Panel 14

Special Panel:
Case studies from Ethiopia

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Leulseged Yirgu

Adapting to climate change in the water sector

Assessing the effectiveness of planned adaptation interventions in reducing local level vulnerability

Nanki Kaur, Million Getnet, Beneberu Shimelis, Zegeye Tesfaye, Gebeyehu Syoum and Endale Atnafu
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Research-inspired Policy and Practice Learning in Ethiopia and the Nile Region

Separate PDF

Holly Radice

Participatory natural resource management with Somali pastoral & agropastoral communities: a lasting community led response to climate change

Holly Welcome Radice, Maria Ruiz-Bascaran, Dr.Yosef Seyoum and Redwan Getachew

INTRODUCTION

Mobile pastoral communities have been coping with changing environmental conditions for centuries. As a result, they have long established their capacity for adaptation. However, in recent years, changes in their environments from increased frequency of drought, land fragmentation and natural resource degradation have undermined their adaptive strategies increasing their vulnerability. Trends point to a pattern of climatic hazards more frequently turning to disasters. One option for pastoralist and agro pastoralists to build on their adaptive capacity and resiliency is closely related to their skills on managing their natural resources.

Save the Children UK (SC UK) has been working with communities in the Somali Region of Ethiopia to help them protect their assets and improve community preparedness for 20 years. This paper examines the experiences of SC UK working with communities of Shinile Zone, Somali Region on participatory natural resource management (NRM) and how it contributes to disaster risk reduction and climate change adaptation.

INTERVENTION AREA OVERVIEW

Shinile Zone is located in the extreme east of Ethiopia bordered by Djibouti to the northeast. Shinile is arid or semi-arid and mostly lowland. The population is 95% ethnically Somali and 86% rural (CSA). Ninety-five percent of the population is engaged in pastoral or agro pastoral activities (SCUK and DPPA), though pure pastoralism is the more prevalent.

In a recent study on climate-related vulnerability and adaptive capacity in Shinile Zone, communities identified the most significant hazards in their area as drought and extreme heat (Riché *et a*l). Both hazards have similar effects; decreased pasture and water, death of livestock, crop failure and decreased market prices for livestock. Future climatic change projections for the Zone suggest that these hazards are likely to be intensified in the coming years (Mc Sweeney *et al)*.

The consequent critical NRM problems have been outlined in studies conducted in Shinile Zone (Kassahun) as:

- Increased encroachment by non-palatable and undesirable, endemic woody plants and exotic weeds,
- Deforestation
- Loss of biodiversity with social and economic values,
- Rangeland deterioration

Shinile Zone has experienced a number of droughts over the past 20 years. The effect of these droughts, coupled with the increase in population, has a direct correlation with the decreasing livestock holdings at household level for the pastoralist and agro pastoralist communities (SC UK and DPPA). Long term meteorological data does not exist for the Zone. The community perceptions suggests, though, that rainy seasons have shortened during the last decade, with rains starting later and ending earlier, and with rain frequency, distribution and predictability decreasing, with Shinile community members further stating that day time peak temperatures now occur earlier than in previous times (Riché *et al*).

In sum, there is a perception of increasingly erratic climate variability which is further exacerbated by a myriad of other under-lying factors of vulnerability, including limited access to infrastructure, resources and information, limited access to educational opportunities, population pressure and conflict – leaving the communities in Shinile Zone at high risk of increased level of vulnerability in the coming years.

PARTICIPATORY NRM IN TWO DISTRICTS OF SHINILE ZONE

In the Afar and Somali Regions, SC UK is increasingly promoting interventions that embrace disaster risk reduction principles. Through assessments, community discussions and local observations in the Somali Zone of Shinile, natural resource utilization has increasingly surfaced as one of the key opportunities for communities to increase their resilience to climate change.

In 2007, SC UK began to work with pastoral and agro pastoral communities of Shinile and Dembel districts in Shinile Zone to explore lasting solutions to the NRM problems faced at the local level. The methodology utilized was adapted from the Flintan and Cullis “Introductory Guidelines on Participatory Rangeland Management” which built upon participatory forest management successfully led by Farm Africa among others in Ethiopia. SC UK worked with over 23 communities, following a comprehensive process:

Step 1 Stakeholders' assessment: This included discussions with key informants (community leaders, local government officials, community based animal health workers, men and women) on NRM issues in the two districts. Major issues identified included land degradation from soil erosion and water run-off, invasive species, deforestation and water access.

