

## **Promoting Sustainable Development through Carbon Trade and CO<sub>2</sub> Sequestration: The Case of Humbo Assisted Natural Regeneration Project in Southwestern Ethiopia**

Bekeri Mohammed and<sup>1</sup> Feyera Senbeta<sup>2</sup>

### **Abstract**

*Ethiopia being a developing country and a signatory to the Kyoto Protocol has a high potential for gaining Carbon Credits through the implementation of Clean Development Mechanism (CDM) projects. The Humbo Assisted Natural Regeneration Project is already developed and registered under the CDM scheme. The objective of this study is to assess the trends of the CDM carbon sequestration project and its contribution to sustainable development in southern Ethiopia. Selected sustainable development indicators that include environmental, economic and social categories were used for the evaluation of the project performance. Data were collected using household survey (100 households) and key informant interviews. A four-point Likert scale questionnaire was used to collect data with a 0.85 level of Cronbach's alpha coefficient. Most environmental indicators evaluated have shown a significant improvement. All the economic indicators assessed including household income, employment opportunities, technological transfers have also shown improvement. This also holds true for most assessed social indicators: property rights clarification, community participation, and capacity building. Exceptions are women's participation, distribution of benefits and costs in the cooperatives, and agreement on carbon trade income distribution. The Humbo Project has opened up an opportunity to promote sustainable development while there is a challenge of integrating it with the socio-economic and political context of the country. Hence, clarifying and mainstreaming the issues surrounding CDM and sustainable development in the Ethiopian context are found to be of great importance.*

**Keywords:** CDM forestry, carbon trade, Ethiopia, sustainable development

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<sup>1</sup> Lecturer, Gondor University, Gondor, Ethiopia

<sup>2</sup> Assistant Professor, College of Development Studies, Addis Ababa University, Ethiopia

## Introduction

Increased emission of Green House Gases (GHGs) especially after the industrial revolution is considered to be one of the major causes contributing to the global climate change (UNFCCC, 1997; IPCC, 2007). Climate change variables influence biophysical factors, such as plant and animal growth, water cycles, biodiversity and nutrient cycling, and the ways in which they are managed through agricultural practices and land use for food production. Many scholars contemplated that sustainable development practices and sharing responsibilities among the global communities are some of the solutions to this pressing global problem.

Mitigation measures are proposed and being implemented at a global level to reduce increase in these gases. One such initiative is carbon trade scheme which forces major industrialized nations to implement the Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) in order to meet their GHGs emission reduction commitments without jeopardizing their economy (Annex 1).

The CDM is one of the three so called 'flexible mechanisms' of the Protocol along International Emissions Trading (IET) and Joint Implementation (JI). While differing in operation, these three mechanisms are based on the same principle: industrialized countries are allowed to "reduce emissions outside their territory and then count those reductions towards their national target" (Kagi and Schone, 2005).

The CDM is designed to achieve two basic goals according to Article 12 of the Kyoto Protocol: promotion of sustainable development in developing countries which host the projects and help Annex 1 countries achieve their emission reduction targets in a cost-efficient manner (UNFCCC, 1997). With this twofold approach, it has been argued that the CDM should give due emphasis to the sustainable development aspect to succeed beyond the GHG emissions reduction. Under this arrangement industrialized countries fund projects in developing countries through purchase of carbon offset credits called Certified Emission Reductions (CERs) from carbon projects like reforestation /afforestation schemes to meet their quota and reduce the gases.

However, it has always been an issue whether CDM projects can promote sustainable development besides reduction of emissions (Nussbaumer,

2006). A review of the literature (e.g., May *et al.*, 2004) on the subject tends to support this argument by implying that the trade-off between sustainable development and emission reductions is working in favor of the latter basically because of market forces and the CDM's own arrangements. Globally carbon sequestration projects are criticized for not meeting the sustainable development objective they signify to advance. This is essentially important because of the weak market power of developing countries (Sutter, 2003).

In the meantime, many developing countries are using the opportunity to establish carbon sequestration projects. However, Africa has been left behind accounting for only 2 % of the projects registered under CDM to date (UNFCCC, 2011).

In Ethiopia there is only one carbon trade project that is registered by the UNFCCC up to 2011. This also reflects the low number of such projects in Africa as a whole which accounts for about 2% of registered projects worldwide. The reason behind this low involvement in carbon trade of the continent in general and Ethiopia in particular is the low level of human and institutional capacity in addition to the market oriented arrangement of CDM projects. On the other hand, project developers are also of limited capacity to come with viable project proposals that are able to earn the Designated National Authority's Letter of No Objection.

Hydro Power is one of the areas where CDM CERs can be generated. Ethiopia as a country has ample hydropower potential but it is not using this opportunity to register hydropower generating projects. This is because Ethiopia is mostly engaged in large scale hydropower projects that in themselves are believed to contribute to emission of gases like methane which contradicts the very basic objective of CDM projects which is the reduction of these gases.

