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Poverty Alleviation and Environmental Restoration Using the Clean Development Mechanism: A Case Study from Humbo, Ethiopia

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Abstract Poverty, hunger and demand for agricultural land have driven local communities to overexploit forest resources throughout Ethiopia. Forests surrounding the township of Humbo were largely destroyed by the late 1960s. In 2004, World Vision Australia and World Vision Ethiopia identified forestry-based carbon sequestration as a potential means to stimulate community development while engaging in environmental restoration. After two years of consultation, planning and negotiations, the Humbo Community-based Natural Regeneration Project began implementation—the Ethiopian organization's first carbon sequestration initiative. The Humbo Project assists communities affected by environmental degradation including loss of biodiversity, soil erosion and flooding with an opportunity to benefit from carbon markets while reducing poverty and restoring the local agroecosystem. Involving the regeneration of 2,728 ha of degraded native forests, it brings social, economic and ecological benefits—facilitating adaptation to a changing climate and generating temporary certified emissions reductions (tCERs) under the Clean Development Mechanism. A key feature of the project has been facilitating communities to embrace new techniques and take responsibility for large-scale environmental change, most importantly involving Farmer Managed Natural Regeneration (FMNR). This technique is low-cost, replicable, and provides direct benefits within a short time. Communities were able to harvest fodder and firewood within a year of project initiation and wild fruits and other non-timber forest products within three years. Farmers are using agroforestry for both environmental restoration and income generation. Establishment of user rights and local cooperatives has generated community ownership and enthusiasm for this project—empowering the community to more sustainably manage their communal lands.

Keywords Agroforestry · Climate change · Carbon markets · Community participation · Farmer managed natural regeneration

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Introduction

Following the severe famine of 1984 in Ethiopia, World Vision, a large humanitarian non-governmental organization (NGO), established operations in the Humbo area. High population density, variable rainfall, environmental degradation and an over-reliance on maize has meant that the area still experiences food shortages. Prior to the start of the project, of the 48,893 people living in the Humbo area, an estimated 85% lived in poverty (World Vision Ethiopia 2003) where the average per capita annual income was under $US 100 in 2003 (Government of Ethiopia 2003).

Poverty, hunger and increasing demand for agricultural land have driven local communities to over-exploit forest resources. Forests surrounding Humbo, located 360 km south-west of the Ethiopian capital, Addis Ababa, (see Figs. 1, 2) were largely destroyed by the late 1960s and across Ethiopia less than 4% of native forests remain today

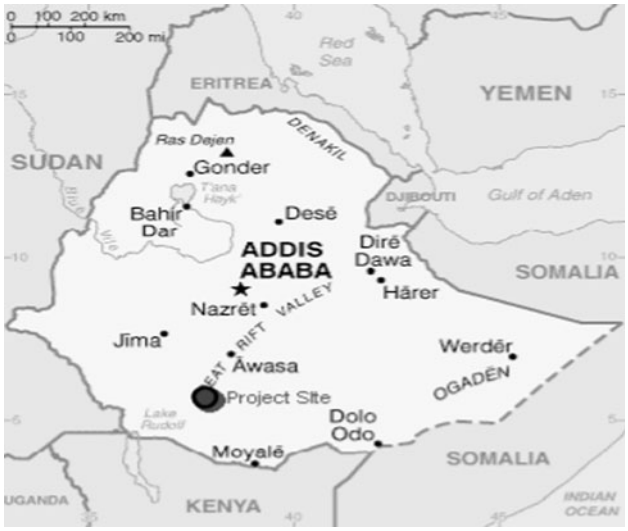

Fig. 1 Map of Ethiopia showing the general location of the project area (*source* CDM 2009)

(Secretariat of the Convention on Biological Diversity 2008). The absence of user rights and appropriate legislative frameworks has exacerbated forest loss at the project site. Communities and individuals in the Humbo region not only lacked any clear tenure to the land they exploited, it was illegal for them to *manage* the forest. Despite government legislation intended to protect forests and the issuing of fines to those caught cutting down trees, poverty resulted in a failure of this authoritarian approach in Humbo (Mariame 2009, Personal Communication), in the same way it has failed in other African countries that have taken this approach (Bojang and Reeb 1998). Tree cutting and charcoal making are livelihood activities of last resort. They involve significant labour inputs for very little income and are undertaken mainly by people who have no other options for revenue generation. It is widely accepted that smallholder, community-based projects can help alleviate rural poverty (Tipper 2002). They have the potential to be a win–win situation (UNEP 2002). Based on this understanding, a program of community agroforestry employing natural regeneration of woody species was established in Humbo with a focus on Carbon Sequestration.

