41.72 and educational level of the sample HH, is rides from illiteracy, primary, junior, secondary and preparatory in the order of frequency of 52(33.12%), 38(24.20%), 36(22.93%), 26(16.56%) and 5(3.18%). The average family size of the sample HH is about 5.7 with an average land holding of 1.11hectare and 4.2TLU (Appendix 3).

Ethnic composition of the sample HH is uniform and no other ethnic group except Wolayta. The religion of the sample HH pertains to orthodox, protestant and catholic with the value of 26.75%, 56.69% and 16.56% respectively. The marital status of the sample HH shows that about 132 HH were married and the rest unmarried – of which 12 were widowed.

In relation to the source of income of the sample household; it is diversified in to different sources. The uppermost income for an individual comes from crop – which accounts for about 71.97%. On the other hand the lowest income for an individual is derived from forest related products and food for work program which is about 1.27% for each. The next important income source of the local HH is livestock and fruit with the corresponding value of 8.28% and 6.37%. In addition to that coffee, off-farm activity and others including CDM project are also the source of the HH income with the rate of 5.73%, 3.18% and 1.91% respectively.

4.2. Assessment of Equity of Payments for Ecosystem Services via Clean Development Mechanism Project

Payments for ecosystem services (PES) have a great role in initiating the service providers (poor farmers) via some amount of incentives either in the form of cash or in kind. In turn those poor farmers and the community benefited from the services directly and indirectly from CDM.

Many of the respondents believe and witness that after the commencement of the project they gleamed that the change in their environment. Thus, about 82.8% believe and witness about the change in their environment after the CDM project. As to the respondents, shortage and instability of rainfall, recurrent drought and poverty, migration of wild animal and other climate related hazard and risk in the area are not uncommon to inhabitants due to the paradigm shift of the climate before the project.

The remaining 17.2% respondents believe on the change to their environment but they do not want to witness for unknown reason. They measured its equity from the view point of the change in their environment and the restoration of previously evacuated wild animals return into the forested area and the change in the atmospheric weather conditions. It shows that there is a change in the perception of the majority of farmers about the severity and sensitivity of climate change risk.

The concern of social equity is improving the wellbeing of human through improving the sustainable development in enriching environment by making great incentives for ecosystem services providers on the basis of their participation. There is difference in the share of benefit from PES between the group of men and women. The survey result (Table4) depicted that the average benefit that male headed sample household would gain from the project is about 619.50ETB/year. Whereas female headed sample

HH gain for about 320.62ETB/year with combined mean of around 530ETB/year. The difference is about 298.88ETB which goes to male headed HH even though their participation is more significant.

Table 5: Difference in Benefit Sharing among Men and Women

Group	Observation	Mean	Std.Err	t-test
Female	35	320.62	0.4105	-2.8582***
Male	122	619.5	0.0397	

*** – refers to significant at 1% significance level

Source: Author's computation based on own survey, 2012

4.3. Inclusion and Exclusion of Household Heads with CDM Project

Inclusion and exclusion of the HH depends up on different independent variables, these variables are level of participation, relationship with officials, religion, distance to the project, other source of income, level of education, age of the household heads, gender of the respondent, actual land holding size of the individual and unobservables. Inclusion of the HH implies that the HH that became member of the project at the beginning or at its commencement while exclusion of HH implies that the HH were not the member of the project at its commencement for different reasons.

The HH that excluded from being member of the project at its commencement are about 21.66% as the result of the study implies. This is to mean that from the total population 21.66% of the household not become the member of the project at its commencement and the provision of the services affected with same rate while 78.34% HHs become the member of the project.

There are five reasons that reflected by respondents with regard to be not become the member of the project at its commencement. The first one is lack of awareness about the importance of the project. This accounts 29.4% of respondents of those who are

not included in project at its commencement. Next, isolation and remoteness from having enough information about the project accounts for about 11.76%. The third important reason is other economic activity of the community where they are busy and it accounts for about 23.53%.

Furthermore, about 20.58% respondents revealed that they retained for the fear of low payment of the activity carried out. Finally, nearly 14.7% of the respondent reflected that they have low interest to participate on community development activity and on this project too.

In contrary, different reasons described for the HH to become the member of the project at its commencement. From the total observation 10 female and 30 male reason out that they become the member of the project for its importance to environment. Some of the others reason out they become the member of the project because of the attractiveness of the project and its future payments. The other 1 female and 11 male headed household become the member of the project because of the enforcement of *Keble* officials encouragement about the project significance in the future to the coming generation and from the perspective of the development, environment, population pressure, social security/welfare aspect etc.

The lion share of the total observation becomes the member of the project due to frequent persuasion on ecosystem services provision. About 17 female and 44 male headed households become the member for the reason of frequent persuasion on ecosystem services provision. The remaining 3 female and 5 male headed household become the member of the project for many other different reasons. Among these some HH thinking about the future payment for the services provision while some

others thinking of about the project would reduce the paradox of the poverty and for aesthetic value. They also think about that the project can regulate the atmospheric temperature and climate and this may lead to the regulation and adjustment on the rainfall and this may also adjust season for cultivation and would boost up the productivity of agriculture.

4.4. Distribution of Benefits and Costs of CDM Project from Forest to the Local Household

Benefits and costs of the CDM project from the forest to the local community are many in kinds. Both benefits and costs analyzed in aggregate form except Bio-carbon fund from carbon sequestration. Benefits include direct use benefit/value (landscape services, fuel wood – small droppings and failed wood, timber – which is not seen in the study area for the time being, food, grass for cattle etc.). Indirect use value/benefit includes; climate regulation (improving ecosystem services), water regulation, soil preservation and establishment, pollination services, recreation or aesthetic value, knowledge transfer, etc. The other important benefits that are not of course active but have great role in keeping the environment for the future generation is the non-use value benefit – bequest, altruistic and existence value and option value.

The other benefit includes the income from carbon sell – for the sequestration of carbon from the atmosphere each cooperative paid by the World Bank from the Bio-carbon Fund. During the project document design (PDD) preparation time the community decided to use the fund (from the WB Bio-carbon for the carbon sequestration) for public development program like water, flour mill, road, health facilities, and the like. According to this study majority of the community need to have the benefit for themselves rather than investing on public goods.

Cost of participation with CDM includes different kinds of direct and indirect costs. Direct costs include cost of forest management, cost of seedling development, cost of building soil conservation structures (trench, check dam, etc.), cost of reforestation, cost of pruning/clearing, cost of fire protection canal, fencing, guarding service etc. Indirect costs include loss of leisure time, loss of crop by wild animals, cost of medication when injured while working at forest management. The other important cost that included in this study is opportunity cost of forested land value. The indication of opportunity cost is that the agricultural production lost due to the existence of forest or a foregone amount of production.

Figure 2 Average benefit, cost and net benefit distribution/HH/ year in ETB

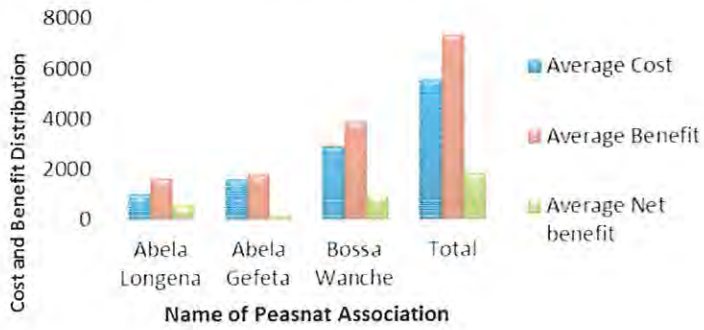


Figure 2 shows that the average distribution of benefits, costs and net benefit of the CDM project from the regenerated forest for all *Kebeles*. The average benefits and costs of Abela Longena, Abela Gefeta and Bossa Wanche per year is (1636.34, 1008.18), (1822.26, 1601.65) and (3906.27, 2917.80) ETB per year respectively. In Abela Longena, the distribution of benefit is increasing at slightly slow increasing rate as compared to Bossa Wanche. But at Bossa Wanche the benefit outweighs the cost at an increasing rate. This shows that the return from the forest is very high to Abella Longena than to Bossa Wanch. At Abela Gefeta the benefit increases at decreasing rate as compared to both *Kebeles*.