Ethiopia being a developing country and a signatory to the Kyoto Protocol has a high potential for gaining Carbon Credits through the implementation of CDM projects. The Humbo Assisted Natural Regeneration Project launched in 2006 was the first and the largest reforestation project in Africa to be registered under the CDM of the Kyoto Protocol. It was an NGO (World Vision Ethiopia) initiated climate mitigation project based on community managed reforestation and the practice of sustainable development. This project is believed to be changing the livelihood of the

community through sustainable use of forest resources and income generating mechanisms. The project, in addition to the income remittance from carbon offset credits, claims to promote local sustainable development (WVE, 2008).

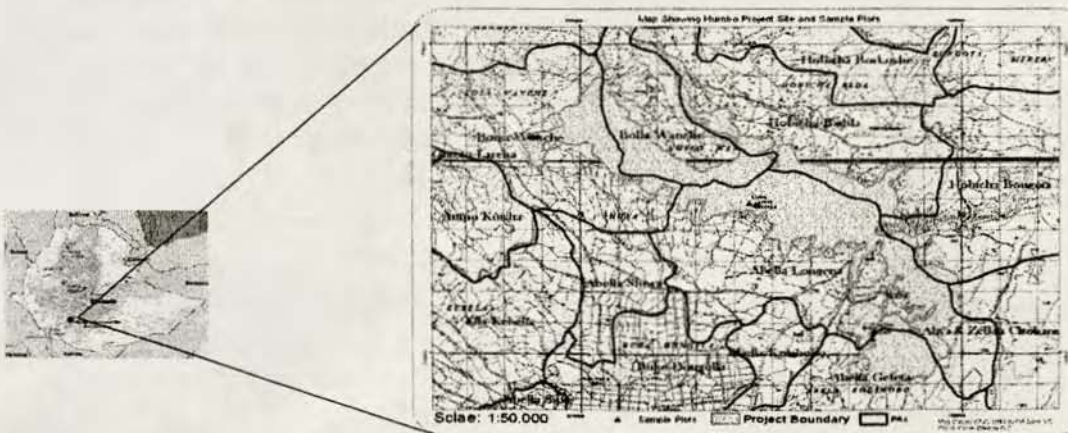
Despite the various arguments about the success/failure of CDM, limited studies were conducted to evaluate the impact of carbon trade initiated CDM projects on sustainable development. Hence, this study assesses the contribution of a carbon sequestration project initiated through the CDM of the Humbo Assisted Natural Regeneration Project in southern Ethiopia.

## Research Methodology

### Description of the study area

The study area is located in Humbo District about 430 km south west of Addis Ababa and 86.2 km from the regional capital Hawassa (Figure 1). Humbo is located at  $6^{\circ} 43' N$  and  $37^{\circ} 45' E$ . Rainfall on the district varies from 700 mm to 1400mm. The geological formation of the study area belongs to the Precambrian rock formation underlain by sedimentary rocks and volcanic ashes. The soil of the area is brownish red predominated by clay soil (Deribe Gurmu, 2006).

Figure 1: Location of the Humbo Project



Source: WVE, 2008

The Humbo District is one of the highly populated areas in the country. The District covers an area of 86,646 ha with a population of around 125,286 (CSA, 2007). The population density is about 145 persons per km<sup>2</sup>. Livestock population is estimated at about 108,000. The main crops grown in the area are maize, sweet potato, *teff*, coffee and cotton. The communities in the district are predominantly farmers with an average of 0.25 ha of land holding with subsistence agriculture as the main stay of the people (Deribe Gurmu, 2006).

Before the commencement of the CDM project the study area was highly degraded as a result of population pressure and unsustainable use of resources. Only bushes and shrub lands were left which led to reduced supply of wood and wood resources, low productivity, flood and drought recurrence (WVE, 2008).

### **Methods**

The survey method is economical and allows rapid turn out in data collection. Self administered questionnaires and interviews were the main instruments used to collect data along other secondary sources of data collected from different organizations engaged in the implementation of the project: World Vision Ethiopia, Federal and Local Government Authorities in particular the Environmental Protection Authority of Ethiopia, which is the authority mandated with overseeing the project.

Using multi-stage sampling the population is clustered into 7 cooperatives (which were already formed by the project to facilitate its implementation) out of which 2 cooperatives were randomly selected. A total of 100 questionnaires were administered taking the household as a sample unit in two cooperatives, Hobicha Bada and Bolla Wanche, each with 450 and 550 households respectively. With an alpha level of 0.05, a 0.03 margin of error and t-value of 1.96 for an approximated population of 1000 households in the two cooperatives the sample size is calculated to be approximately 100. Purposive sampling is used to identify those households that are participating in the project.