In this article we use a case study approach to report on early experience using the Clean Development Mechanism (CDM) to jointly address the challenges of poverty alleviation and environmental restoration. While it is too early to present quantitative results of project outcomes, particularly given the long time horizon of the project, it is instructive to review the process by which the project evolved—from initial conception, to its design in partnership with the World Bank's BioCarbon Fund,[1] and its subsequent validation and registration within the CDM. By doing so, we are able to assess, in a qualitative manner, early impressions of project outcomes as perceived by project beneficiaries and actors. At the same time, we are able to examine lessons learned to date, which might be of benefit to projects at earlier stages in the CDM pipeline. We begin with a brief review of the approach to carbon sequestration (Farmer Managed Natural Regeneration [FMNR]) employed by the project, a description of the CDM and some background on the NGO and its role in the region and the project. We follow with an outline of the case study approach and project methodology followed by a discussion of early results of the project to date. We conclude with a discussion of some lessons learned which may be of relevance to various practitioners and researchers engaged in sustainable community development as well as climate change mitigation and adaptation activities.

Farmer Managed Natural Regeneration

Community-based reforestation projects face many challenges, as the poor track record of such projects testifies. For many years, conventional Western forestry methods have been applied and exotic tree species promoted in the countries of the Sahel region and in east Africa in order to combat desertification (Fortmann and Bruce 1988). Large and small projects were commissioned to curtail the assumed southward movement of the Sahara desert, but few, in our experience, made any lasting impression. As Edward Wolf of World Watch Institute wrote in the foreword to *Reforestation in Arid Lands* (Weber and Stoney 1986), "reforestation has become a centrepiece of rural development in arid lands, a key to conserving soil and water supplies, securing food production, and reducing the hardships of rural life". In many ways, the famine of the 70s shaped development activities for the next 10–15 years where it was just taken for granted that the desert would take over without concerted efforts at tree planting and this work took precedence over other interventions for many organizations.

Little thought was given to the appropriateness of these methods. Indigenous species were generally dismissed as "useless" scrub. In the name of afforestation, many projects even cleared this "useless scrub" to make way for exotic species. Often exotic species were simply planted in fields containing living and sprouting stumps of indigenous vegetation, the presence of which was barely acknowledged.

[1] The World Bank has established several funds to precipitate the development of the carbon market in specific sectors. The BioCarbon Fund was created to assist in the development of a market for forestry-based carbon. This fund identified and committed to purchase carbon from projects selected for inclusion in the fund.

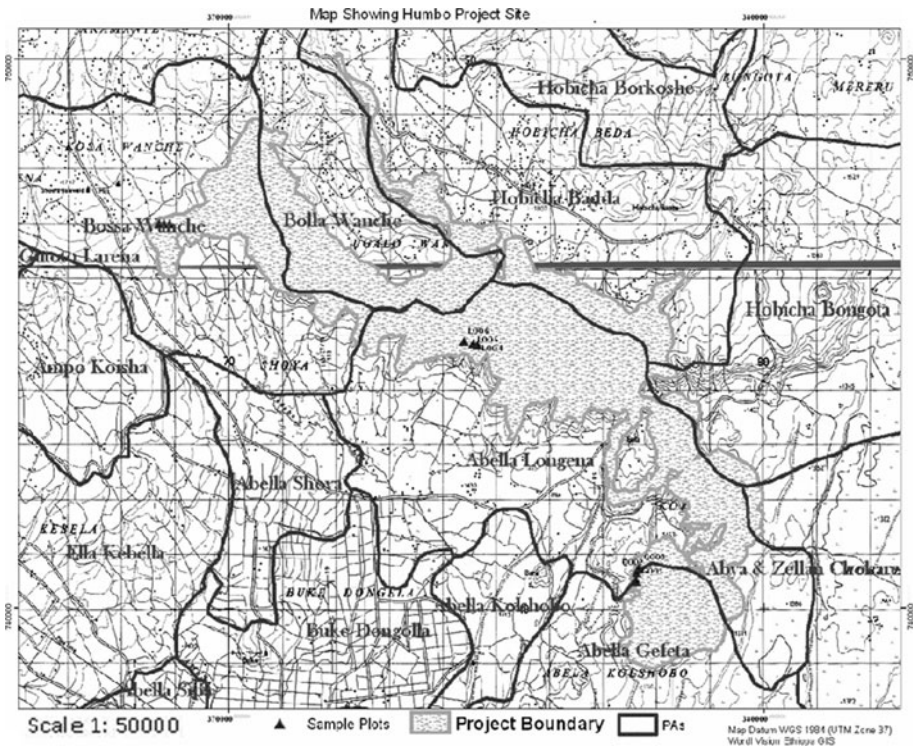

Fig. 2 Map of the project site and surrounding area, highlighting the project boundaries (*source* CDM 2009)

This was an enormous oversight. In fact, these living stumps constitute a vast "underground forest" (Rinaudo 2001), able to regenerate and provide multiple benefits at little or no cost. These live stumps may produce between 10 and 50 stems each. During the process of traditional land preparation, farmers viewed these as a liability, removing them before sowing their food crops. Under this management system, the stems rarely grow beyond 1.5 meters tall before being removed. The net result is a barren landscape for much of the year with few mature trees remaining. The land appears to be turning to desert and many have assumed that tree planting is required to restore it. Farmer Managed Natural Regeneration (FMNR), however, is the systematic regeneration of this pre-existing "underground forest".