Step 2 Community Action Plan: Participatory tools were used to identify the local natural resources, understand traditional NRM techniques and knowledge, the uses of local natural resources and the constraints to current use / management. Care was taken to include perspectives from men, women and children, and local materials (e.g. rocks, sticks) were used to map out issues. Major NRM issues identified by the communities were similar to those in the stakeholders' assessments, but each community had its specific NRM issues in terms of scope and magnitude. Community members prioritized the activities to be completed, and the mapping and prioritization then fed into the development of community action plans (CAP) which were later transferred to paper versions which were stored for community reference.

Step 3 Establishment of community level development committees: In each community, one adult development committee with five members was formed (with 30% female composition) as well as one child committee per community (with 40 % girls) were also formed. These groups then mobilized communities and created awareness on the NRM activities, and they also acted as link to SC UK staff and the larger community, by assisting with beneficiary selection, progress reporting, conflict resolution, safeguarding tools and materials and mobilizing community contributions.

Step 4 NRM training: SC UK staff worked closely with local government to enhance community skills and knowledge of NRM interventions, encourage experimentation with local and new NRM techniques and promote active participation in NRM activities.

Step 5 NRM activities implemented: The prioritized works were done through two different means—community contribution or cash-for-work (CFW). The selection of the means used depended on the extent of the work needed and the available resources (community and SC UK), and was decided in consultation with the community. Beneficiaries of CFW were identified by the development committees, local authorities and community members using community-based criteria. This included the poor (traditional recipient of the *zakat*[1]) as well as female-headed households, households with chronically sick family members, pastoralist 'drop-outs' and male-only headed households. Overall 35% of all beneficiaries were women, across most activities. The NRM work took 10 days per beneficiary on average and the work was mainly done at the beginning of the dry season (a low period for agricultural work and mobility for pastoralists).

1 The Muslim form of giving to those who are less fortunate or alms.

Step 6 Experimentation and innovation: The effectiveness of six traditional ways of controlling *prosopis*[2] was tested through simple trials of different removal methods conducted on small plots. The methods were applied on three to four *prosopis* trees and changes observed for three months. Other experimentation plots included fodder production in communities not previous familiar with its production.

RESULTS OF COMMUNITY ACTION PLANS

The results of the CAPs in Shinile Zone are many and range from the immediate to the longer term, including:

- **Immediate income:** CFW beneficiaries received an immediate cash injection. In 2008-2009, beneficiaries received ETB 140 per household, representing 2% of minimum food needs or 3% of the estimated total income of poor households in the 2009-10 year for only 10 days of work (King *et al*). CFW schemes were conducted during the dry season, *Jilaal*, which is the hunger gap period. Thus cash earned in CFW helped to protect assets and / or could be readily used for household food purchases. The timing of the transfer held more significance as it was during a low cash availability period for the communities.
- **Conversion of under-utilized land:** Hectares of land that had been abandoned due to the encroachment of invasive species, soil erosion and degradation were converted to productive uses. One 4.5ha plot of previously farmed land was cleared of invasive species and later used to cultivate maize, sorghum, vegetables and fruits. The transformation of the plot was so remarkable it was used as a demonstration area for other communities. A grazing area that had been abandoned due to degradation from drought and water run off was rehabilitated with diversionary canals. The rehabilitation also re-opened 400km² of grazing land now being used by over 500 households.

- **Increased access to food**: Rehabilitated land was used for cultivation and improving grazing in degraded areas, both of which have a direct effect on increasing access to grains, fruits, vegetables and milk on household and community levels.

- **Alternate income sources:** Additional income came from the sale of horticulture. One example is the sale of watermelons, cultivated in irrigation canals, to truck drivers along the international Ethiopia-Djibouti highway. Another example is the sale of *prosopis* for firewood, fences, charcoal, vegetables and seeds. In one project, more than 75 sacks of charcoal were made from the uprooted *prosopis* and sold for more than ETB 3,000. Though charcoal making is often considered a negative adaptation strategy, in this case the use of *prosopis* to make charcoal reduced pressure on native species and potential for increased deforestation. As part of the NRM training, controlled charcoal production with the involvement of local officials was stressed, discussed and agreed among the community members.

- **Community inspiration:** In various communities, buoyed by the successful clearing of previously noxious plants and rehabilitated lands, NRM activities continued and expanded by themselves without the support of SC UK.