### **Humbo Local Area Context and the Project Design**

According to local sources, the Humbo area and its surroundings have severely been exposed to drought and recurrent famine for many years. The major reasons for drought and recurrent famine were over exploitation of

the resources particularly the forest resources due to agricultural expansion, land grants to investors and resettlement schemes. Three decades ago, the area has been covered with dense tropical jungle with different species (WVE, 2008).

The Humbo Farmer Managed Natural Regeneration Project was initiated in 2006 by World Vision Ethiopia. It was a non-conventional method of regenerating "underground forest" by giving priority to indigenous plant species rather than exotic species as was the case in conventional reforestation projects. To implement the project, seven cooperatives were formed based on the Cooperatives Society Proclamation No.402/2004. The cooperative societies included in the project have bylaws that govern them in conducting their activities outlining the structure of their organization, rights and duties, objectives, membership criteria, conditions of withdrawal and dismissal and issues related to management and the management bodies established according to these bylaws (PDD, 2009). Each cooperative is composed of the local communities as well as representatives from World Vision Ethiopia and the forestry department. The functions, composition, power and hierarchical reporting structures of these organs of the cooperatives are outlined in bylaws. The highest decision making authority is the General Assembly which is the assembly of all the cooperative members.

There were different national and international stakeholders, including the Environmental Protection Authority of Ethiopia, involved in the project design and implementation at different stages of the project. Ethiopia ratified the Kyoto Protocol in 2005. It has also mandated EPA to be the Designated National Authority according to the requirement of the Kyoto Protocol in regard to CDM project activities. This mandate has given the Authority to approve or disapprove CDM projects based on the assessment of sustainable development criteria.

World Vision Ethiopia also played an important role in mobilizing the community, raising fund, giving technical and human support and facilitating the flow of funds. Different government bodies were also involved at different levels. At the federal level, the most important participants were the Ministry of Agriculture and Rural Development and the Environmental Protection Authority. The regional bureaus were also equally important in implementing regional forest and land policies and

regulations. At the local level, the District Agricultural Office is responsible for allocating land to the community as well as facilitating the establishment of cooperatives in the community.

### **Data Analysis**

Data analysis included simple descriptive summaries (mode, median), graphical procedures, and data tabulation used to determine the initial stage of the data analysis.

A 4-point Likert scale (strongly disagree, disagree, agree and strongly agree) was employed by avoiding the middle point option (i.e., the undecided/neutral option). Descriptive statistics which was based on the median, the mode and the frequency of responses was presented using tables and graphs. The median and the mode were chosen over the mean because with statistical analysis of individual Likert items, the mean is not considered to be an appropriate measure since the measurement scale is ordinal at this level (Johns, 2010; Jamieson, 2004). In this study priority is given to the mode value.

Validity which is the correctness and effectiveness of the questionnaire items has been verified by reviewing different literature on the measurement of sustainable development in addition to consulting different stakeholders in the project. In regard to the analysis of the internal consistency of the 35 scaled items a 0.85 Cronbach's alpha was derived indicating an excellent reliability since 0.8 alpha values are considered to be perfect measures of reliability.

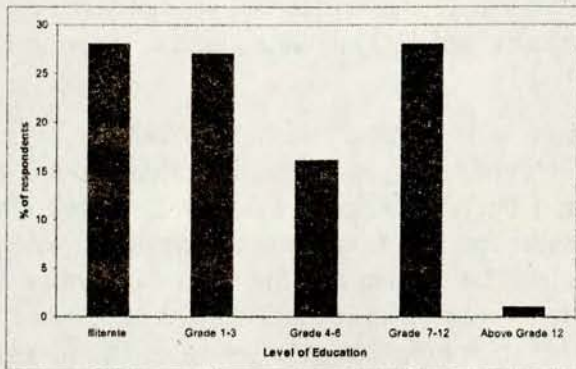
## **Results and Discussion**

### **Demographic characteristics of households**

The age of the respondents ranged from 18 to over 65. The youngest age was 18 since the respondents were household heads who were at least expected to be at the lowest marital age according to the Ethiopian family law. The survey data indicated that the majority of respondents (about 62%) fall within age categories between 25 and 44. The distribution of gender in the respondent groups also showed that the male headed households were dominant (66%). The average family size in the survey was 6. Figure 2 indicates the educational status of the respondents. Most of the respondents

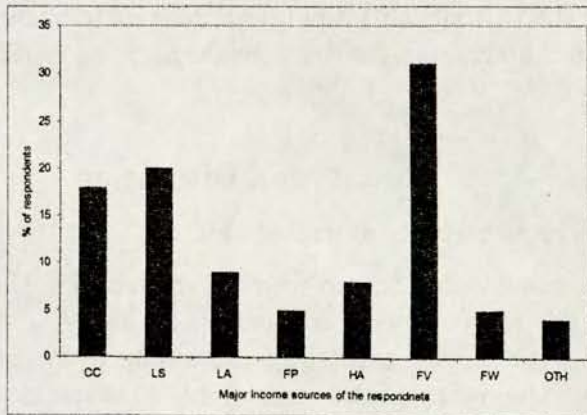
(47%) in the survey constituted the “Illiterate” and the “Grade 1-3” category.