Experience in Niger in the 1980s (Tougiani and others 2008) showed that farmers practicing FMNR realised increases in crop yields, fodder production, fuel wood availability from pruning and thinning, as well as the potential to sell firewood in drought years. FMNR spread rapidly in Niger Republic because of its ease of adoption and reliance on resources at hand. Once introduced, this agroforestry system did not require outside intervention, but spread from farmer to farmer. Two essential features made this spontaneous diffusion and adoption possible: firstly, community-level cultural change around what constituted "good or acceptable land management practices" and, secondly, institutional change in tree tenure, from state ownership to local ownership by those with individual land holdings. It is estimated that adoption of FMNR in the Maradi region Niger Republic has resulted in an increased annual income in the order of US $250 per ha per year from a combination of the following: increased production of wood, fodder and harvest of edible leaves, fruits for household consumption and sale; contributions to increased crop yields, livestock production and sale, improved dry season gardening arising from improved ground water recharge (Tougiani and others 2008; Winterbottom 2007, Personal Communication).

Agroforestry methods, including FMNR, can play a critical role in addressing poverty, food security and environmental issues in the small farmer African context (Leakey and others 2005). Few African farmers can afford external inputs such as fertilizers and pesticides (Franzel 1999). Planting and/or leaving beneficial tree species on farmland at optimum densities (which will vary according to local environmental conditions) has made a significant impact on poverty and environmental health in many countries (Reij and Smaling 2008). Agroforestry increases household resilience to environmental shocks such as drought, flood and insect attack and, in a situation where annual crops are destroyed, farmers have access to tree resources such as wood and fodder. Through contributing to soil organic matter and mulch material, trees help increase water infiltration into the soil, improve moisture retention and reduce evaporation—effectively increasing crop resistance to drought. While many think primarily of agroforestry systems as those where annual crops such as

maize are planted in association with leguminous tree species, agroforestry per se is much broader than this. A more complete definition states that agroforestry systems are agricultural lands where trees have been introduced and judiciously managed together with crops and/or animals (Albrecht and Kandji 2003). Silvo-pastoral and agro-silvo-pastoral systems as well as managed woody fallows, cacao agroforests and traditional shifting cultivation systems are also classified as agroforestry systems (see, for example, Rocheleau and others 1988). FMNR practices fit well into this category.

Clean Development Mechanism

The Clean Development Mechanism (CDM) is one of the three flexibility mechanisms of the Kyoto protocol which allows developed (Annex 1) countries to purchase emissions offsets from developing (non Annex 1) countries. The CDM has the dual goals of reducing overall greenhouse gas emissions, as well as promoting sustainable development (Austin and others 1999; Richards 2003). Although the CDM holds considerable potential for realisation of sustainable development benefits, it has been criticised recently for failing to deliver projects that offer high levels of sustainable development. It has also failed to deliver an effective mechanism for forestry based credits (Taayab 2006). While the intent of the CDM is, in part, to facilitate sustainable development in an equitable manner, there are contradictions between market-based instruments and small-scale local development (Richards 2003).

CDM projects range from the purely commercial, aimed at generating returns to investors, through to those whose goal it is to increase the incomes of local landowners by using carbon markets as a component of a rural development strategy (Jindal and others 2008). Some projects, such as this NGO's BioCarbon Fund project in Humbo, are already registered with the CDM (CDM 2009; JACO CDM 2009). The validation report was submitted on 23/June/2009 and registration granted 7/Dec/2009 for a 30-year crediting period from 1/Dec/2006 to 30/Nov/2036 (http://cdm.unfccc.int/Projects/DB/JACO1245724331.7/view). However, most carbon sequestration projects in Africa are in the initial stages of implementation and their sequestration potential is an estimate at this point in time (Jindal and others 2008). In addition to the challenge of estimating future carbon sequestration from these projects, is that of ensuring the permanence of the carbon that is sequestered. One approach to the problem of permanence has been to use contracts with participating farmers (Jindal and others 2008) with the attendant transactions costs. An alternative approach, as in the case of the Humbo project described herein (Dettmann and others 2008), is to work with the whole community and to ensure that there are significant local benefits apart from the CDM ones, which take some time to be realized. It has the potential to be a win–win project—sequestering carbon and benefiting the poor (Richards 2003).

World Vision: Responding to the Link Between Environment and Development

World Vision has a long history of community development work in Ethiopia, particularly in the areas of education, health and agriculture (World Vision International 2009). While the link between environment and poverty is often overlooked, many of the NGO's greatest gains in agricultural development and poverty alleviation have been in association with restoration of the natural environment. The best known example is the conversion of parts of the Antsokia Valley from what was effectively a dust bowl in 1984 to a productive mix of forests, orchards and farmland today (World Vision 2007).