4.4.1. Distribution of Cost to the Local Households

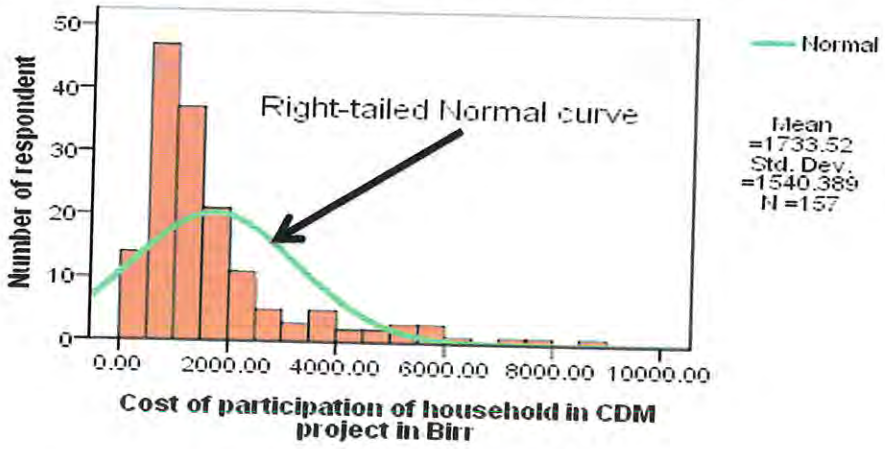
When the local HH participates on the CDM project, they commonly incur some amount of costs. In addition to the normal cost for forest regeneration and environmental rehabilitation, there is a negative externality on the side of regenerated forest with respect to crop failure by wild animals. According to this study (Appendix1) the maximum cost that spent on forest management, regeneration and other activity is 8650ETB per year. The minimum cost is 200ETB per year. The annual average cost of participation of the HH in CDM project is 1733.52ETB. This cost deviates from the mean by 1540.39ETB. This shows that the existence of variation and dispersion from the average value. It is not close to the mean or most of the observations are not concentrated and crowded around the mean i.e. it spread out by far from the mean.

Cost distribution of participation of HH in CDM project (App1) explain that the median cost of participation is 1222ETB – which is 50%. The largest cost of participation for the household rates between 6495 and 8650ETB and the smallest cost of participation in the project lie between 200 and 320ETB annually. For some HHs the cost is high due to the failure of crop and prey of small house animals by the wild animals that hosted in the forest.

As to the distribution of the cost, figure 3 shows that 75.8% of the participant spends less than 2000ETB in the CDM project per year in different ways. From the total observation about 15.29% respondents contribute for the participation in CDM project is between 2000 and 4000ETB per year. Only 6.37% respondents spend with in a year between 4000 and 6000ETB. The remaining 2.54% contributes greater than 6000ETB. That is why the normal distribution curve is right-tailed and the majority of

the participants concentrated around the mean – skewed to the right and the peak point on the normal curve shows that the majority of the HHs concentrates around the mean.

Figure 3: Cost distribution of the total households per year in ETB



4.4.2. Opportunity Cost distribution: Contingent Valuation

All respondent were asked about the existence of the forest to explain their Willingness to accept the forgone productivity of the land from agricultural products. Some of the HH zero WTA (zero opportunity cost) nothing, while some others WTA some more amount – those who think that as they lost bulky of income and benefit from the land that occupied by the forest if it is used for agronomic purpose. The maximum value of opportunity cost per individual is about 950ETB per year. Some of the respondents are willing to give up (agricultural productivity) nothing to secure the land to forest except the loss of agricultural production.

For example, an individual local farmer gives up 411.81ETB on average per year due to the existence of the forest only from crop production sector. The annual opportunity cost that each *Kebele* give up per year is 33530ETB for Abela Longena, 13866ETB for Abela Gefeta and 17259ETB for Bossa Wanche and respectively the

average amount that an individual gives up 441.17ETB, 447.29ETB and 345.18ETB. The distribution entails that *Kebele* with the highest hectare of land give up more income that would be generated from the land if the land was free from the forest. But the community believes that they earned and benefited more from the existence of the forest though the forgone cost is significant.

4.4.3. Distribution of Benefit with Respect to Participation of the Local Households

The minimum gross benefit that derived from the participation of households with CDM project per year is 350ETB while the maximum is 8500ETB per year. This shows that some of the local household benefited the highest amount and the remaining majority of the project benefited the less. According to the study 2.54% (4) respondents benefited the lion share e.g. the largest share of the benefit goes to only 4 households and 99% of the benefit is occupied by 0.64% of the observation.

As Appendix2 shows half of the benefit is less than 1845ETB per year for individual households. Inversely some of the household earns greater than 1845ETB per year. The smallest amount of benefit that four households gained per year is rated between 350 and 375ETB while the largest amount is between 7100 and 7735ETB to four household only per year. The possible reason for this is the poor farmer facing crop failure due to wildlife damage and the level of participation in addition to biased distribution of costs and benefits. The average benefit that the household gained is 2395.959ETB per year. And the benefit per year varied by 1613.399ETB from the mean.

Distribution of benefit is skewed to the right (Appendix 2) – implies that maximum benefit is owned by few farmers or the mass obtained the least amount of the benefit per year. Most benefits concentrated on left of the mean and extreme amount of benefit is at the right of the mean per year. This portrait that mass of the community scores low and spread out increasingly toward the high – meaning the average benefit is greater than the middle benefit and the mode.

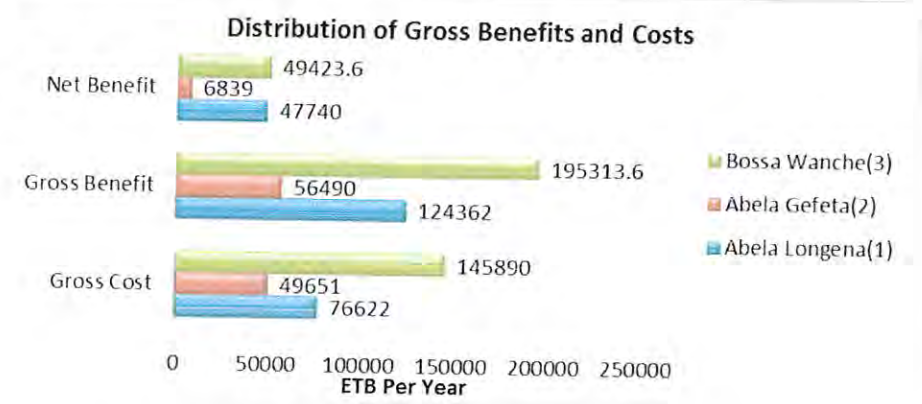
In addition to that the value of Kurtosis is greater than 3. This explains the distribution is leptokurtic and the concentration of the benefit is highly around the mean and that there is high probability for the household to obtain the maximum (the extreme benefit that seen on the benefit distribution) amount of benefit in future per year.

4.4.4. Distribution of Net Benefit for the Local Households from CDM Project

Net benefit is derived from gross benefits and costs. It is important variable in measuring the efficiency of household participation in payments for ecosystem services using the CDM project of forest regeneration from gross benefits and costs distribution.

Fig. 4 illustrates the distribution of gross benefits, costs and net benefits of individual *Kebele's* from forest using CDM project. The overall economic value/benefit from the forest with respect to net benefit for Abela Longena, Abela Gefeta and Bossa Wanche is about 47740ETB, 6839ETB and 49423.6ETB respectively on annual basis. However, the value of net benefit is different with respect to discounted benefit for all *Kebeles* on the basis of one year intention.