Figure 2: Educational level of respondents



In terms of income source, most of the households depend on the sale of fruits and vegetables (31%) followed by the sale of livestock and livestock products (20%) and sale of crops (18%) in the study area (Figure 3).

Figure 3: Major source of income of the households



Note: CC-Crops; LS- Livestock; LA- Labor; FP-Forest products; HA-Honey; FV-Fruit and vegetables; FW-Fuel wood; OTH-Others



### Sustainable development indicators of the project

In this section, the contribution of the Humbo CDM carbon sequestration project to local sustainable development is analyzed and discussed under environmental, social and economic indicators.

#### Environmental indicators

As sustainable development indicators, 10 environmental indicators were used to assess people's attitude towards the project's contribution to environmental protection and regeneration of the degraded environment. These indicators include water quality and quantity, restoration of biodiversity, reduction in soil erosion, improvement of air quality, improvement in waste disposal, reduction in illegal deforestation and restoration of endangered animal and plant species of the area (Table 1).

Water quality has a median of 2.00 and two modes (1 and 3). While 38% of the respondents agreed that there was improvement in water quality after the project, another 38% reported that there was no water quality improvement. This holds true for water quantity as well in which the project has contributed to improvement in availability and access to water, though there is only one mode (i.e., 2) which has a frequency of 54%.

Table 1. Median, mode and frequency distribution of the environmental indicators

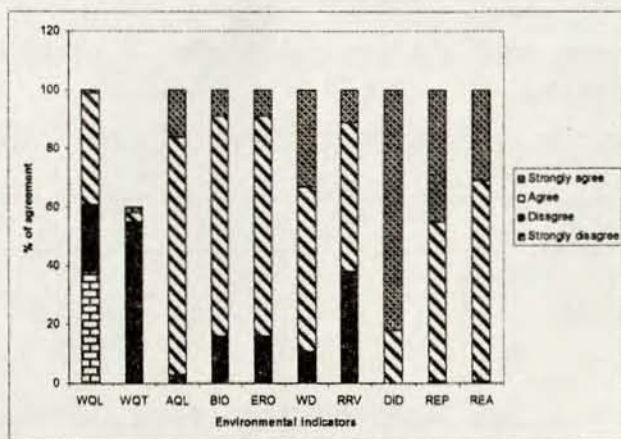
	WQL	WQ T	AQL	BIO	ERO	WD	RRV	DID	REP	REA
Median	2.0	2.0	3.0	3.0	3.0	3.0	3.0	4.0	3.0	3.0
Mode	1, 3	2	3	3	3	3	3	4	3	3
Frequency	(38%),38 %	(54 %)	(81 %)	(84 %)	(75 %)	(56 %)	(51 %)	(82 %)	(54 %)	(68 %)

Note: WQL = Water Quality Improvement; WQT = Water Quantity Improvement; AQL=Air Quality Improvement;BIO = Restoration of Biodiversity; ERO = Reduction in Erosion; WD= Improvement in Waste Disposal;RRV = Reduction in Rainfall Variability; DID = Decrease in Deforestation; REP = Restoration of Endangered Plants; REA = Restoration of Endangered Animals).

It is generally agreed that carbon sequestration projects "can often generate co-benefits such as more regular and higher quality water supplies" (Scherr *et al.*, 2006 cited in Jindal *et al.*, 2006). This is not the case with the Humbo

Project which exhibits different scenarios with regard to the above indicators. Due to high level of exposure to drought from previous degradation, positive impact on water quality and quantity was not expected in the study area. In one of the cooperatives (Hobicha Bada), a significant amount of the respondents (38%) agreed that there was water quality improvement as a result of the project implementation while in the other cooperative (Bolla Wanche), an equal number of the respondents (38%) disagreed about improvement in water quality as a result of the project implementation. However, to come to the conclusion whether water quality has been improved by the project implementation, it is appropriate to consider the other two responses (i.e., disagree and strongly agree) which scored 23% and 1%, respectively. This raises the cumulated disagreement level to 61%. Therefore, it is safe to conclude that overall there is no water quality improvement due to the project according to the survey result. The respondents in both groups agreed that there has been no water quantity improvement that resulted owing to the project. They stressed that there is water supply problem in both their respective cooperatives.

Figure 4: Summary of responses to the environmental indicators



Note: Abbreviations are the same as those in Table 1.

According to the survey result, air quality has improved significantly after the project. Since it is a project that targeted to improve the area's micro-climate this comes as a no surprise. The success of the project in that regard

has been affirmed by the majority of the respondents (81%) who agreed that there is improvement in air quality after the project

The same holds true with the biodiversity of the area which is successfully regenerated after the project. The restoration of the biodiversity of the area relied on the Farmer Managed Natural Regeneration (FMNR) method which focused on the regeneration of indigenous species resulting in the reappearance of the wild animals and plant species that were lost as a result of deforestation.