2 Prosopis Juliflora is an evergreen shrub with large crown and open canopy growing to a height of 5-10m. It is drought tolerant, grow s well at marginal and strongly saline soils and tolerates seasonal water logging. It was introduced in Ethiopia in the 1970s and has spread a large area of many of the country's pastoral areas.

LESSONS LEARNED

Lessons learned from the CAP implementation in Shinile and Dembel districts include:

- **Promotion of innovation & experimentation works**: Communities in Shinile Zone had for years watched the degradation of key natural resources. Though there have been some efforts to remedy the effects, they have not been at scale nor have they used the most effective methods. Communities have now realized that small scale community led efforts such as these bring immediate results and improvements to their livelihoods. The CFW scheme started a spark in some communities to tackle NRM issues in an organized manner; and with this catalyst many were inspired to do more. Embracing indigenous knowledge to find solutions to local problems through trials gave clear examples of the importance of innovation.

- **Involvement of women, children & local officials throughout is key:** Each unique group of people in communities has different needs, priorities and relations to the natural resources. Bringing together and consulting an inclusive selection of the community brings together these different perceptions and needs. The meaningful involvement of women in the project committees has shown the communities and local officials that women are effective decision makers. Children in Shinile Zone have a close relationship with natural resources as their household duties generally encompass their use and, as a key stakeholder in NRM, they contributed positively to the development and implementation of the CAPs. Having the local government involved has been important for sustainability, transparency and connecting the community to government initiatives and resources. Some communities were also able to receive support from the local government in achieving their CAPs.

- **CAPs provide a tool for communities to engage:** While the communities in Shinile Zone have traditional means to manage natural resources, collective action towards problem identification is not always done in a collective, mixed gender and age groups. Through the CAP process each participating community member could see, discuss and comment on NRM. This not only facilitated discussions at the community level, but also externally, when two communities bordering each other engaged in the joint planning of CAPs after acknowledging the interrelationship of their individual CAPs.

CONCLUSIONS

The communities, local government officials and SC UK have seen a wealth of benefits from the NRM activities implemented in Shinile Zone over the past four years. These benefits have been economic and social, immediate and long-term. Although climate change adaptation was not the original focus of the projects, it is clear that indeed the results are leading in that direction.

The activities were designed in line with the United Nations International Strategy for Disaster Reduction (UNISDR) disaster risk reduction framework, and achieved three of the five points of action:

- Identify, assess and monitor disaster risks
- Use knowledge, innovation and education to build a culture of safety and resilience at all levels
- Strengthen disaster preparedness for effective response at all times (UNISDR)

The NRM activities done by SCUK with the communities of Shinile and Dembel district built on two of the five characteristics of adaptive capacity outlined in the African Climate Resiliency Alliance (ACCRA) framework, including 'asset base' (individual, social and community)' and 'innovation'. To a lesser extent the activities have contributed to 'Knowledge and Information', 'institutions and entitlements' and 'flexible forward-thinking decision making and governance' as the four projects drawn on were too short in duration to adequately address these two characteristics. Subsequently SC UK needs to analyze when best to incorporate these points into future programming.

What is clear through this study is that participatory, community owned NRM projects have a great potential for positive impact on livelihoods.

RECOMMENDATIONS

In order to further promote and strengthen participatory community led NRM activities, with an implicit connection to climate change adaptation and disaster risk reduction, the following recommendations are made:

Donors:

- **Support short term activities as well as sustainable drylands management support:** In areas such Shinile Zone that normally experience predictable changes in weather-related hazards and are vulnerable to gradual changes in climatic impacts, two tracks of support are needed by communities. This approach will address immediate needs *and* foster enabling conditions to longer term NRM, as the approach bridges both disaster risk reduction and climate change adaptation programming.

- **Longer term funded to support adaptive capacity in robust manner: I**n order to work towards strengthening all five characteristics of the adaptive capacity framework, donors need to provide longer-term funding for activities that can build on institutions and entitlements.