Figure 4: Distribution of Gross Benefits, Costs and Net Benefits



Generally, the total aggregate benefit of all *Kebeles* in the form of discounted net benefit is 69,805.73ETB on the basis of one year intention. From this the share of Abela Longena is 52.19%, Abela Gefeta is 2.44% and Bossa Wanche is 45.37%. And on average the distribution for individual HH is also vary from *Kebele* to *Kebele*. For instance it is 479.39ETB for Abela Longena while it is 54.95ET for Abela Gefeta and it is 633.36ETB for Bossa Wanche – which is the highest net benefit of the other two *Kebeles* individual HHs per year. The net benefit for the local HHs increased steadily for more than half of the observation.

Some of the HHs earn even negative net benefit from the project participation (e.g. -150 up to -7ETB per year – this is the loss by some HHs). The loss implies that how the household willing to pay for their environment improvement and sacrificing to transfer naturally rich environment for the future generation. In addition to that they are willing to provide good ecosystem services even with the loss. As far as the study is concerned net benefit distribution is more or less satisfactory and relatively efficient. Because, majority of beneficiaries tailored along positive net benefit line even though some HH at worst are bearing the cost of others' benefit.

4.5. Level of Participation with CDM Project and Free Riders Problem

From the total observation, 26.11% households participate irregularly. The remaining 73.89% are participating on the forest management regularly and contributing more. Irregular participants reason out different kinds of problems for irregularity of participation. The most frequently observed problems are distance of the project area from their home (43.9%), different socio economic and cultural problems of the family (31.2%), the low return of participation (17.2%), exclusion problem (4.5%) and problems other than these (3.2%).

The study shows that the level of participation in forest management is positive. Because, though there are some difficulties, local HH sacrificed for the regeneration of the forest – for example the ratio of regular participation to irregular participation is greater than 1. This shows that the regular participants have covered 2.83 times of the irregular participants' position by using their full potential per year or regular participants done 2.83times more than the irregular participants per year per work load. The implication is that 26.11% of the participants earn annual net benefit at the expense of 73.89% regular participants. This means that 26.11% are free riders to the resources without exact labor service provision to ecosystem services.

According to the study, average net benefit distribution to the local individual with respect to participation level for irregular participant is 83.67ETB, while it is 37.73ETB for regular participants per year per individual. The consequence shows that 26.11% respondents gain more than their fair share of labor (i.e. they pay less than their fair share of cost to the regenerated forest). In other words 73.89% of the local HH lose 17.50ETB of net benefit for their fair share of cost or spending per year.

4.6. The Impact of Property Rights and Institutional Set up on Ecosystem Service Provision

Ecosystem service is affected by different variables like contested property right and institutional set up – cooperative organization. In the study area, the forest is owned by the cooperative organization – which means that the forests belong to the mass of the population of that *Kebeles*. Personal observations also show that the majority of the residents or the member of the forest cooperative believes that the ownership of the forest is their cooperative organization.

From the whole observation 116 (73.9%) household trusts that the owner of the forest is their cooperative and they feel that sense of proprietorship. For the remaining 41(26.1%) households believe that they were not sure whether they were the owner of the forest. Some of them reported that they were participating on forest management because of the punishment by the *Kebeles* officials and cooperative leaders. They do not have developed sense of proprietorship, less awareness about the ownership.

On the other hand, institutional strength of cooperative organization matters the provision of ecosystem services. About 40.8% households replied that they believe and trust that the owner of the forest is their cooperative and emphasized the strength of the organization in high 'very strong'. About 35 (22.3%) HHs believes that their cooperative organization is not as such strong enough and prefers to weight them on the position of "somewhat strong". 34.4% HHs categorized their cooperative at the status of "weak" for many reasons. The remaining 2.5% HHs has their own category and they do not trust on the cooperative with respect to property right.

According to this study, the efficiency of ecosystem services somehow affected due to the contested property right knowledge and the weak strength of the cooperatives. For

example, 26.1% respondent indifferent about the ownership and property right to the forest. This means that the efficiency of the forest ecosystem services provision may be decreased by that percentage as the household participation decreases. Concerning the strength of the cooperative institutions also can affect the efficiency by not less than 35%, for instance local institutions are not fair (Corbera *et al, 2009*), even in the distribution of benefits.

4.7. The Role of Efficient PES in Reducing Local Household Poverty

Climate change usually gives rise to the occurrence of flood and drought. This in turn leads to poverty and aggravating and crippling the natural environment by making change on seasonal growing period. The household portrayed the impact of climate change in different way for the last at least one decade. It is already known that PES has a great role in reducing the poverty of the local household via participating on CDM project by boosting up the income level though generating it in different ways. There are different kinds of income generating activities and plans to reduce the poverty of the local HHs through the PES. But the ways are not direct. So far as it was discussed the average annual benefit that the HH earns from PES is somehow supportive in reducing HH poverty.

The respondents were asked that how the project supported the community in improving their health and their environment too. In addition to that they were also asked for about the improvement of their knowledge by letting their children to send school and in supporting the supply of potable water. Above all the improvement on environment has great impact on reducing food poverty. According to the study improvement on health is explained by the HHs shows that about 64.33% of

respondent reported that they were strongly and relatively agree on the changes of their family and their environment due to the regeneration promotion.

Since having long life is depends up on the status of the health, it looks like sound for the households to survive more years due to the decrease on food gap as far as the increased production of agricultural production is concerned. This in turn reduced the level of the poverty because to survive more is one of the indices of poverty – which is signified by different scholars for instance, studies by (Gergory, 2011.) imply that efficiently and properly designed PES has a great role in poverty alleviation and reduction for the local community.

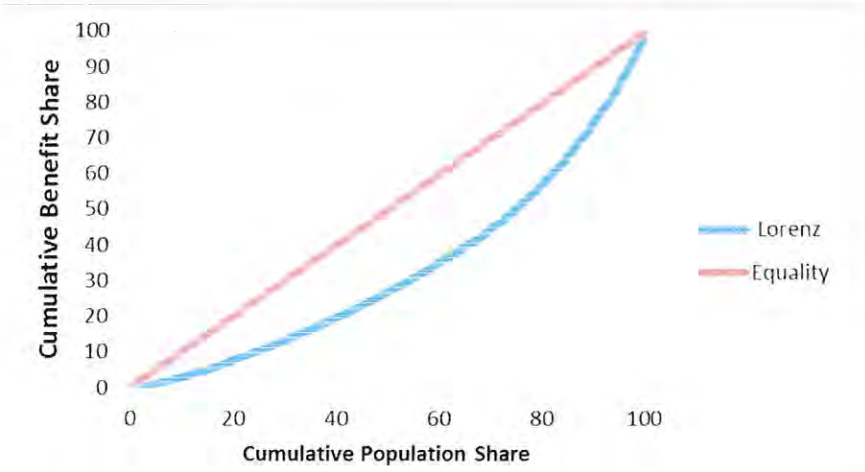
According to the study improvement on environment created favorable conditions in refining water source points, soil retention, regulating climate, adjusting the cropping time. From the total observation 37.6% of respondent strongly agree and believe that the project improved their environment – this implies that at least some amount of change in relation to poverty reduction and about 36.3% agree on the change of environment positively by reducing the level of drought.

Implication of CDM project Benefits from Forest to Local Household Income

Income of household comes from different directions. Such as agriculture (on farm income), trade (off-farm income), income from CDM using forest benefits and other source of income. Among these CDM project accruing for about 20% of incomes through direct and indirect ways of the regenerated forest , this result comply with the study in Mexico by (Corbera *et al, 2009*) in fostering the livelihoods of the local household. But the distribution of benefit is not perfectly equally distributed. The Gini

index for the distribution of benefits is 0.3428 with the value of standard errors 0.104. Here, the implication for the distribution is more or less relatively equitable but not perfectly equitable as far as the Gini calculation concerned. This can also be realized by using the Lorenz Curve for the distribution below.