Soil erosion was one of the most pressing challenges in the area before the project (Kamara, 2008). The findings of this research revealed that 75% of the respondents reported that there was reduction in soil erosion in the area.

More than half of the respondents (56%) said that there has been improvement in waste disposal after the project due to the proper burial or burning of household waste. With regard to rain fall variability, almost 89% of the respondents confirmed that rainfall variability has been decreasing since the implementation of the project.

The project has established protected forests that are under the control of the cooperatives. This has resulted in a significant reduction of deforestation. The survey result confirmed that 82% of the respondents strongly agreed that there is reduction in deforestation. In the past the major cause of deforestation was the unrestricted access to these forest resources. According to key informants, people from far distances used to collect wood from the forest prior to the project. After the commencement of the project, this activity has been reversed to bring positive impact on deforestation reduction.

About 99% of the respondents positively supported the improvement in the restoration of endangered plant and animal species. Similar findings were also reported in Uganda, Madagascar and other countries regarding the restoration of biodiversity in CDM project sites (Jindal *et al.*, 2006). Ironically, the problem now appears to be the wild animals' (e.g., baboons and lions) intrusion in people's lives after they have been restored to the area. Although the people affirmed that endangered wild animals and plant species are successfully restored, the wild animals are posing a threat by destroying crops and fruits.

### Economic indicators

Eleven economic indicators are used in the survey to grasp the changes brought about by the CDM project in the area. These indicators are intended to measure attitudes towards household income, new employment opportunities created, technological transfers, resource management and access and market access created for resources produced. The outcome of the survey is summarized in Table 2. All the indicators have a 3 point mode and median value indicating that the respondents agreed to the affirmative statements in the survey. Similar studies in other developing countries showed that CDM projects have the potential of improving economic capacity of local communities especially through income generation. For example, a study made by Brunt and Anya (2005) found out that a project in Kenya has improved the livelihood of the local community through income generation and financial savings in addition to the production of organic fertilizers.

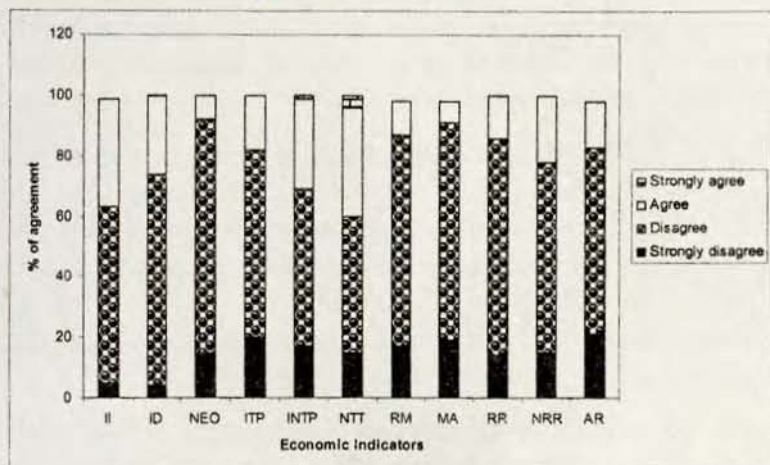
Table 2: Median, mode and frequency distribution of the economic indicators

	II	ID	NE O	ITP	INT P	NT T	RM	MA	RR	NR R	AR
Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Mode	3	3	3	3	3	3	3	3	3	3	3
Frequenc y	58 %	70 %	77%	62 %	52%	45%	70 %	72 %	72 %	63%	62 %

Note: II = Increase in Income; ID = Income Diversification; NEO = New Employment Opportunities; ITP = Income from Timber Products; INTP = Income from Non-timber Products; NTT = New Technological Transfer; RM= Resource Management; MA = Market Access; RR = Renewable Resources; NRR = Non Renewable Resources; AR = Access to Resources).

In the case of the Humbo Reforestation Project, fodder and honey production along other timber and non timber forest products are the main sources of income. However, the frequency of respondents' agreement to the economic indicators varied (Table 2). The highest percentage (77%) voted for the new employment opportunity whereas the least percentage (45%) of agreement was recorded for new technological transfer.

Figure 5: Summary of responses to the economic indicators



Note: Abbreviations are the same as those in Table 2.

As it was the case for the environmental indicators, the economic indicators also produced positive impact. Over all the survey result indicated that there has been income increase in the project participant households. About 58% of the respondents agreed to the affirmative. Income increment mostly resulted from sale of forest products, honey and fodder due to proper management and utilization of the natural resources. Almost 62% and 52% of the respondents obtained income from timber and non-timber forest products, respectively. Timber products include firewood that is generated from lots reserved for that purpose. In the past, one of the problems was shortage of fuel wood due to over exploitation of the forest resources. However, with the inception of the project, people are getting fire wood and other products from their lots following the principles of the FMNR method.