Since the 1984 famine, the Ethiopian office of the NGO has had a strong focus on reforestation within its development interventions, enabling staff to approach this project with a legacy of making forestry and community development projects successful. Between 1975 and 2002, over 66 million forest trees and over 300,000 fruit trees were planted in its operating areas, which have made a significant improvement in the livelihood of many communities (World Vision Ethiopia 2002). Emergence of a market for carbon offers not only a new income stream to fund this work but a practical means of demonstrating the linkage between the environment and poverty.

In addition to its significant livelihood and environmental benefits, the Humbo project provides communities significantly affected by environmental degradation with an opportunity to benefit from the global market in carbon. While forest regeneration has direct flow-on social, economic and environmental benefits for local communities, it can also generate temporary certified emissions reductions (tCERs) under the CDM. The intent of the Humbo project is to channel the additional income generated from the sale of carbon back into the local community, funding community-designated development initiatives (CDM 2009; World Vision 2008).

There have been few studies to date of the impacts of CDM projects on either the host countries or the participants themselves (Jindal and others 2008). This article takes a case study approach to qualitatively assess some of the initial local impacts of one such project—impacts that have been observed by the community and project personnel prior to receipt of any CDM direct benefits from carbon payments. It is based on a review of internal project documents made available to the authors (some of whom

are engaged in oversight roles within World Vision) as well as those that are publicly available. Internal documents include a variety of project reports, internal assessments and trip reports. Publicly available documents include the project design document (PDD) (CDM 2009), assessment reports prepared by World Bank consultants for use in writing the PDD (available on the CDM web site at http://cdm.unfccc.int/Projects/DB/JACO1245724331.7/view) and the independent validation report prepared by JACO CDM Co., Ltd (JACO CDM 2009).

Case Study Methodology, Approach and Project Description

This case study reports on progress to date by the CDM's first large-scale afforestation/reforestation (AR) project to be successfully registered in Africa. It is based on a desk study of key project documents, external assessment reports prepared by consultants as part of the iterative process of preparing the Project Design Document (PDD), the report of the external validator as well as trip reports, personal communication with key informants, and site visits by some of the authors over the course of the project design phase and the first 3 years of implementation. Given the early stage of the project, it is premature to undertake quantitative assessments of project outcomes (such as changes in household income, food security). At the time of writing, the first mid-term assessment conducted in March 2010 had been completed, but the final report was not yet available. Qualitative assessments provided confirmation of earlier impressions by the authors. With respect to benefits through the CDM itself, measurement of the actual growth of the regenerated vegetation took place in the second half of 2010 with the first payment based on carbon sequestered received in September. As such, it is the first project in the World Bank Carbon Finance Unit's Africa portfolio to receive payments for emissions reductions.

Methodologies for carbon forestry projects have not yet been utilised at scale, and when this project was conceived in 2004, there was only one AR project registered within the CDM. The first tranche of BioCarbon Fund projects (of which this project was a component) involved 'learning by doing', with little certainty of available methodologies, or the likelihood of registration by the CDM Executive Board. The methodological pathway in the development of this project was an exploration of possible tools and techniques, as well as collaboration with a wide range of professionals working in the AR sector. The NGO's experience in this process was pioneering, and offers lessons for others considering such an approach to forestry based carbon mitigation (Dettmann and others 2008).

The Humbo project involves seven agricultural communities situated on the periphery of 2,728 ha of highly degraded native forest. The site itself is mostly hilly, but has some very steeply sloped areas as well. Prior to the start of the project there were significant areas of bare and rocky ground and the vegetation was low, sparse and thinning due to charcoal makers removing roots and stumps of trees (there being few branches left big enough for charcoal production). When it rained, the hard ground absorbed little of the moisture and run-off caused severe problems down-stream where deep gullies had formed and farmland flooded. While the primary livelihood activities of the seven communities emphasize annual crop production on the land that surrounds the project site itself, the actual project site was and still is uninhabited and unoccupied. Rather, it has been held in common and used for grazing, firewood collection and charcoal making—though all these activities have historically provided minimal benefit to the residents of the surrounding communities.

Following technical suitability and feasibility assessments (Benti 2006; Greenhouse Balanced 2006; Tamarat 2009), the community was consulted (Admasu 2009; Kamara and others 2008; Kebede 2006) with respect to the potential for a project of this nature and the community's widespread support for the initiative was apparent. Key activities of the project itself project have included:

- Establishment of user rights to the forest by the community.
- Formation of community cooperatives in each of the seven villages adjacent to the project site.
- Training in farmer managed natural regeneration (FMNR) techniques for management of the majority of the project site (the degraded forests), some 2200 ha.
- Establishment of nurseries for the production of planting material for use on the remaining areas of the project site (some 500 ha) where FMNR could not be practiced due to a lack of live root material or natural seedling regeneration.