Figure 5: Lorenz curve for household income/benefit/ from CDM using Forest regeneration



The curve shows that the contribution/share of the cumulative benefits from CDM project using the regenerated forest and cumulative population share. It depicts that the poorest 50.96% of the population have earned 27.58% of total benefit/income of the project while the remaining 49.04% have earned 72.42% of the total benefit from the project. This is to mean that from the total discounted benefit about 50.96% of poor households gets low amount of benefit. In other words, approximately, the bottom 51% household gets less amount of benefit for their fair share of labor and activity while the top 49% using more benefit.

4.8. The Effect of Inclusion or Exclusion of the Sample HH with the CDM Benefit Distribution

There are different kinds of factors that affected the local HHs inclusion and exclusion with CDM project benefit distribution at the commencement of project. To estimate the effect, logistic regression model has been used by having dependent variable. It assumes 1 for inclusion of the HH with CDM project benefit distribution at its commencement and 0 otherwise. The important variables such as level of education, gender of the respondent, other source of income, need not to invest benefit on public goods and livestock are estimated for the model using stata 9 software and they are significant.

Result of the model (factors) (Table5), inclusion and exclusion with the project matters expressively the level with respect to gender. This shows that how much it affected at the commencement of the project positively by excluding with gender discrimination. On the other hand other source of income affected negatively by signifying the paradigm shift of the local households accompanied by exclusion. In addition to that local HHs who are unwilling to invest the benefit on public goods from carbon sale (INVEPUB) and the number of livestock worsened exclusion negatively/increased. But education (EDUi) has implied positive relationship with respect to household inclusion using CDM project.

As shown in (Table6) of marginal effect, inclusion of the local HH is affected by the willingness of the individual farmers either to invest benefit from the carbon sale on public goods or to use individually (INVEPUB). It is negatively related to inclusion of the HH with CDM project at commencement. It tells that the chance of the HH to be excluded from being the member of the project at its commencement is increased by

12.35% (inclusion of an individual HH is affected by 12.35 percent less) when the individual is unwilling to invest income from carbon sale on public goods. It confirms that the reluctance local HHs to invest on public goods due to the existence of free riders – who use public goods without their fair share and their economic status.

Table 6: Logit prediction of the effect of inclusion or exclusion the sample HH with CDM benefit distribution

INEX	Coefficient	Robust Std.Err.	Marginal Effect
LASI	-.2875028	.264426	-0.04323
AGE	.0010079	.0355434	0.000152
EDU	.0891171*	.0538662	0.013401
SEX	.6734729**	.5136521	0.101272
OSINC	-.7958199*	.4720408	-0.11967
MAST	-.733421	.8659626	-0.11029
INVEPUB	-.8215799**	.4134486	-0.12354
LIVSTKTLU	-.1159567*	.0651332	-0.01744
CONS	2.546233	.573796	
Log pseudolikelihood = -73.397204			
Logistic regression	Number of obs = 157		
	Wald chi2(8) = 18.11		
	Prob > chi2 = 0.0204		
	seudo R2 = 0.1053		

Source: Author's Computation using own Survey data 2012

*, **, *** indicates statistical significance at 10%, 5%, 1% probability level, respectively

In addition, other source of income (OSINC) is associated with inclusion negatively and significant. When the income source of an individual is diversified and increased or many source of income caused inclusion by 11.97% less for the sample of excluded households. Education implies that when the level of the local HH education increases by one grade, the likelihoods to be included in CDM project and being beneficiary of the project is increased by nearly 1.34%.

The level of livestock holding affected inclusion /aggravated the level of exclusion of the HH since it is considered as a one source of income. This implies that a unit

increase in the number of local HHs livestock reduces the level of inclusion of sample household by 1.74%. This means that farmers who have an incremental growth of livestock holding leads to the probability to decrease inclusion with CDM benefit distribution by their own need though there are other benefits earned.

4.9. Determinants of Participation of the Local HH with the CDM Project

As shown in (Table7) the level of participation with the CDM project on forest management adversely and positively determined with regard to gender/sex, agro-ecology (AGEC), attending on the general assembly of the members (ATME), cost of participation (CPCDM), net benefit (NBEN), distance to the project site (DIPR) and other source of income (OSINC) of the HH head. Among these gender discrimination (SEX), agro-ecology (AGEC), net earnings (NBEN), distance to project site from residence (DIPR) and other source of income (OSINC) determined the state of participation with the project is negatively while the rest coefficient with star sign (Table, 7) determined the level positively with their respective results.

Concerning marginal effects (Table 7), the highest amount of the earnings or the benefit goes to male headed HH. This is to mean that the marginal effect shows that a shift from female to male cause the rate of participation of female headed HH with CDM project to decline by 14.74%. This implies that the level of female headed HH participation is 0.028% lower when they loss 100ETB per year with respect to net benefit (NBEN) as if its relation is negative and significant.

On the other hand, for each additional 100ETB loss of NBEN net benefit leads individual to participate with the CDM project of forest regeneration less by 0.028% -

which also maters the level of ecosystem service provision by the percentage. This means that the decrease of annual income from the project leads to decrease level of participation and further reduce the provision of ecosystem services. This is also accompanied by the size of the family hindering from participating.

Table 7: Determinants of participation of the local HH with CDM Project Using Heckman's procedure

Variable	Coefficient	Std.Err	Marginal Effect (ME)
EDU	0.0990527	0.1200242	0.0272218
SEX(*)	-0.6330668*	0.3512352	-0.1474148
AGEC(*)	-0.5232184*	0.3245598	-0.1584837
LASI	0.1433527	0.1779263	0.0393964
RELGS	0.0453084	0.2047447	0.0124517
AGE	0.0041127	0.0164259	0.0011302
ATME(*)	1.327556***	0.289234	0.4370569
FASI	-0.0050721	0.0644984	-0.0013939
MAST(*)	-0.5319423	0.5198711	-0.1201182
WTA(*)	0.0172078	0.2836353	0.0047387
INC	-0.000056	0.0000403	-0.0000154
WTPG(*)	0.2813771	0.2671828	0.0799176
CPCDM	0.0002516*	0.0001525	0.0000691
BPCDM	-0.0000554	0.000115	-0.0000152
NBEN	-0.0010203**	0.0004748	-0.0002804
DIPR	-0.150224*	0.1051234	-0.0412848
OSINC(*)	-0.5024354*	0.3064205	-0.1534417
_CONS	1.527571	1.271053	
Number of obs = 157		Log pseudo likelihood = -69.6131	
Censored obs = 41		Pseudo R2 = 0.2279	
Uncensored obs = 116			
Wald chi2(28) = 50.86			
Prob > chi2 = 0.0012			

(*) dF/dx is for discrete change of dummy variable from 0 to 1- which is marginal effect

Source: Author's Computation using own Survey data 2012

*, **, *** indicates statistical significance at 10%, 5%, 1% probability level, respectively

Having one additional other source of income (OSINC) other than CDM forest regeneration program affected the level of participation of the local HH with the CDM project by reducing nearly 15.34 percent and its correlation is negative. The

inference is that there are other sources of income for HH that hinders them not to go to forest management and their preference to shift from CDM to other higher return/earnings by delegating other family member for forest management is also increased consistently.

Distance to project site from the residence "*DIPR*" using one additional kilometer impedes the HH head from having full effort investment of time on forest management activity approximately 4.13%. This may be convoyed by different social, cultural and economic challenges of the local household. When there is a shift from unmarried to married the probability of labor supply of local HH for forest management become reduced by almost 12% as it was described in effects of inclusion or exclusion part.

And as the HH becomes more mature and having more experience give rises to work hard on forest management by 0.11 percent causing the level of participation to increase by 0.5% by bearing future burden of payment willingly (WTA). This shows that the community is committed in rehabilitating their environment and in favor of shifting healthier environment for the next generation.