The income increase in the study area was also accompanied by income diversification where members are engaged in different economic activities. According to an expert from World Vision Ethiopia, there were different skill development trainings offered like cloth tailoring given to the community members to detach them from their dependence on charcoal production.

Creation of employment opportunities is one of the contributions expected from carbon sequestration projects. In this regard, the Humbo Project has a success story in creating temporary employment in tree nursery. The survey result supported this argument as 77% of the respondents agreed that there are employment opportunities created by the project.

Technological transfer in the CDM context implies the introduction of new technology to the local community to alleviate problems that the community faced. This particular case showed the introduction of different technologies like sewing machines, improved hives and others was possible as 60% of the survey respondents said that some kind of new technology has been introduced as a result of the project. These new technologies can be accessed by individuals, households or the community at large.

The use of innovative techniques for resource management is one of the praises for the project which depended on the FMNR method to enhance the forest resources in the area. This method which depended on the local community is based on the promotion of restoring indigenous species. According to a key informant, this method is chosen because of its success in that "unlike other closed regeneration projects, the FMNR allows the community to fetch fire wood and other tree products creating the sense of ownership."

Market access has been created for products like honey. Even community-PLCs were established to facilitate market access. In the survey more than 90% of the respondents confirmed that market access has been created. Access to resources has also been improved according to the survey responses in which more than 80% of the respondents indicated that there is improvement of access to resources.

### **Social indicators**

In the social dimension of the survey measurement 14 indicators were used that ranged from property rights clarification, community involvement in project design and implementation, community capacity building, investment in education and health services, formation of cooperatives to carbon payment arrangements and improvements in the livelihood of the community in general. Table 3 shows the frequency distribution of the respondents.

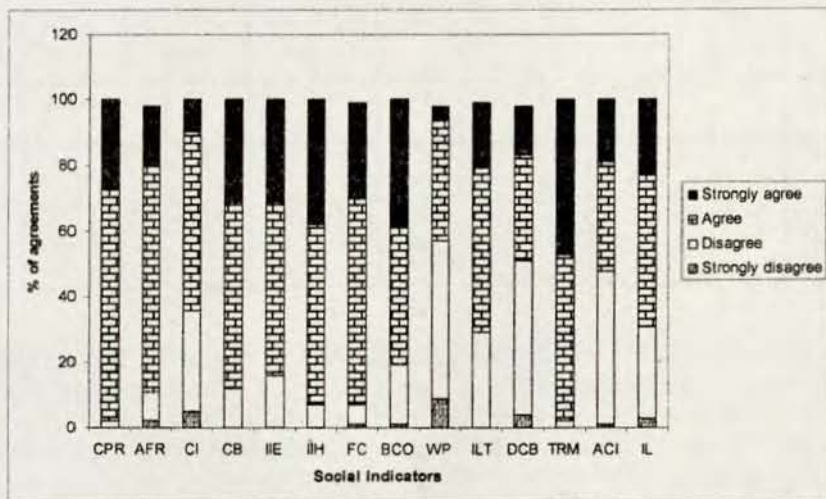
Table 3: Median, mode and frequency distribution of the social indicators

	CP R	AFR	CI	CB	IIE	IIH	FC	BC O	WP	ILT	DC B	TR M	AC I	ILC
Me d.	3.0	3.0	3. 0	3.0	3.0	3.0	3.0	3.0	2.0	3.0	2.0	3.0	3.0	3.0
Mo d.	3	3	3	3	3	3	3	3	2	3	2	3	2	3
Fr.	71 %	70.4 %	54 %	57 %	53 %	55 %	63.6 %	42 %	49 %	50.5 %	48%	51 %	47 %	46 %

Note: CPR=Clarification of Property Rights, AFR= Access to Forest Resources, CI=Community Involvement, CB=Capacity Building, IIE=Investment In Education, IIH=Investment In Health, FC=Formation of Cooperatives, BCO=Bylaws have Created Order, WP=Women's Participation, ILT=Increase in Literacy Rates, DCB=Distribution of Costs and Benefits, TRM=Trainings for Resource Management, ACI= Agreement on Carbon Income, ILC=Improvement in the Livelihood of the Community).

All the indicators have a median value of 3 except for women's participation and distribution of cost and benefit sharing. This shows that the respondents, like the preceding two criteria, are in agreement to the positive social contribution of the project. However, that is not the case in regard to the mode values of three variables: women's participation, distribution of costs and benefits in the cooperatives and agreement on the distribution of income from the carbon trade each of which has a mode value of 2 (signifying disagreement to the affirmative propositions). In this context, the mode is preferred to make the conclusion by sticking to the general principle in Likert items data analysis.

Figure 6: Summary of responses to the social indicators



Note: Abbreviations are same as those in Table 3.