The NGO's role in establishing nurseries, facilitating the formation of community structures (cooperatives), and negotiating with the World Bank and others has been complementary to the communities' work—but this has always been a community led project. A detailed description of the project (CDM 2009; World Vision 2008) is available on line (http://www.climate-standards.org/projects/files/ethiopia/Ethiopia_Humbo_CCBA_PDD_June_6.pdf or http://cdm.unfccc.int/Projects/DB/JACO1245724331.7/view).

Preconditions for Establishing an Effective Project

Based on our analysis of the available documentation, together with our experience with the project to date, critical elements of the project methodology of importance to success of the approach include:

1. The foundation of community trust. This project is built on 18 years of development work undertaken by the NGO in the Humbo District. The trust established with the community over this period delivered a platform from which to present the concept of a carbon and forestry project, and for the community to have a level of confidence in the NGO as the project originator. This mutual knowledge of and understanding between the NGO and the community was critical to effective project design and implementation. Issues of access to land are known to be contentious in Ethiopia (Kibreab 2002), yet through working closely with the relevant government offices and the Humbo communities work has so far progressed in a relatively problem-free manner. On more than one occasion community members have stated that this NGO was the organisation sufficiently respected within the community to facilitate such a project.
2. Realising Early Success. Community support for the project improved as the project progressed successfully—user rights were granted, cooperatives were formed, training was provided and forest blocks were demarcated with participation of each of the seven communities living on the forest perimeter and district government staff. Even so, it was not until actual physical benefits were realized that most community members fully believed that they were the primary beneficiaries and that the degree of their participation would affect how much they benefited. Thus, as communities began harvesting and utilizing fodder and firewood according to their management plan, even those who had been ambivalent to the activities began to become more actively involved in the project.
3. Laying the groundwork through effective local collaboration. From the outset, the Humbo project operated with a focus on collaboration among community, local, state and national authorities. Focus groups were engaged through participatory rural appraisals in each community to assess interest in restoring the degraded forest and willingness to make necessary changes to land use practices that would be required to adopt FMNR. Discussions were held with local forestry and government officials on the nature of carbon forestry projects. This began with endorsement at the local level, and progressed through to the national government. There was widespread support for the objectives of the project and the authorities expressed a willingness to grant user rights to encourage community management of the forest. This approach to realising government endorsement was very effective in this case. Legal aid was obtained for cooperative formation and guidance in forming by-laws.
4. Building a competent team. The NGO's offices in Ethiopia and Australia formed a strong partnership, established a core team and worked closely with additional specialists from the BioCarbon Fund of the World Bank and Joanneum Research (an Austrian based consultancy responsible for the first AR project in China) in development of this project. The networks and capacity of the team laid a foundation for effective project development and direction.
5. Building institutional support from inception. Letters of support for the project from Woreda State, and Regional governments were secured. A letter of no objection and letter of approval were subsequently granted from the Ethiopian Environmental Protection Authority (EPA), the Designated National Authority (DNA) on matters related to the CDM. The BioCarbon fund team at the World Bank was effective in supporting this process, and in realising additional start up funding for capacity building and technical support.
6. Compliance with CDM requirements. A clear awareness of the requirements of the CDM process from the beginning of the project was essential to ensure that relevant data was collected and specific actions undertaken in the development of the project. Of particular importance were:

    - Determining project eligibility: It was essential that the project be established on land that was cleared of trees before 1990, and would be able to sustain a forest under the Ethiopian definition as submitted to the UNFCCC. Ethiopia's DNA defines a forest as land with trees that has a minimum area of 0.05 ha, a minimum tree crown cover of 20% and a minimum average tree height above 2 m (CDM 2009). Project eligibility was substantiated at the beginning of the negotiation, and documentary evidence collated.
    - Determination of project baseline: AR projects must establish the baseline or business as usual scenario. The project team ascertained the ongoing clearing of isolated existing trees, and identified the baseline scenario (what would occur without the project intervention) as an ongoing depletion of carbon stocks.
    - Determination of levels of pre-existing biomass: In order to understand the impact of the project on carbon stocks, the project required an assessment of pre-implementation stocks of carbon. This assessment was undertaken in 2006 by the NGO's Ethiopean project team prior to the official project launch, and before changes in management of the project area were implemented.

- Securing letters of no-objection and endorsement: The Ethiopian DNA was brought into the planning of the project from an early stage, and was therefore very supportive, delivering the required letters for no-objection, and subsequently endorsement.
- Validation and submission for registration: The project team worked with the validator (JACO) in delivering the additional documentation required for registration, and the project was submitted on June 23, 2009 for registration with the CDM Executive board (JACO CDM 2009).

Timeline of Project Development

The Humbo project has developed over a period of five years—including two years of preparation prior to project inception in December 2006. Table 1 outlines some of the most important milestones in the process.

Results of the Project to Date

The project has now been operational for almost 4 years, with the application of FMNR over the entire site for over three years. Over this time, the project team has had opportunity to observe both the physical changes within the project site, as well as the attitudinal changes within the communities involved in the project.