As far regular meeting in the forest management decision and resource utilization "*ATME*" as concerned the local HH head participation level increased by almost 43.7%. This implies that the level of decision making process is crucial in participatory communal forest management program as compared to other explanatory variables whereas the level of education of the sample household portrays that having one additional step on educational cycle will result to increase the level of participation by 2.72% and this further improves benefits as though the return is not on the basis of fair labor share.

As result of dummy variable of gender shows that the level of participation of female headed household decreased by 14.74% as compared to male headed household since the marginal effect result of discrete change from female to male. On the other hand agro-ecology also maters the level of participation from *Weyna Dega* to *Kola* and vice versa negatively by 15.84%. This implies that peoples in *Kola* are participating more regularly than *Weyna Dega*. This is possibly due to the state of *Kola* region/area is more vulnerable to climate change hazard and the community understood the pain of recurrent drought and poverty. Also cost of participation affected its level positively by less than one fourth of a percentage.

4.10. Net Benefit Earning with CDM Project Participation

As shown in (Table 8), Heckman's two step estimate regression model with sample selection using the coefficient and marginal effect values described as follows. Education (EDU) has a great role in boosting up of earning through effective participation, because they are using their time wisely to implement. In addition to that attending on general assembly (ATME) created an alarm for wise use of resources in allocation and helps to undertake crucial decision on different issues like benefit and cost distribution. Moreover, the amount of cost of participation positively correlated and lambda (Invers Mills Ratio) is also significant and confirmed positive earnings of local households.

In contrast, willingness to accept (WTA) the level of compensation for the existence of forest and transferring it to the next generation , agro ecology of the residents (AGEC), and benefit of participation (BPCDM) variables emphasis on negative returns of participation. The relationship implies that the level of earnings from

participation for the local HHs becomes declined on the bases of WTA per individual households. And the return from participation with respect to *Kola* and *Weyna Dega* is declined due to the emphasis of the local households at each region.

The level of education EDU shows that as the HH becomes more and more educated the distribution of benefit becomes increased fairly and when the HH becomes not educated and if still they left with previous knowledge the level of earning from participation decreased (unfair) by that percent due to lack of enough knowledge to utilize the resources from forest.

Table 8: Net benefit earning with CDM project participation; Heckman's Method

Variable	Coefficient	Std.Err	Marginal Effect
EDU	0.171684*	0.1504771	0.171684
SEX	0.037186	0.4843146	0.037186
AGEC	-0.86368**	0.4137696	-0.86368
LASI	0.054885	0.2162679	0.054885
RELGS	0.156956	0.2534533	0.156956
AGE	0.025264	0.021967	0.025264
ATME	1.896469***	0.6545264	1.896469
FASI	-0.00561	0.0786126	-0.00561
MAST10	0.292705	0.5299205	0.292705
WTA	-0.40417*	0.3570463	-0.40417
INC	3.44E-05	0.0000488	3.44E-05
WTPG	0.347936	0.3533563	0.347936
CPCDM	0.000298**	0.0001466	0.000298
BPCDM	-0.00031**	0.0001328	-0.00031
_CONS	1.989389	1.533463	
LAMBDA	2.469458***	0.9435291	
Number of obs = 157			
Censored obs = 41			
Uncensored obs = 116			
Wald chi2(28) = 50.86			
Prob > chi2 = 0.0052			

Source: Authors Computation using own Survey data 2012

*, **, *** refers to statistical significance at 10%, 5%, 1% probability level, respectively

As the study shows using marginal effects on (Table8), a one cycle increase in education guarantees fair distribution of benefit and results on increase of net benefit by 17.16%. The implication is that if the HH knowledge becomes increased the level of participation on regeneration of forest become increased and this also shows that higher earnings from the forest either directly or indirectly.

And HH those who are willing to accept (WTA) the burden of the existence of forest for the next generation earn net benefit of 40.40%less from the normal distribution. This implies that these HHs work very hard in order to transfer healthier environment and at the same time they earn high amount for the labor they provide but invest for future. Gross benefits and costs of the HH from the participation of CDM confirmed the level to earn 0.031% less and 0.029% more/increase net benefit per year from the actual concerning benefit of participation (BPCDM) and cost of participation (CPCDM) respectively.

On the other hand the agro ecology (AGEC) of the sample household also matters the level of earning. And hence as we move from *Kola* to *Weynadega* the earning becomes reduced by 86.36% which is significant at 10% level with expected sign. This may be due to household dwell in *Kola* knows the challenges of climate change than *Weyna-dega* for their participation. Effective participation with regard to attending on the general assembly (ATME) has a great role in boosting up of the level of annual earnings of the local households as compared to other explanatory variables and LAMBDA (Invers Mills Ratio) is also significant and confirmed positive earnings of local households.

Chapter Five

5. Conclusions and Policy Implications

5.1. Conclusions

Distribution of benefits and costs of CDM project is inconsistent according to the study. Significant numbers of local households were excluded at the beginning of the project and this further crippled the provision of services and efficient distribution of benefits and costs. In addition to that substantial parts of the community looking to have the funds from payments for ecosystem services for individual and own purpose rather than fixing it on investing public goods like flour mill, water, bridge, health facilities etc. according to project document design.

About one fifth of the local household income emanates due to the existence of the CDM project using forest benefits of direct and indirect ways. But, equality of its dissemination over the poor and rich local household seems moderately equal (almost at the periphery of inequality and not fairly equal) and relatively efficient (not perfectly efficient). This exacerbated the tricky of inequality among poor and rich farmers nevertheless it has relative importance on reducing local household's poverty.

Participation significantly determined by the remoteness of the site, knowledge status, other source of income, willingness and reluctance to invest the fund on public goods, agro-ecology and gender discrimination among different other factors. This further affected the level of net benefit on the basis of one year analysis from the project. On the other hand, the project has transformed the perception of local households concerning climate change and the way for mitigation but not holistically.

Finally, some of the community suspecting about the ownership of the forest under the control of their respective cooperative organizations and contesting and hesitating for its property right on top of its weak strength.

5.1. Policy Implication

I. To bring about equitable distribution of benefits and costs and to remove exclusion problem there should be a mechanism for redistribution and households ought to get reasonable net benefit for their fair share only in addition to pervasive training.

II. To convey regular participation, there should be equal share of work load and equal share of benefits for each HH and using labor division scientifically with respect to individual characteristics.

III. For few HHs, a cost of participation is high with low return due to crop failure by wild animals. Therefore, concerned bodies and the community in collaboration ought to fence the forested area and planting agroforestry trees so as to subdue the problem of crop failure.

IV. Majority of the communities are reluctant to invest the fund on public goods thoroughly. Therefore, they should be convinced through comprehensive ways of persuasion and some of them should share experience from other similar institutions/organization and then authorizing them to ought to influence others positively.

V. Local household should be encouraged to participate on ecosystem services provision by developing forest on their private land and with existing forest besides communal ecosystem services project through making use of efficient payments for ecosystem services.

VI. To mitigate the problem of suspicion and hesitation with regard to ownership and property right, there should be segregated training in persistent arena, provision of dividend to the members, experience sharing and further cooperative organizations should be strengthened to facilitate regular participation of local HHs and equitable benefit sharing processes.