With regard to social indicators, one of the successes of the project was its clarification of property rights in land and forest resources which inhibited the over exploitation of the natural resources leading to degradation. As a case in point, the land on which the project is implemented was owned by the state and the use of the resources including the forest used to be open to anyone. This led to the over exploitation and degradation of the area as a “tragedy of the commons” semblance. However, since the inception of the project, the forest land has been converted into community ownership giving the members of the cooperative the right to use the resources on the land including the income from the carbon trade.

The project was expected to facilitate the poorest households’ access to resource. In this regard, 87% of the respondents affirmed that the project has achieved one of its objectives at a high level (87% of the respondents agreed to that). This is the case with other similar carbon sequestration projects in Africa as was found out by Jindal *et al.* (2006) in which benefits from timber and non timber forest products are being reserved to local communities except in one case where the “implementing organization owned the wood and non-wood products generated by its plantations.”



One of the requirements for CDM projects is that they should have extensive consultation with stakeholders before they are implemented. The Humbo carbon sequestration project has also passed through the same path in involving the local community to participate in design and implementation of the project. Particularly consultation at the early stage of the project was vital since many of the community members were threatened assuming that they were to lose their traditional source of income.

The other challenge was introducing the community to the concept of carbon trade which in itself was complex in addition to being new. As the project is the first of its kind in Ethiopia there were no other projects from which experience can be drawn. However, the success was enormous with people wholeheartedly participating in the implementation of the project as evidenced by the regeneration activity. The survey also implies similar results with 64% of the respondents claiming that there was community involvement in the design and implementation of the project.

In terms of building the community's capacity there have been different activities executed by the local government offices and the project proponent, World Vision. Capacity building mostly focused on rehabilitating those whose livelihood was dependent on the forest resources which are now restricted with the implementation of the project. Capacity building also stressed on the diversification of the sources of income through skills development. In a similar study, Jindal *et al.* (2006) found out that carbon sequestration projects in Africa focused on community development rather than profit making which led to community organization and capacity building. In the survey result, about 84% of the respondents reported that capacity building was provided to them through trainings and workshops. Such training and skill development is important in enabling the community to take over the project in years to come.

Investment in important social services like education and health is an important aspect of sustainable development which should also be considered with CDM projects that claim to promote local sustainable development. In that respect, the Humbo CDM project has invested in basic services like education and health as confirmed by the survey respondents with 88% and 93% agreement, respectively.

Forming community groups to administer and look over carbon projects in community based forestry activities is highly recommended since it helps in the successful implementation of the project by creating a sense of ownership. In one such project in Mexico, Corbera (2005) found out that this was highly effective in curbing community conflicts. Cooperatives, as outlined in the bylaws, are formed to advance the rights of the members. These cooperatives help members to be aware of their rights better and advance them. They have also been facilitating the administrative process through the committees formed under their auspices. The members also indicated in the survey that the formation of these cooperatives was helpful in making them become aware of their rights in regard to resources and other rights including the right to the income from carbon trade. A 92% level of agreement was recorded from the survey in terms of the cooperatives' contribution to better understanding of rights and entitlements. There were other similar initiatives in other projects. Even though cooperatives were not formed small groups that consisted 10-12 farmers were established, for instance, in Tanzania to facilitate the participation of more than 20,000 community members in one given carbon-sink project (Jindal *et al.*, 2006).

The bylaws are also contributing to the establishment of order in the community by outlining duties and rights of the members. They deal with issues ranging from the criteria for membership to the conditions of leaving the cooperatives. The respondents find that these bylaws in the cooperatives are helping in bringing order as 81% of the respondents confirmed that. Similar benefits of establishing such bylaws to manage forests by local communities around the world have been reported by Murdiyarso and Skutsch (2006).

Women's participation is an important aspect of any society's development endeavor as they constitute half of the society. However, in traditional societies like Ethiopia that is not the case since women's place is considered to be in the domestic sphere in which they are denied the decision making sphere of the public arena. One of the measures of sustainable development is its contribution to women's participation in decision making in their community. The Humbo Project in that regard was not able to bring any change from the status quo. Women's participation in decision making has not improved in any significant way where the majority of the respondents claim that the project has not encouraged women's participation. This is

because in Humbo, just like in other rural parts of the country, women are still not encouraged to participate in public affairs for traditional and religious reasons. This problem can be alleviated through different mechanisms like reserving membership seats for women in the different committees drawing on the experience of such projects in India and Nepal (Tewari and Phartiyal, 2006; Parasai, 2006).

Almost 29% of the respondents in Humbo fell under the illiterate category. The project has invested on education. In the study 70% of the respondents agreed that the project has improved the literacy rate of the household members.

