

CARBON OFFSETS FOR FORESTRY AND BIOENERGY: RESEARCHING OPPORTUNITIES FOR POOR RURAL COMMUNITIES

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EXECUTIVE SUMMARY

Concerns about climate change have been a key driver in the rapid evolution of carbon markets over the last five years, as a potentially efficient and cost-effective way to reduce greenhouse gas concentration in the atmosphere. Carbon offset projects implemented in developing countries are one of the approaches that have been developed as a way to achieve emissions reductions or removals that generate credits that can be traded in carbon markets. They include a wide range of technologies for which emissions reductions or removals can be quantified, from tree planting and avoided deforestation, to energy efficiency, renewable energy and capture of industrial gases. The theory is simple: by implementing projects in developing countries, carbon finance can be harnessed to contribute to sustainable development whilst also reducing the costs of tackling climate change. Poverty reduction is an aspect of sustainable development that commercial carbon offset providers, donors, governments and NGOs are increasingly interested in addressing through carbon offset projects.

This report presents findings from a research study looking at the opportunities that carbon offset projects offer for poor rural communities. It addresses three main questions:

1. What are the different approaches to establishing carbon offset projects in the forestry and bioenergy sectors?
2. Does the carbon offset aspect of these projects introduce new opportunities or risks for the poor? I.e. has the fact that these are *carbon offset* projects, rather than more traditional development projects, given rise to new opportunities or risks for the rural poor?
3. How does carbon finance influence the long-term sustainability of any new opportunities?

The report first gives an overview of the carbon offset markets and considers opportunities at the global level in terms of the types of projects that are attracting investment in rural areas in developing countries and the size of the market. The findings are clear: whilst the overall scale of markets has been increasing rapidly (though with recent slowing related to the global financial crisis), investment in projects in low income countries is still only at a small scale, with only 3.2% and 1.2% of projects in Africa and in the mandatory and voluntary carbon markets, respectively. When considering forestry and bioenergy projects in rural areas (the rural project types in which households tend to be more directly engaged), these opportunities are even more limited. Nevertheless, investment is increasing in both the forestry and bioenergy sectors so there could be potential for finance. Recent market surveys also suggest that investors are interested in 'reduced emission from deforestation and degradation' (REDD) projects because of their potential social and environmental benefits, and progress in the UNFCCC could contribute to a rapid increase in these projects.

The remainder of the report looks at three forestry and three bioenergy offset projects in more detail, in Uganda and India respectively (full case studies are provided in Appendix 1 and 2, in order to answer the three questions at the local level. The case studies represent carbon offset projects using similar technologies but structured in different ways.

Approaches to establishing carbon offset projects

There is a great diversity of approaches to establishing carbon offset projects. Both forestry projects and bioenergy projects vary broadly between two extremes: small-scale community or individually implemented projects, often with local NGOs acting as the main intermediary, and having a poverty reduction objective; and large-scale, more commercially orientated projects driven by private enterprises. These generalizations mask details which need to be well understood in order to assess the opportunities and risks for communities. Key variables include:

- **The type of technology used to generate carbon offsets.** In the forestry sector differences between sequestration activities (through tree planting) and carbon stock preservation (through reducing emissions from deforestation) have implications for the types of land in which projects can be implemented, and hence their implications for the poor. There is great diversity of technology in bioenergy based offsets. Most biomass or biogas technologies are relevant for commercial activities (e.g. energy generation on large farms), with few direct benefits for the poor beyond the potential for employment.
- **Nature of the markets used for trading carbon.** There are two main carbon markets (regulated and voluntary) for trading credits from offset projects (chapter 3). The type of market influences the types of technologies that can be used, standards and methodologies applied, the prices paid for carbon credits and the motivations of buyers.
- **Institutions and actors.** Even where projects use similar technologies and trade in the same markets, they can be set up in different ways. For example, communities can be involved through group or individual contracts, which can affect participation of the poor. Group structure (e.g., whether existing or new structures are used) is important. Important differences also arise at the level of intermediaries. These can differ in type (e.g. whether local NGOs are involved, governments, or both) and number (e.g. buyers may transact with project developers based in developed countries that may partner with companies or NGOs in host countries, introducing many different levels into the system). The types of project developers involved and their motivations are also key variables. Project developers can be private companies, NGOs, developing country governments and donors (e.g. multilateral banks) are commonly involved. Some projects are established for commercial purposes, and others are non-profit.
- **Local context.** There are differences in country policies relating to carbon trading and the implementation of different project technologies. Country sustainable development criteria vary considerably for the CDM, which affects issues such as the social impact requirements during project preparation. The degree to which the Designated National Authority (DNA) has oversight of project implementation also varies considerably between countries as do the financial and human resources.

While carbon finance has some influence over how projects are established and run it does not appear to result in much innovation. This is a concern, given that the ultimate aim of carbon offsetting is to help shift towards low carbon development. Many of the types of projects and approaches that are attracting finance have been implemented for many years. This may not be an issue where these are well tested. But often these have failed, not because of the technology, but because 'best practice' has not been taken into account. 'Best practice', for example in terms of establishing collaborative forest management approaches, has not been followed in a number of the projects reviewed here. The fact that projects are often driven by external actors, who may also be new to the field, may be a contributing factor to this tendency to adopt such a trial and error approach. Paying more attention to best practice would be a good first step in enhancing project opportunities.