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Appendix;

Appendix 1: Cost Distribution of Participation of HH in CDM project in ETB

	Percentiles	Smallest		
1%	250	200		
5%	350	250		
10%	507	265	Obs	157
25%	800	320	Sum of Wgt.	157
50%	1222		Mean	1733.522
		Largest	Std. Dev.	1540.389
75%	1850	6495		
90%	3900	7200	Variance	2372798
95%	5480	7742	Skewness	2.134061
99%	7742	8650	Kurtosis	7.697487

Appendix 2: Benefit distribution of participation of household

	Percentiles	Smallest		
1%	355	350		
5%	785	355		
10%	960	375	Obs	157
25%	1305	375	Sum of Wgt.	157
50%	1845		Mean	2395.959
		Largest	Std. Dev.	1613.399
75%	3065	7100		
90%	4705	7695	Variance	2603055
95%	5935	7735	Skewness	1.526531
99%	7735	8500	Kurtosis	5.095907

Appendix 3: Descriptive Statistics

Descriptive Statistics					
Variable	Obs	Mean	Std.Dev	Min	Max
Agro ecology (Agec)	157	0.254777	0.43713	0	1
Sex	157	0.77707	0.417544	0	1
Age	157	41.72611	8.765178	25	70
Edu	157	1.324841	1.188711	0	4
Mast1	157	0.88535	0.319618	0	1
Family Size (Fasi)	157	5.745223	2.264284	1	12
Religion (Relgs)	157	1.898089	0.652262	1	3
Distance to project (Dipr)	157	1.631369	1.338669	0.1	8
Land size (Lasi)	157	1.119268	0.898623	0.125	5
Rate of participation (Rapr)	157	0.738854	0.440665	0	1
Attending on meeting (Atme)	157	0.751592	0.433472	0	1
Inclusion/exclusion (Inex)	157	0.78344	0.413219	0	1
Cost of participation (Cpcdm)	157	1733.522	1540.389	200	8650
Benefit of Participation (Bpcdm)	157	2395.959	1613.399	350	8500
Willingness to pay (Wtp)	157	0.643312	0.480554	0	1
Willingness to accept (Wta)	157	0.636943	0.48242	0	1
Annual income (Inc)	157	9798.121	3675.139	1250	20000
Net benefit (Nben)	157	662.4369	300.5325	-150	1615
Other source of Income (Osinc)	157	0.22293	0.417544	0	1
Livestock holding (livstktlu)	157	4.23121	2.904988	0	15.4
Investing benefit on public/otherwise (invepub)	157	0.414013	0.494127	0	1
Marital status (Mast)	157	1.267516	0.811632	1	4

Appendix 4: Logit prediction of inclusion and Exclusion of local HH at commencement of the Project

```
. logit inex lasi age edui sex1 osinc mast10 invepub livstktlu, robust

Iteration 0:   log pseudolikelihood = -82.035658
Iteration 1:   log pseudolikelihood = -73.857063
Iteration 2:   log pseudolikelihood = -73.401558
Iteration 3:   log pseudolikelihood = -73.397205
Iteration 4:   log pseudolikelihood = -73.397204

Logistic regression                               Number of obs   =        157
                                                  Wald chi2(8)    =      18.11
                                                  Prob > chi2     =     0.0204
Log pseudolikelihood = -73.397204                 Pseudo R2       =     0.1053

------------------------------------------------------------------------------
             |               Robust
        inex |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lasi |  -.2875028    .264426    -1.09   0.277    -.8057683    .2307626
         age |   .0010079   .0355434     0.03   0.977    -.0686559    .0706717
        edui |   .0891171   .0538662     1.65   0.098    -.0164588     .194693
        sex1 |   .6734729   .5136521     1.31   0.019    -.3332666    1.680212
       osinc |  -.7958199   .4720408    -1.69   0.092    -1.721003     .129363
      mast10 |   -.733421   .8659626    -0.85   0.397    -2.430676    .9638345
     invepub |  -.8215799   .4134486    -1.99   0.047    -1.631924   -.0112355
   livstktlu |  -.1159567   .0651332    -1.78   0.075    -.2436155     .011702
       _cons |   2.546233   1.573796     1.62   0.106    -.5383506    5.630816
------------------------------------------------------------------------------

. mfx compute, nodiscrete

Marginal effects after logit
      y  = Pr(inex) (predict)
         =  .81563794
------------------------------------------------------------------------------
variable |      dy/dx    Std. Err.      z    P>|z|   [    95% C.I.   ]       X
---------+--------------------------------------------------------------------
    lasi |  -.0432326      .03815   -1.13   0.257  -.118009   .031544   1.11927
     age |   .0001516      .00534    0.03   0.977  -.010312   .010615   41.7261
    edui |   .0134008      .00811    1.65   0.098  -.002492   .029294   3.98089
    sex1 |   .1012719       .0776    1.30   0.019  -.050829   .253373    .77707
   osinc |  -.1196696      .07029   -1.70   0.089   -.25744   .018101    .22293
  mast10 |  -.1102865      .12769   -0.86   0.388  -.360549   .139976    .88535
 invepub |  -.1235432       .0602   -2.05   0.040  -.241532  -.005554    .414013
livstk~u |  -.0174367      .01015   -1.72   0.086  -.037327   .002453   4.23121
------------------------------------------------------------------------------
```

Appendix 5: Heckman Selection Model of local HH Participation and its Earnings

Heckman selection model -- two-step estimates (regression model with sample selection)

Number of obs	=	157
Censored obs	=	41
Uncensored obs	=	116
Wald chi2(28)	=	50.86
Prob > chi2	=	0.0052

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnnben						
edu	.1716839	.1504771	1.14	0.054	-.1232457	.4666136
sex	.0371863	.4843146	0.08	0.939	-.912053	.9864255
agec	-.8636843	.4137696	-2.09	0.037	-1.674658	-.0527108
lasi	.0548852	.2162679	0.25	0.800	-.3689922	.4787626
relgs	.1569559	.2534533	0.62	0.536	-.3398034	.6537152
age	.025264	.021967	1.15	0.250	-.0177906	.0683186
atme	1.896469	.6545264	2.90	0.004	.613621	3.179317
fasi	-.0056084	.0786126	-0.07	0.943	-.1596863	.1484694
mast10	.2927052	.5299205	0.55	0.581	-.7459199	1.33133
wta	-.4041696	.3570463	-1.13	0.058	-1.103967	.2956282
inc	.0000344	.0000488	0.70	0.481	.0000613	.0001301
wtpg	.3479361	.3533563	0.98	0.325	.3446294	1.040502
cpcdm	.0002983	.0001466	2.03	0.042	.0000109	.0005857
bpcdm	-.0003087	.0001328	-2.32	0.020	-.000569	-.0000483
_cons	1.989389	1.533463	1.30	0.195	-1.016142	4.994921
rapr						
edu	.0990527	.1200242	0.83	0.409	-.1361903	.3342957
sex	-.6330668	.3512352	-1.80	0.071	-1.321475	.0553416
agec	-.5232184	.3245598	-1.61	0.051	-1.159344	.1129072
lasi	.1433527	.1779263	0.81	0.420	-.2053765	.4920819
relgs	.0453084	.2047447	0.22	0.825	-.3559839	.4466007
age	.0041127	.0164259	0.25	0.802	-.0280816	.0363069
atme	1.327556	.289234	4.59	0.000	.7606683	1.894445
fasi	-.0050721	.0644984	-0.08	0.937	-.1314866	.1213424
mast10	-.5319423	.5198711	-1.02	0.306	-1.550871	.4869864
wta	.0172078	.2836353	0.06	0.952	-.5387072	.5731227
inc	-.000056	.0000403	-1.39	0.164	-.0001349	.0000229
wtpg	.2813771	.2671828	1.05	0.292	-.2422915	.8050458
cpcdm	.0002516	.0001525	1.65	0.099	-.0000474	.0005505
bpcdm	-.0000554	.000115	-0.48	0.630	-.0002808	.0001701
nben	-.0010203	.0004748	-2.15	0.032	-.0019509	-.0000898
dipr	-.150224	.1051234	-1.43	0.053	-.3562621	.0558141
osinc	-.5024354	.3064205	-1.64	0.098	-1.103008	.0981378
_cons	1.527571	1.271053	1.20	0.229	-.9636481	4.018789
mills						
lambda	2.469458	.9435291	2.62	0.009	.6201745	4.318741
rho	1.32321					
sigma	1.8662569					
lambda	2.4694577	.9435291				