One of the responsibilities of the cooperatives is to facilitate the distribution of costs and benefits among the members of the cooperatives according to their contribution. The benefit of this arrangement is to compensate and encourage those who participated in the regeneration and other activities accordingly. Unfortunately, mixed opinions were observed from the survey data where about half of the respondents (47%) claimed the existence of some form of unfairness in the distribution of costs and benefits while another 47% claimed that there is fairness.

The newness of the project requires that the project proponents and the responsible government offices should provide appropriate and sufficient training to allow the community to better manage resources and participate in the project as a whole. In the case of the Humbo carbon sequestration project, there is an enormous agreement (98%) that trainings are effectively provided to allow better resource management and project participation.

The first carbon payment (\$34,000) is released from World Bank's Bio Carbon Fund marking the first ever carbon trading in Ethiopia. The Fund has agreed to buy a total of \$726,000 worth of carbon credit for \$4 per metric ton, from the total 880,000 metric tons of CO<sub>2</sub> equivalent CERs to be generated over 30 years of period. World Bank's Bio Carbon Fund is an initiative with private and public contribution that buys emission reduction credits from afforestation and reforestation projects as well as from Reduced Emissions from Deforestation and Degradation (REDD) projects.

The question now is how the community uses this money. It has already been decided that the income should be invested on community development programs. According to World Vision Ethiopia's expert,

different activities are promoted with the income, including bee keeping, petty trade, brick production, pipeline, crop storing, and nursery and seedling distribution by providing grants that have no interest or have interest rates lower than commercial banks. The role of the Credit Committee in the cooperatives is to identify highly impoverished members of the community and provide them with the credit after appropriate trainings. This approach of distributing income from carbon sequestration projects is also being practiced by similar projects in Africa except in some cases where "farmers groups receive quarterly payments on the basis of the number of trees they protect" (Jindal *et al.*, 2006).

In addition, investment on projects that are beneficial to the community as a whole such as constructing schools, health centers and the like are among the community's priority list. However, the survey respondents were not in complete agreement to this arrangement as 48% of them reported that agreement how to use the income from the carbon trade has not yet been reached. Yet another 52% of the respondents were of the opinion that agreement has been reached.

To generalize the survey result, it is important to investigate whether the project has improved the livelihood of the community in general which 69% of respondents claimed has been achieved. This is fairly successful as compared to one research that found out that only "58% of [similar] projects pursue some kind of community development activity comprising environmental education programs, the construction of infrastructure such as roads, support of local schools and the improvement of health services" (Burian, 2006). However, a study by Current *et al.* (1995) cited in Scherr and Smith (2002) reviewed 56 such projects and found out that the majority of them were profitable.

In conclusion, the carbon sequestration project of Humbo is a success story of its kind in bringing about sustainable development to an area that has been exposed to degradation. This success is mainly attributable to full-fledged involvement of the local people in the project through the FMNR method.

## Conclusions and Recommendations

In Ethiopia to date, there is only one CDM project that is operational. The Humbo Assisted Natural Regeneration Project has been considered as a success story of its kind while many CDM projects around the world are being criticized for not meeting the objective of bringing about sustainable development benefits to the locality in which they are operating. This study has assessed how the Humbo Project managed in achieving this success.

All in all there were 35 sustainable development indicators that were categorized in to three broad environmental and socio economic dimensions. Among these variables in the environmental category water quantity and quality were not found to have been improved by this project while the other indicators have shown a significant improvement according to the survey data. The economic indicators in the survey result have also shown an improvement of the indicators. This result holds true for indicators in the social category where respondents agreed that there is significant improvement in the indicators used except for women's participation, distribution of benefits and costs in the cooperatives and agreement on carbon trade income distribution.

In conclusion, the Humbo Assisted Natural Regeneration Project has proved to be a plausible way of regenerating degraded resources and helping poor communities to survive resource degradation and climate change through income generation and resource management in a sustainable way that can also be reproduced in other areas.

Apparently, the following suggestions are made based on the Humbo CDM project assessment:

- The controversies surrounding carbon payments and benefit sharing among the beneficiaries need to be dealt with early so as to create community consensus. This requires further empowerment of the cooperatives and the local community to eventually own the project.
- The success of this project mostly emanates from its full-fledged involvement of the community in the project indicating that sense of ownership is a significant factor in assuring the project's prolonged development contribution to the community. Sustainable development can only be realized when the

community own the sense of ownership, which need to be strengthened.

- In the Humbo Project, there are two concerned groups: those who are involved in the project and those who are not. The agreement is that both groups get the benefits of the carbon payment through community development investment of the income generated from the carbon sequestration project. This may lead to issues of conflicts of interest between these two groups. Therefore, the simplest way out is to include as many of the community members as possible to avoid the issue of unfair distribution of burdens and benefits.
- There are still some unexpected problems that arose with the implementation of the project like wild animals whose successful regeneration was intended to be a positive side effect of the project. However, their regeneration has brought unanticipated negative effect on the people. All stakeholders should cooperate on such issues to make sure that the project does not end up in directions that it is not intended to.

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