Improvements in Local Flora and Fauna

Just 36 months since FMNR project activities commenced, the change in vegetative cover was so pronounced as to draw the attention of all levels of government, universities, other development partners and communities visiting the project site. In recognition of its unique nature and its significant environmental impact, June 2009 saw Ethiopia's national environment day celebration take place at the Humbo project site (World Vision 2009). Community members themselves have identified that, due to increased leaf litter fall and the return of grass to the hillsides, there is significantly less flooding, erosion and siltation of their farmland, which is located downstream from the project area itself (Nuri 2009, Personal Communication). Similarly, they have observed an increased presence of wildlife and birds in the forest.

Sustainable Forest Management

To date, 2,728 ha of degraded forest which were previously unmanaged and over-exploited for wood, charcoal and fodder extraction have been protected, are now being

Table 1 Major milestones in the development of the Humbo project

Date	Milestone	Required by
October 2004	Project feasibility mission undertaken to determine the possibility of an AR CDM project in Humbo Ethiopia	
December 2004	Community consulted regarding the potential of a carbon project and its implications. Proposal received strong community support	
February 2005	Project Idea Note (PIN) completed and submitted to the BioCarbon fund of the World Bank	CDM
June 2005	Completion of a Carbon Finance Document Provisional acceptance into the BioCarbon Fund	World Bank
January 2006	World Bank team assessment of project site	World Bank
April 2006	Acceptance of project into the BioCarbon Fund	
May–September 2006	Baseline analysis and pre-existing biomass assessments undertaken	CDM
	Community cooperatives initiated	
	Training on Farmer Managed Natural Regeneration (FMNR) undertaken	
December 2006	Project inception—area closure	
	Pruning and nursery establishment begin	
January 2007–August 2008	Project Design Document (PDD) written	CDM
June 2008	Project officially opened by the government and World Vision	
	Planting of seedlings over cleared areas is implemented at scale	
August 2008	PDD submitted to JACO for validation	CDM
November 2008	Period of public review of PDD	CDM
March 2009	Validation mission with the DOE, JACO	CDM
April–June 2009	Clarification and rectification of outstanding PDD issues for Validation	CDM
24 June 2009	Submission of Validator's report, and PDD for registration with the CDM Executive board	CDM
February 2010	Project registered with the UNFCCC	CDM

restored and sustainably managed through species selection, coppicing, protection from livestock and strategic replanting. Tree regrowth has reached 2–5 m since project inception (Yirgu 2009, Personal Communication). The native vegetation includes *Acacia* spp., *Aningeria adolfi-friederici*, *Podocarpus falcatus*, *Olea africana*, *Cordia africana*, *Croton macrostachyus*, *Erythrina* spp., *Ficus* spp., and other locally indigenous species (World Vision Australia and Ethiopia 2005). To date, over 700 ha of the area under management have been pruned using FMNR techniques. In addition to this, some 230 ha unsuitable for FMNR have been replanted with a survival rate of 79%, (Tefera 2007) the principle species in nurseries for transplanting being *Grevillea robusta*, *Eucalyptus globulus*, *Acacia saligna*, *Schinus molle* and *Cordia Africana* (Tefera 2007). Residents of the communities have observed that fruit from five indigenous tree species are becoming increasingly available as the trees grow and sightings have been made of wildlife, which had previously left the area, including antelope and wild goat.

Direct and Indirect Economic Benefits

Direct Benefits

The first carbon revenue was received by the project in September 2010—a sum of about 34,000 $US. Although seasonal and management factors will have an impact on the amount of carbon revenue which is realised, the project anticipates carbon revenues from the World Bank in the order of $726,000 (US) for the first 165,000 tCO_2 over the initial ten years of the project according to the emissions reduction agreement (ERPA). Emissions reductions over and above this will be sold to the World Bank or other buyers. In a June 2008 initial review of the community managed agroforestry activities, the sentiment expressed by community members included comments such as "We are too much happy [*sic*]. We never expected to see so much grass growing from these rocky, barren slopes, to see trees growing so quickly or to harvest firewood so early in the program" (Rinaudo 2008). Within the first year of livestock exclusion, one of the seven communities reported that the landscape had recovered sufficiently that they harvested 300 large bundles of grass from previously rocky and barren hillsides (Rinaudo 2008). By the second year, when all collaborating communities began pruning tree regrowth, there was capacity to meet domestic firewood needs from the project site.

Indirect Benefits

While measurements have not yet been undertaken, it is anticipated that the increased vegetative cover and leaf litter protecting the fragile lateritic soils will reduce water runoff and erosion, and increase infiltration and ground water recharge. This view is supported by anecdotal observations made by community members. Decreased water runoff will reduce flooding, landslide and damage to agricultural lands. The ephemeral lake, Abaya, approximately 50 km to the south has significant turbidity problems leading to a loss of aquatic biodiversity. Application of the management approach taken by this project across the entire watershed could help to arrest the decline in water quality of Lake Abaya.