Appendix 6: Marginal Effects after Heckman of Earning

```
. mfx compute, nodiscrete

Marginal effects after heckman
      y  = Fitted values (predict)
         =  5.1726756
```

variable	dy/dx	Std. Err.	z	P>|z|	[	95% C.I.	]	X
edu	.1716839	.15048	1.14	0.054	-.123245	.466613		1.32484
sex	.0371863	.48431	0.08	0.939	-.912053	.986426		.77707
agec	-.8636843	.41377	-2.09	0.037	-1.67466	-.052709		.254777
lasi	.0548852	.21627	0.25	0.800	-.368992	.478762		1.11927
relgs	.1569559	.25345	0.62	0.536	-.339803	.653715		1.89809
age	.025264	.02197	1.15	0.250	-.017791	.068319		41.7261
atme	1.896469	.65453	2.90	0.004	.613621	3.17932		.751592
fasi	-.0056084	.07861	-0.07	0.943	-.159687	.14847		5.74522
mast10	.2927052	.52992	0.55	0.581	-.74592	1.33133		.88535
wta	-.4041696	.35705	-1.13	0.058	-1.10397	.295627		.636943
inc	.0000344	.00005	0.70	0.481	-.000061	.00013		9798.12
wtpg	.3479361	.35336	0.98	0.325	-.344629	1.0405		.643312
cpcdm	.0002983	.00015	2.03	0.042	.000011	.000586		1733.52
bpcdm	-.0003087	.00013	-2.32	0.020	-.000569	-.000048		2395.96
nben	0	0	.	.	0	0		662.437
dipr	0	0	.	.	0	0		1.63137
osinc	0	0	.	.	0	0		.22293

Appendex7: Survey Questionnaire

The purpose of this questionnaire is to collect data to conduct a research on Households participation and equity of benefit sharing of Payments for Ecosystem Services of Humbo Clean Development Mechanism Project in Ethiopia in Household level.

Households participation and equity of benefit sharing of Payments for Ecosystem Services of Humbo Clean Development Mechanism in *Wolaiyta*, Ethiopia: Household survey questionnaire

1. Name of peasant association (Kebele) ----------
2. Agro ecology of Kebele_____ 0=Kola, 1=Woyna-Dega, 2=Dega
3. Name of Village _____
4. Interviewer name ----------
5. Date of interview ----------
6. Interviewee/respondent's name (Code) ----------

II. Respondent's Characteristics

1. Sex of the respondent : 1= Male 2= Female
2. Age of the respondent: _____ (in Years)
3. Education level of the respondent:_____(in Years; 0= illiterate, 1= basic education)
4. Marital status of the respondent: 1= Married 2= Unmarried 3= Divorce 4= Widowed
5. Family Size: Male: _____ Female _____ Total: _____(*including household head*)
6. What is your religion? 1=Orthodox 2=Protestant 3=Catholic 4=Muslim 5=other (specify) ____
7. To which ethnic group do you belong? 1=Welayita, 0=others (Specify) _____
8. **Particulars of the household members**

Ser. No.	Sex **(Code A)**	Age **(in Years)**	Education level (in Years)	Occupation **(Code B)**

Code A: *1=Male 2=Female*
Code B: *1=farmer 2=Government employee 3=Trader 4=Casual laborer 5= dependent 6= others (specify)* _____

9. Were you born here? 1=Yes 0=No
10. If response to Qsn. 9. is No, from where did you move here?

1= other *woreda*or *kebele*2= other sub-city 3 = brought up abroad

4= other region (specify) _____

11. Why did you move here? 1= I built a new house 2= by government settlement program 3= for seasonal employment 4= other (specify) __

12. Is your residential house located close to the CDM project area? 1=Yes 0=No

13. How far is it(CDM Project) located from your residential area_____(in Kms)

2. Livestock and livestock products

14. Do you have any kind of livestock? 1= Yes 2=No

15. If yes, specify the following details of livestock

S/N	Type of livestock	No owned	Items sold in 2003/4 E.C		Remark
			No of livestock	Price per unit	
1	Cattle				
	Cow				
	Ox				
	Heifer				
	Bull				
2	Equines				
	Horse				
	Donkey				
	Mule				
3	Goat				
4	Sheep				
5	Poultry				

3. Land Resources

16. How much is the total land holding size of you? (In local unit, Timads) _____

17. What is the land use pattern (allocation) fill beneath each item of land use on the table:

Item/land	Crop land	Grazing	Wood/forest	Grass	Annual	Perennial
Unit(Timads)						

Current land use for crop production

18. Types and hectare of land allocated for major crops in this year (2003/4 E.C)

S/N	Major crops in descending order	Area covered by the crop (timad)	Total production (Kg)	Production(qt)		
				Consumption (Kg)	Sale	
					Amount (Kg)	Income (birr)
1						
2						

19. What is the source of income? Choose top Five in their order of importance by giving numbers;

1. Crop
2. Fruit
3. Vegetable
4. Coffee
5. Forest product
   -timber
   -charcoal
6. CDM project
7. Livestock
8. Bee rearing
9. Food for work
10. Off-farm activity
- Daily labor
- Petty trade

11. Unearned income
- Remittance

12. Others (specify..)

Clean Development Mechanism (CDM) Project

20. Are you the member of CDM project since its commencement? 1= Yes, 0= No

21. If response to Qsn. 20 is yes , how do you become the member? Due to;

1. the importance of project to Environment
2. pervasive persuasion/understanding the idea of the program
3. attractiveness of payment
4. enforcement by officials
5. others involvement
6. others (specify)

22. If response to Qsn.20. is "No" why?

1= lack of interest
2= low payment
3= busy (other income source)
4= segregation/isolation
5= lack of understanding
6= other (specify../

23 Are you participating regularly in forest management activity? 1= Yes 0= No

24. Are you participating in all the meetings of your cooperative at any time? 1= Yes 0= No

25. How do you express the pleasure concerning your satisfaction on CDM project?

1= Very much satisfied 2= Very satisfied 3= Somewhat Satisfied 4= Not at all satisfied

26. If you participate regularly why?

1= it gives me satisfaction 2=fear of punishment 3= generate income
4= for the sake of public development 5=other (specify)_____

27. If you are not regularly participating why?

1= the distance 2= family related problems
3= its low return 4= segregation/exclusion by officials 5=other (specify)___

28. How do you get the project concerning its importance and your benefit?

1= More than I expected 2= about the same as I expected
3= Less than I expected 4=other (specify) _____

29. Have you ever benefited from the project? 1= Yes, 0= No

30. How important would the project with regard to benefiting you?
    1= Very important, 2= Somewhat important, 3= Not important
31. What are the major benefits that you obtained from the project? (Select top three from the following by giving numbers based on its importance in front of each alternative);

1= increased the source of income	4= created good market access
2= improved the availability of water	5= created access for the grazing
	6= credit provision
3= facilitated soil conservation/protection	7= for eye attraction
	8= other (specify)

32. Have you earned income/money from carbon sale? 1= Yes 0= No
33. If Yes (Q-32) is it satisfactory? 1= Yes 0= No
34. If not (Q-32) do you think that it would be better if it is distributed to individual? 1= Yes 0= No
35. How do you express your agreement concerning distributing money to individuals? 1= Strongly agree 2= Agree 3= Undecided 4= Disagree 5= Strongly disagree

36. Indicate the details about the costs that you spend with CDM project while you are participating using the following table?

No.	Type of activities	Amount	Unit cost in birr	Total cost in birr	Remark
1	**Direct Cost**				
	Developing seedling				
	Forest management per hr				
	Protection/conservation in hr				
	- Cutoff drain(Km)				
	- Trench				
	- Check dam				
	Reforestation/afforestation				
	Pruning/clearing				
	Fire protection canal				
	Fencing /Kacha/				
	Guarding service				
	Free work time				
2	**Indirect Cost**				
	Loss of leisure time				
	Loss of crops by wild animals				
	Cost of medication when injured*				
	Others Specify. . . .				
3	**Opportunity Cost**				
	Time of travelling				
	Total cost				

* *Medication cost implies only when you injured while you are performing project activity.*

37. Indicate the details about benefits that you get while you are participating on CDM project using the following table?