Non Governmental Organizations:

- **Link community livelihoods activities to NRM protect and synergy:** NRM activities in isolation may be undermined by other community activities, or synergies may not be sufficiently leveraged. Making these connections may multiple the positive impacts and may also give opportunities for scale up of NRM activities, such as through the public works activities of the government safety net program

Ethiopian policy makers:

- **Develop and implement policies and strategies related to invasive species removal / control:** Invasive species are a serious threat to the livelihoods of pastoral and non-pastoral communities alike. Community led initiatives are a good start to addressing their eradication. However, inefficient removal techniques or harmful practices, such as the use of toxic chemicals, used by some communities can increase the threat to human and animal health as well as place continued burden on communities. National policies on the introduction, control and removal of invasive species are essential to reduce the impact on communities and economies. In Ethiopia, it is clear that these types of policies need to reach the lower levels of government so that community actions can bear them in mind.

Researchers:

- **Expand research on NRM in pastoral areas:** National research bodies with links to implementing agencies and government programs can contribute much to current knowledge and understanding, in particular through research on the impact of NRM on the socio-economics in pastoral areas and the management of invasive species in these areas.

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Bisrat Alayu

The contribution of urban agriculture to climate change

Summary

The climate change scenario is affecting livelihoods across the world. Especially African countries are affected more. Different adaptive and mitigation strategies have been on the process of formulation, of course it should be continuous effort. However different researches are indicating it is a very costly in terms of time and money.

Less costly, practical, locally based initiatives and contributing to mitigate the climate change impacts should be further assessed. In line with this Urban Agriculture can demystify its potential to be considered as climate adaptive mechanism.

Urban agriculture has multiple advantages; economic, social and environmental. From environmental perspective its contribution; in minimizing the carbon emission in transporting the food from the rural to urban, to effectively addressing trouble from waste disposal through composting, in enhancing Urban environment and Energy efficiency has been tried to be addressed.

Further UA practices helpful in addressing those climate related problems from the local to global and community based initiative perspective has been highlighted. Thus some of the practical experience support that UA has the potential, prospect and means as one of the adaptive mechanism in the climate change scenario.

Thematic issue: New thinking on community led responses: from local to global.

Focus area; promoting local food production in urban areas.

Urban Agriculture from alternative source of livelihood and IGA to climate adaptive mechanism. *The practice*

Linking climate research, policy and practice for African led development 9-11 march 2011, Addis Ababa, Ethiopia

1. Ethiopian Agriculture

Agriculture is the main source of livelihood and the backbone of the economy of most developing countries. It creates employment opportunities, serves as a source of food, foreign currency and raw materials for industries.

In Ethiopia, the sector employees more than 80% of the labor force, accounts for 45% the GDP and 85 % of the export revenue (MoFED, 2006). It is mostly rain fed and subsistence. Di Falco *et. al*. (2010) illustrate the climate change vulnerability of Ethiopian agriculture, as the amount and temporal distribution of the RF and other climatic factors are important for the yield and can induce food shortage and famine.

2. Climate change and Agriculture

Climate change is any long-term significant change in the expected patterns of average weather of a specific region (or of the Earth as a whole) over an appropriately significant period of time.

It is well acknowledged fact that the production environment of African Agriculture in general and Ethiopian Agriculture in particular is known to be characterized by joint combination of low land productivity and harsh weather conditions i.e. high average temperatures, and scarce and erratic RF.

Eth. agriculture is extremely vulnerable to climate change. Thus, adverse environmental conditions are affecting the sector & livelihood despite the increased demand for food and lower productivity.

Therefore adaptation and mitigation are becoming the global and local concerns. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects.

It has some paramount importance to advocate innovative, low cost, and community based adaptation measures. Fisaha I (2010) *Urban Agriculture*, Vegetable farming/gardening, Fruit production, Composting, and Tree Planting, are recommendable Adaptation measures to climate change for domestic purposes.

Local food production in urban areas can be considered as one of the adaptive mechanisms.

3. Urban Agriculture

Urban agriculture (UA) is the practice of cultivating, processing and distributing food in, or around (peri-urban), a village, town or city (Bailkey and Nasr, 2000.)

UA has multifaceted benefits including biodiversity conservation, local climate amelioration, job creation, improving nutritional access of local households, income generation and solid and liquid waste management (Kaethler, 2006 base line).

Dubbeling et.al., (2010) *Alongside the economic and employment aspects,* UA can play a role in social inclusion of marginalized groups (the aged with pension, unemployed youth, persons with disabilities, PLWHAs, female-headed households etc.) by providing an opportunity to feed families, raise income, enhance self management and entrepreneurial capacities.