Social (Local Governance) Benefits

The establishment of seven local forestry cooperatives, one within each of the villages which had historical tenure over the project site, has helped the participant communities to establish management and user rights over the forest land, and engendered within each of the communities motivation and momentum to manage their forest resources. The external actors in this project (World Vision, the World Bank, the various levels of government in Ethiopia) have played critical roles in the project establishment, however the ongoing management, and long term ownership of the management of the project rests with the community cooperatives. Establishment, membership and management of the cooperatives is based on the legal requirements articulated by the enabling legislation. Membership of the Humbo forestry cooperatives is open to all community members for the payment of a small registration fee (approximately US$1). Most community members have joined the cooperative and share in the management, benefits of forest products and decision-making processes.

Empowering local communities through the cooperatives with both the governance structure to effectively manage the forest on behalf of the entire community, as well as the authority to undertake management actions, has the potential to unlock significant benefits in the management of natural resources in Ethiopia.

Discussion

One of the challenges of forest-based carbon projects of this type is assessing their suitability. The Climate, Community and Biodiversity Alliance has developed the CCB Standards (CCBA 2008), which are being adopted by a number of organizations to help identify projects that simultaneously address climate change, support local communities and conserve biodiversity. Brown and Corbera (2003, Table 3, p. S51) have taken a similar approach, but place much more emphasis on social development indicators. In addition to the anticipated carbon benefits, the project has to date met most of the ecological and social development criteria they include (Brown and Corbera

2003). Several aspects of this project have been identified, which have contributed to effective implementation and which have potential for wider application.

Promotion of Farmer Managed Natural Regeneration

As a technique, FMNR, which is being used to regenerate degraded native forests, is inexpensive, replicable and provides significant short-term benefits. By the second year of operation, communities had already commenced harvesting hay and firewood. Realising these early and substantial benefits has increased community enthusiasm and commitment for the work and for FMNR as an agroforestry system. Many of those who previously opposed or were ambivalent to the project are now joining the cooperatives (Rinaudo 2008). Not only does FMNR restore the natural forest without the effort of replanting, by emphasizing the regeneration of native vegetation it avoids the negative consequences of some exotic species and addresses concerns about the reduced biodiversity associated with new plantations (Jindal and others 2008).

However just because a new technology is simple doesn't guarantee that it will be easily or rapidly adopted. Initially, many key stakeholders, including some World Vision staff, did not embrace the approach or the benefits of FMNR. A significant commitment was required to educate staff, partner organisations and the community when introducing innovative activities in both implementation and follow-up stages. Thus, it is important to provide clear and repeated messaging over the long term.

Creation of an Enabling Environment

Woods (2003) cites five enabling conditions that contribute to the spontaneous adoption of agroforestry enterprises by resource poor households:

1. ease of access to markets;
2. economic and other benefits that are higher than those from alternatives;
3. a viable production technology that is available and known to farmers;
4. access to sufficient areas of land with security of tenure;
5. farmer confidence in being able to control risks, such as fire, pests and theft.

In light of the above, the Humbo design process focused on creating a favourable enabling environment in which communities could readily embrace new techniques and were empowered with responsibility for large-scale environmental restoration. Farmers in Humbo have access to both village and Sodo city wood and fodder markets and as the volume and quality of wood and fodder increases the income from this activity will also increase.

While economic comparisons between charcoal making and sustainable wood and fodder harvest have not been made, it is clear that charcoal making is only a short-term economic prospect even if it could provide comparable economic returns. Through the management system introduced to Humbo, communities will have a long-term, steady and increasing income from the sale of wood and fodder, as well as non-wood forest products including honey and indigenous fruit. These are an important supplement to what they earn from their primary agriculturally-focused livelihood activities, which they practice in the communities where they live on the periphery of the project site.

The technology of FMNR is simple, cheap and provides rapid results. The project invested heavily in training and follow up to ensure that all farmers in the cooperatives understood how to practice FMNR and how to manage risks such as fire and theft. By-laws addressing tree pruning (when, how and who) and respect of the cooperative's rules were established by the communities. Training on fire risk reduction and mitigation was provided and communities selected those whose income was most impacted by area closure to be paid a small salary for guarding the forest against theft.

Some of the communities manage a smaller proportion of the project area on a land-area-per-capita basis, however even those communities with small areas are benefitting more under management by their cooperatives than they were when there was no effective management. The issuing of user rights over the community land has given the communities the necessary incentive to sustainably manage the forest and establish rules for harvesting, etc. (see below for more details).

Ownership and Empowerment

One of the challenges to effective AR CDM projects is to ensure that local communities understand the long-term nature of the projects amid concerns that the poor have the ability to make the necessary changes (Jindal and others 2008). Clearly defined property rights are also essential (Gutman 2003). However, solving the problem of land title is not a simple matter (Ensminger 1996) as there is often a conflicting coexistence of customary and statutory land rights in many Africa countries (Woodhouse 2003). Ethiopia is a case in point—all land was officially nationalized in 1974, yet a system of inheritance and hereditary rights continues in parts of the country (Jindal and others 2008).