No.	Type of activities or benefits	Amount	Unit price in birr	Total benefit in birr	Remark
1	**Direct Benefit**				
	Income from forest resources				
	- Grass for cattle				
	- Failed trees				
	- Fuel wood(dropped during clearing) *chiraro*				
	Employment opportunity				
	Income from carbon sale				
	Climate control				
	Energy saving technology/service				
	Training on forest mgmt.				
	Top soil protection from erosion/soil retention				
	Others				
	Indirect Benefit				
	Learning new skills/Knowledge transfer				
	Capacity Building				
	Provision of credit for small HH animals Such as Goat, sheep				
	Improving water points				
	For good eye view/attraction/aesthetic value				
	Increase environmental awareness				
	Providing access to energy efficient cooking while easing resource conflict				
	Bee rearing				
	Empowering communities to take action				
	Narrowing food gap				
	Getting agricultural Gadgets				
	Others				

38. Have you obtained other benefits rather than money from carbon trade for your ES provision indirectly? 1= Yes 0= No

39. Have you observed factors that affect the provision of ES in the field?
    1= Yes 0= No
40. What are these factors with respect to ES provision? Select top ***three***
    1= lack of exclusive property right
    2= lack of sense of ownership
    3= delay of payments by World Vision
    4= tragedy of commons
    5= absence of distribution of income from carbon sale
    6= Land rights and tenure;
    7= Market access
    8= Payment and pricing mechanisms and equity
    9= Institutions (Cooperatives)
    10= Governance
    11= Participation
    12= Information and bargaining power
    13= others (specify)
41. Is there clear distribution of income from CDM? 1= Yes 0= No
42. Do you think that the owner of the forest is your cooperative? 1= Yes, 0= No
43. Do you think that owning forest under cooperative has a positive impact with respect to ecosystem service provision? 1=Yes, 0= No
44. If yes for Q-43(above) what are the possible impacts? (select the most four)
    1=facilitates forest management easily
    2=sustainable forest protection
    3=increases access to poor (land less) farmers
    4=helps to invest on public goods
    5=increases social values and networks
    6=increases income via carbon trade
    7=others (specify)
45. If response to Qsn-43 is "No" (i.e. other than cooperative) what shall better?
    1=private right to use forest
    2=exclusive carbon right
    3=re-adjusting the cooperative by-laws with respect to service provision and benefit distribution
    4=others (specify)
46. Which one is the best to provide efficient ecosystem service provision with respect to benefit? 1=private ownership, 2=communal/cooperative ownership, 3=others(specify)

47. Which one is the best to provide efficient ecosystem service provision with respect to environment? 1=private ownership. 2=communal/cooperative ownership, 3=others(specify)
48. What is your judgment with regard to ecosystem services provision about private property right 1= very strong 2= somewhat strong 3= weak
49. What is your judgment with regard to ecosystem services provision about communal property right 1= very strong 2= somewhat strong 3= weak
50. Do you want to have the best property right other than what you have been governed? 1= Yes 0= No
51. Do you think that your cooperative is strong enough to secure the property right? 1= Yes 0= No
52. Is your cooperative fair and transparent with regard to decision making on the income of carbon sell? 1= Yes 0= No
53. If Yes do you agree on not dividing money to individuals? 1= Yes 0= No
54. Is your Iddir/Eqube has any contribution for forest management of ES? 1= Yes 0= No
55. Your annual income in ETB_____

Please indicate your level of agreement with the following statements (Your opinion about PES of CDM). Select your choice from the bottom of this table

56.	The project has great importance in improving the health and nutrition of my family/HHs					
57.	The contribution of CDM project is high in opening an opportunity to send children to school					
58.	CDM project created conducive condition to increase the capacity to work hard via participatory work approach					
59.	Due to the project the fertility and productivity of land is improved					
60.	Biological resources such as trees, forest products, wild life, wild foods and biodiversity has been improved					
61.	Rationalization of land and forest right defined without any contest					
62.	Environmental services improved					
63.	Enforced mechanisms for participation in decision-making of benefits from carbon trade and forest resources					
64.	Improved supply of water and energy(fuel wood, charcoal)					
65.	Played key role in disseminating tools like equipment for production					
66.	Benefiting from credit Via Improved the knowledge of saving					

1=Strongly Agree, 2=Agree, 3=Undecided, 4=Disagree, 5=strongly disagree

67. Are you willing to pay for forest guarding services in the form of contribution annually? 1=Yes 0=No
68. Do you think that more benefit will be derived if the forested land used for other agricultural purpose? 1= Yes 0= No
69. Do you want to have any kind of compensation for the existence of forest? 1= Yes 0= No
70. If your response for Qsn.69 Yes, how much? In Birr_____
71. If there are foregone benefits due to the existence of forest, how much would it be?_____
72. Is the project efficient concerning different benefits and costs for you? 1= Yes 0= No
73. If your response for Qsn.72 No what are possible problems? _____
74. Your annual expenditure in ETB _____

Questions for Cooperative Organization; Name of the coop_____

1. What are the main goals/objectives of this cooperative?

   .....

2. What are the major tasks that you carry out for the successfulness of your organization?.....

3. Do you have any employee? 1=Yes, 2=No

4. If yes, how many? .....

5. Indicate the details of your employee on the table below

No.	**Position**	**Sex**	**Age**	**Level of education**	**salary**	**Remark**
1.						
2.						
3.						

6. Indicate the status of your cooperative

No. of Member				Capital		Loan		No. of Workers/Paid		Credit		
Initial		Current										
Male	Female	Male	Female	Initial	Current	Initial	Current	Initial	Current	Provided	Returned	Remaining

7. If the number of member is increasing what is the reason?

   .....

8. If it is declining or static, why?

   .....

9. Have you launched the general assembly meeting last year or 2003/4?

   1= Yes 2= No

10. If yes for how many times _____

11. Have you ever get income from carbon sale? 1= Yes 2= No

12. If yes answer the following details on the table;

When was it paid	How many times	Income from Carbon sell total (ETB)	Type of investmen t/Name	Amount invested(E TB)	Amount saved (ETB)	Further plan for the remaining amount	Others

13. Have you ever divided dividend for members? 1= Yes 2= No

14. Approximate the benefit that you earn from CDM project _____ETB

Questionnaires for Focus Group Discussion (FGD)

1. Do you think that CDM project has a great role in changing your livelihood, and Environment? How?_____
2. Is the distribution of benefit and cost of CDM project equitable and efficient with regard to the provision of ecosystem services among the community? How?_____
3. How do you relate the CDM project with poverty reduction/narrowing food gap? Discussion_____
4. To bring about efficient and equitable PES what strategies need to be used(to scale up)? How? _____
5. Prioritize following Factors influencing equity and efficiency of PES using cdm project of outcomes (select top three and discussion)
   - Land rights and tenure; other material or production rights
   - Market access
   - Payment and pricing mechanisms and equity
   - Institutions(cooperatives)
   - Governance
   - Local to global scales
   - Intermediaries
   - Participation (and 'participatory parity')
   - Information and bargaining power
6. Is there any inclusion and exclusion problem with regard to equitable distribution of the benefit among the individuals?
7. Is the local household satisfied with the benefit? And how the individual HH participate in the CDM project (free riders)?
8. How do property rights and institutional setup, affect the efficiency in the provision of service?
9. What do you think about ecosystem service demand and supply force with respect to significant economic value to people's livelihood?
10. What are the significant impact of income from carbon trade in alleviating and reducing poverty with respect to efficiency and equity of PES with the CDM project? (i.e. contribution of CDM project in alleviating poverty of the local households).

DECLARATION

I hereby declare that this thesis is my original work and has not been presented for a degree in any other University. All sources of materials used in this work have been duly acknowledged.

05/11/2012

DESALEGN DAWIT

This thesis has been submitted for examination with my approval in my capacity as an advisor.

BELAY SIMANE (PhD)