Different Facts and figures are indicating that UA should take a pivotal role in alleviating the growing urban poverty coupled with the climate change scenario. According to, Drescher et al. 2000, by 2015 about 26 cities in the world are expected to have a population of 10 million or more. And To feed a city of this size – at least 6000 tones of food must be transported each day.

The world urban population is expected to be 6.4 billion by 2050, and it is predicted that 60% of the world population live in cities (UNFPA, 2007). The Low income urban dwellers spend between 40% and 60% of their income on food each year.

As the result of poor economic performance, limited non farm jobs is available in the city and aggravate the urban poverty.

4. Why UA as an agenda?

(From environment perspective)

- Minimize carbon emission

  Carbon emission from fossil fuel takes the lion share among the various causes of the climate change. Local food production in urban and peri urban areas minimize green house gases from fossil fuel emission in transporting food and other livelihood items from the rural areas.

- Waste management (WM)

  With continuous urbanization the bulk of urban waste increases. Landfill gases emanating from organic materials in solid waste produce a variety of gaseous products. Landfill gas is about 40-60% methane and the rest Co2. And it produces pollutants and toxins that in turn trap heat and exacerbate global warming.

UA plays a key role in this respect as it effectively addresses trouble from waste disposal through ***composting*****:** Contributes recycling of 60-70%waste and it is also a sustainable way of Waste Management through Income Generation Activity.

- Urban environment enhancement

Urban greening, and Urban Forestry (Fruit trees & Edible cities) and simple Soil and water conservation practices (urban river basins) enhance the urban environment.

- Energy efficiency

In addition to the current rural- urban food and livelihood transportation cost and the associated green house gases from fossil fuel emission, fresh local food production minimizes the energy used to store and process food.

5. UA as climate adaptive mechanism?

The practice

The presentation argues that supporting community based adaptation strategies can help communities strengthen their capacity to cope with disaster, improve production skills, and diversify their livelihood. Thus some of the practical experience support that UA has the potential, prospect and means as one of the adaptive mechanism in the climate change scenario.

- The Potential (the case of A.A)

  Addis Ababa is the capital of Eth. With an altitude range 2100 - 3000 m.a.s.l.

  The city has a total human population 2.7 million as of 2007. (Karveller: 2004 cited in Davis, 2005). The city's Population below poverty line 44.2% (urban poverty) and 40% of the working age population unemployed (WB, 1992 cited on PSPC, 2003).

Axumite, 1994 investigate UA as *a traditional* practice in Ethiopia & 'an "Ultimate" survival strategy', and particularly important as it encourages people to eat vegetables which traditionally is given low attention.

The main agricultural activities related to UA in Addis Ababa are crop, vegetable and livestock (PSPC, 2003).

60-70% of milk, 30% of total vegetable & 60-70% of leafy vegetables and 40-50% of egg production in Addis Ababa market are from the urban and peri urban farms. Thus putting UA as an agenda is *only* strengthening the existing potential.

Different UA pictures in Addis Ababa river vegi. Production.

- Availability of Applicable technologies; maximizing productivity and efficiency.

There are simple, low cost and applicable technologies from locally available materials maximizing production and productivity from small plots and /or containers in the city.

Double digging agronomic practice proofed to increase production in small plots of land in the city. It helps to increase the soil depth, plant more and conserve the soil moisture.

Picture

(***Plot gardening and double digging, pictures from ENDA Ethiopia AA urban Agriculture office)***

Local preparation of organic manures from urban wastes- FAITH gardening and different 'in house' composting techniques. Simple techniques, starting to sort wastes from the source and minimum training help a lot to realize organic vegetables.

(Composting and FAITH gardening, picture ENDA Ethiopia)

Wasted materials like barrel, sacks, tires, ceramic containers and etc. are possible solutions at local level for the '*common'* urban space problem and increase efficiency. Availability of land has been mentioned as one of the challenges in promoting UA in cities.

(Different container gardening techniques, picture ENDA Ethiopia)

Urban poultry is also the most effective enterprise in Addis Ababa city. Different cages with different capacities from 5-60 birds have been successfully promoted. And experiences should that the poultry enterprise support the urban gardening

- Knowledge and skill

Knowledge and skill are is the most important resource in the production processes. Only through tailor made trainings (on the techniques of UA), minimum agricultural equipment supports & supervision are required to start up the initiatives.

It doesn't require advanced extension system. Community volunteers with short term trainings, allowances and technical supervision and coaching from experts could successfully deliver the necessary knowledge and skills. Hence more of community based and sustained system.