In Humbo, the establishment of legally robust land user rights and registered cooperatives laid a foundation for community user rights for this project. Each of the

cooperatives represents a pre-existing community and network of prior relationships amongst the population. The people in the area now have legal title to the land, which entitles them to utilize the forest in a sustainable way. However, communities not only require the right to use and manage the forest, but to benefit from forest products including sequestered carbon. Today, a little over three years after project commencement, as communities begin to harvest firewood, fodder and wild fruits, a deeper level of confidence and trust in the user rights agreement is emerging. Since the forest is now effectively "theirs" (i.e., the community's) and not "the government's", there is a very high incentive for protecting it and managing it in a sustainable manner.

A Commitment to Work Through Challenges Using Resources and Tools Available

All projects, and particularly those involving access to land, have the potential to cause friction between communities. During the planning phase, a small disagreement arose between two of the seven adjacent communities regarding the location of boundaries on the project site. However, through the application of community facilitation techniques, using the legal structure of community cooperatives, and facilitation of a brokered outcome by a third party (the NGO and government forestry staff) a mutually agreeable demarcation of the project site was established (delineated using GPS and marked with physical markers for all to see).

Collaboration

Early collaboration with government at all levels was essential to the success of this project. This made engagement and implementation simpler and more transparent. In the Humbo case, the NGO's reputation within the community facilitated local and regional buy-in, and so established a foundation for state and federal government endorsement.

Management of Cooperatives

With legal assistance, the cooperatives created by-laws, which laid out how and by whom the forest would be managed and how benefits would be shared. Cooperatives became responsible for protection of the forest and its sustainable management. Cooperative members are organised for pruning of tree re-growth, tree planting and weeding; schedules for fuel wood and fodder harvest are implemented; membership fees are collected and managed; and infringements are dealt with according to the by-laws. While cooperatives are not a new or innovative tool for community development, they are, in the context of Humbo specifically and Ethiopia generally, a relatively new approach to forest management.

Transactions Costs

One of the challenges of the CDM is that transactions costs can be prohibitively high when a project involves many individual smallholders (Smith and Scherr 2002). The design of the CDM is not well-matched with the needs of communities for successful implementation of sustainable land use activities (Tipper 2007). Though simplified guidelines for such projects do exist in certain circumstances, the approval process is still very slow and costly (Jindal and others 2008). The Humbo project dealt with this in part through legal recognition of community ownership and establishment of community cooperatives for management purposes, rather than seeking to establish individual title for what was essentially a commonly held resource. While this avoided the cost of having to deal with individual landowners, the costs of verification are still a significant burden.

Conclusion

As discussed by Jindal and others (2008), there are three design elements which are critical to the success of carbon sequestration projects. Such projects should:

- help smallholder farmers sell carbon individually or in groups;
- employ trees that provide multiple benefits beyond the carbon income; and
- encourage practices which do not pose a threat to local livelihood systems.

The Humbo project incorporates these design elements. Given that members of the local community are pleased with the outcome at this early stage due to the existence of early, non-carbon benefits, and the project does not threaten local livelihood systems, but enhances them, there is a high probability that the changes brought about will continue for the foreseeable future. The focus on developing a locally sustainable project (using development "best practice" and paying close attention to local institutions) has increased the likelihood that there will be significant carbon credit revenue in the future. Something which might not occur had the prospect of cost-recovery and longer-term cash benefits to the community arising from carbon revenues been the primary focus. The fact that the project was planned with the CDM in mind probably encouraged the planners to be more intentional and rigorous in some aspects of planning and design. Conversely, it could be

argued that the NGO would have been able to do this without trying to meet the CDM requirements. However, had this been the case the project would have proceeded with no emphasis on the future carbon credit revenue and the potential it has to benefit the community and the livelihoods of its residents in the future.

Environmental restoration has been shown to be economically viable and socially acceptable from the community's perspective even without carbon sequestration income. The initial investment in the community participatory process itself has been sufficient to bring about significant benefits as perceived by the community. It remains to be seen if the receipts from carbon will be sufficient for a project developer to recover the investment as well as resourcing additional development activities in the community.

In the event that they do not, the project has nonetheless established a process of community-driven change that can help alleviate poverty through environmental restoration. The project effectively demonstrates, even at this early stage, that protecting highly degraded land against overgrazing, over cutting and charcoal production can lead to regrowth of forest biomass without the need to invest in costly replanting and all its attendant risks. This is possible through simple technology and legal empowerment. By working with the whole community and ensuring some early local benefits, the Humbo project addresses some important constraints to the successful implementation of the CDM in a pro-poor manner. In a country where there are few examples of successful implementation of community management, this project demonstrates an approach that effectively removes the institutional constraint to change. It does this by working with and through local communities to establish socio-culturally appropriate and "owned" institutions that facilitate a sense of community ownership and management of valuable common pool resources.

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