(Practical training, picture ENDA Ethiopia)

- Water

Unlike the rain fed (rural agriculture) most UA activities are small scale and the moisture requirement per initiative and the soil moisture lose through evaporation is minimum.

And there are some practices, like Rainwater harvesting, Drip irrigation and Reuse waste water could be easily applicable and low coast at individual level. Further research on the development of more applicable technologies is recommended. The problem of polluted city river has been mentioned as a problem to use the river as a water sources, thus strong policies on banning those discharging their wastes to the river should be strengthen, and different techniques on treating the polluted waters should be encouraged.

ISAPSO Picture and water reuse initiatives.

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Hailu Tefera/Assefa Tofu

Poverty alleviation and environmental restoration using the Clean Development Mechanism in Humbo, Ethiopia

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Poverty alleviation and environmental restoration using the Clean Development Mechanism – A Case Study from Humbo, Ethiopia

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 1960's. 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 assisted regeneration of 2,728 hectares 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.

Key Words: Agroforestry, Climate Change, Carbon Markets, Community participation, Farmer Managed Natural Regeneration

2 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.

Poverty alleviation and environmental restoration using the Clean Development Mechanism – A Case Study from Humbo, Ethiopia

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

percent 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 kilometres south-west of the Ethiopian capital, Addis Ababa, (see Figures 1 and 2) were largely destroyed by the late 1960s and across Ethiopia less than four percent of native forests remain today (Secretariat of the Convention on Biological Diversity, 2008). The absence of user rights over communal land 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 a process of community managed natural regeneration of woody species was established in Humbo with a focus on Carbon Sequestration.

In this paper 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[2], 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 mightbe 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 lessonswhich may be of relevance to various practitioners and researchers engaged in sustainable community development as well as climate change mitigation and adapt

Farmer Managed Natural Regeneration (FMNR)

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 70's 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.

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 et al., 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 hectare 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 et al., 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 et al., 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 et al., 1988). FMNR practices fit well into this category.

Clean Development Mechanism (CDM)

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 et al., 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 et al., 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 et al., 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 et al., 2008) with the attendant transactions costs. An alternative approach, as in the case of the Humbo project described herein (Dettmann et al., 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

[3] At the time of writing the earlier case study (Brown et al., 2010) not all of the authors were engaged in oversight roles within World Vision.

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 et al., 2008). This paper 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 up to and including receipt of the first carbon payment. It is based on a review of internal project documents made available to the authors[3] as well as those that are publicly available and updates results previously reported (Brown et al., 2010). 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), the independent validation report prepared by JACO CDM Co., Ltd (JACO CDM, 2009) and a case study of early results (Brown et al., 2010).

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 4 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 (Kabore et al., 2010) conducted in March 2010 had been completed. In addition to the quantitative data reported therein, qualitative assessments provided confirmation of earlier impressions by the authors as well as reports from community members of perceived adaptation co-benefits. 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 was 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 et al., 2008).

The Humbo project involves seven agricultural communities situated on the periphery of 2,728 hectares 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 et al., 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 hectares.
- Establishment of nurseries for the production of planting material for use on the remaining areas of the project site (some 500 hectares) 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), generating data for the PDD, negotiating content of the emissions reduction agreement (ERPA), 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:

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.

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.

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.

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.

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.

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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:

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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 hectares, a minimum tree crown cover of 20 per cent and a minimum average tree height above 2 metres (CDM, 2009). Project eligibility was substantiated at the beginning of the negotiation, and documentary evidence collated.

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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.

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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.

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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.

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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.

Table 1. Major milestones in the development of the Humbo project. Date	**ilestone**	**equired by**
ctober 2004	oject feasibility mission undertaken to determine the possibility of an AR CDM project in Humbo Ethiopia.	
ecember 2004	mmunity consulted regarding the potential of a carbon project and its implications. Proposal received strong community support.	

Tesema Alganesh

Role of genebank in Adaptation to Climate Change in three sites of Showa region in Ethiopia

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Climate change represents a critical threat to food security, especially in Ethiopia where climate variability and instability has been observed. High temperature and low precipitation is severely impacting crop production, even when high yielding improved cultivars are used. The present study is aimed at selecting locally adapted land races from National Genebank of Ethiopia for climate change with the participation of indigenous women farmers in protecting the lives and livelihoods of vulnerable women farmers from the adverse effect of climate change and identify promising wheat varieties using the innovative focusing identified germplasm strategy technique to meet the short -and long-term challenges faced by farmers affected by climate change as well as make available and provide access to better-suited crop varieties for targeted local communities for use in adapting to climate change. It is also support the mission of IBC to collect, Conserve and sustainably use indigenous plants and associated traditional knowledge in Ethiopia. The study was conducted at three sites of Oromia region particularly (Showa) (Ejerie, Cheffie donssa and Koka) with different agro ecological zones (2200 m.a.s.l.,2400 m.a.s.l.,1400m.a.s.l). A total of 200 accessions of (durum wheat and barley) land race populations and 22 improved varieties were selected using innovative geographical information system for climate change evaluation at each site. The germplasm were collected from different agro ecological zones by Institute of Biodiversity Conservation .The seed evaluator women farmers were one hundred fifty, in respecting different ages of women farmers ranged from 20 to 70 years old in each project site and ten couple of elder farmers as control. Fifty women farmers per site were selected with the collaboration of agricultural officers and extension agent's. While the ten couple farmers were from cheffedonssa.The women farmers have their own way of characterization and evaluation. The women farmers character recorded were; cold tolerant, heat tolerant, plant performance, leaf size, spike length, grain filling, seed plumpness, stem

appearance, leaf color, Plant height, spike color,straw quality, awn color, seed size, disease resistant, seed vitrous, adaptability, uses, missed varieties, awnedness, spike density, return ability in milling and baking, drought resistant, lodging resistant, glume hairiness and tillering capacity. In addition the economic importance and market attractiveness of the variants were examined. It was observed that the way of characterization difference between men's and women's. The project was produce da list of locally adapted varieties of wheat and barley. These varieties was fully characterized and and evaluated by women farmers and researchers. The study will support Institution of Biodiversity and Conservation (IBC) for better Conservation and Sustainable use, and the Ethiopian Agricultural Research Organization (EARO) in its search for genetic potential. Preliminary results shows that 95% wheat and 90% barley of the total land race populations selected were favored, while only a few accessions of the improved variety were selected.

At the lower altitude site in Koka, the women farmers selected 45%wheat and 55% barley of the total landrace populations. In Koka site twelve variants were selected by women farmers. The study indicated that the all selected variants have good seed performance and free of diseases. While in Ejerie the women farmers were selected 70% wheat and 65% barley of the total land race population out of which 30 variant of wheat and 50 variants of barley were selected. But, in Cheffe donssa there were 75% wheat and 50% barley of the total landrace population,out of which 35 variants of wheat and 25 varients of barley were selected. In all sites the purple seeded wheat and the irregular and six raws barley were preferred. In Koka the early type variants were selected.While in Cheffedonssa the late type were selected as well as the lodging tolerant variants. But, in Ejerie the intermediate type of variants were selected. As the evaluators were explained the late type variants are not cold tolerant. It is observed that the late type variants are susceptible to drought and diseases. Whereas, the early type variants were resistant. The study was observed 76 seeds per spike at Cheffedonsa. While in Koka it was observed (0 to 50) seeds per spike. The off type and extreme degree of shrivilage was observed in Koka. But also, the high quality seed vitreous wheat was observed in Koka. While in Cheffee Donsa most of variants were plumpy and starchy. The women farmers were observed the cold tolerant and cold resistant variants in Ejerie. Over all the elder women evaluators were critically observant. 50% landrace population of all accessions was known by elder farmers. While the young successor women farmers were not familiarized with the primitive landrace populations. The intermediate age of women farmers have been known the primitive landraces on their families farm field only. As the variant observant (women farmer evaluators) indicated the 80% of the total variant found in the project site were missed in their farm field.140 women farmer evaluators were growing only improved varieties on their farm field. But, two variants of land races have been used for medication and market attractiveness. 10 women farmer evaluators were a member of Community gene banks and they use to grow the land race populations with few variants. Therefore, the development agent should act to balance the primitive landraces and improved varieties and Institute of Biodiversity Conservation also it should give priority for restoration program as urgency. The National gene bank at (IBC) have been conserved an immense genetic diversity of many crops. However, thus arrested germplasm should have strong nonstop linkage with on - farm conservation for its proper natural services. If not there is not crop production stability and food security The study shows the potential for genebanks, coupled with indigenous knowledge of farm communities, in providing locally adapted varieties to help women farmers to cope with climate change.

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