Impacts of carbon offset aspects of projects on the opportunities and risks for poor rural communities

The use of carbon finance to support projects has some bearing on whether projects offer new opportunities, barriers and risks for the poor compared to more traditional financing approaches. Carbon finance can contribute to a number of expanded *financial and material* opportunities, including:

- **Employment:** All of the projects reviewed are providing employment to varying degrees for both participants and non-participants. These tend to be higher in the forestry projects, where more labour is required. Projects are likely to provide ongoing employment for smaller numbers of people. Employment quality can also be enhanced by offset standards.
- **Subsidy of technologies:** In some projects carbon finance covers all upfront and ongoing maintenance costs, whereas in other projects it supports only a small fraction of investment costs for participants.
- **Income from sale of products related to projects:** This is particularly the case for forestry projects, where income from future timber sales by participants could be substantial. There is little evidence that the profitability of alternative income generating activities, where they are promoted by project, is well understood.
- **Income from carbon offset payments:** Projects vary considerably in whether they make direct payments for carbon to producers. Four out of the six projects reviewed here have arrangements with participants to channel some payments to them based on carbon contracts. Net income appears to be relatively low in most cases compared with yearly household income. There are income gains for the wider community (e.g., from community carbon funds) in some cases, but these funds are very low.
- **Infrastructure improvements:** Carbon finance is contributing to investment in local infrastructure improvements in a limited number of cases. This includes, in one project, support to a local school and in another, improved management of local electricity distribution systems.

Carbon offset projects can have both positive and negative effects on *increasing the security and reducing the vulnerability* of the poor. For example, there is some evidence in forestry projects that both the trees and the carbon payments can be used as security for loans by participants. However, there is also potential for increased vulnerability, for example through the way that project contracts are established. A lack of flexibility in project contracts, combined with low understanding about the terms of contracts, could result in participants becoming involved in projects where they commit to changing activities but the expected returns never emerge. Given the complexities of carbon offset projects, intermediaries are extremely important in enabling participation and in helping to avoid some of these risks. Intermediaries may become compromised in cases where they enter into delivery contracts for carbon investors – they are then under pressure to ensure that the participants that they manage, deliver emissions reductions or removals even if they have few mechanisms through which they can ensure delivery.

Non-participants may have some small gains in terms of increased security and reduced vulnerability through employment created by projects and potentially through benefits such as investments in community infrastructure and improved local environment. However, the negative impacts in terms of reduced access to assets (e.g. grazing land) and elite capture may outweigh any benefits, but further cost-benefit analysis would be needed to quantify this. These disparities appear to be greater in forestry projects than in bioenergy projects.

There should be scope for offset projects increasing *empowerment* as a result of the standards that are often used for project development, which include procedures for engaging with communities. In practice it appears that consultation processes are relatively ad-hoc and in some cases tokenistic (e.g., in relation to the participation of women), even where projects are certified to additional standards that aim to enhance community benefits. Lack of knowledge among participants, and in some cases intermediaries, about what they are signing up to, appears to be a common issue which may also exacerbate the risks associated with participants investing resources in project participation. The carbon monitoring requirements for projects could act in a positive way to help ensure regular communication between project developers/intermediaries (who may have considerable technical expertise) and participants.

There is great variation between projects depending mainly on how they are structured. At one extreme, projects use elected local coordinators, run regular awareness workshops and integrate carbon offset activities with other development projects. At the other extreme, projects rely on external coordinators, have less regular opportunities for links between participants and intermediaries and operate more in a vacuum. There is clearly scope to improve the processes through which consultations are conducted before projects are implemented and how the quality of consultation is assessed. There is even greater scope for establishing project monitoring and coordination systems that follow best practice in their implementation.

In summary, there are new opportunities related to carbon offset projects, but these are relatively small in most cases, and are limited to individual or group participants. Risks to the wider community (particularly for large-scale forestry projects) may outweigh the benefits for participants, but more detailed cost benefit analysis would be needed to support this statement. Participation of poorer community members appears not to be a priority and is limited in most project approaches. This is because they do not have the financial resources to participate or they do not meet other eligibility criteria, such as owning land for tree planting, having secure title, or having livestock to run biogas systems.

Sustainability of opportunities

Carbon finance appears to have some influence over the sustainability of new opportunities. This is due to the length of contracts (which can range from 7 to 50 years, but are generally longer than the 3-5 agreements for many traditional development projects). New income opportunities for participants appear to be relatively secure over the length of these agreements once projects have been registered and start to trade. More regular and more detailed monitoring and evaluation procedures (particularly to evaluate emissions reductions, but in some cases to evaluate non-carbon benefits/risks) that are required throughout the lifetime of projects, may also help to overcome some of the sustainability issues associated with more traditional projects (e.g. lack of maintenance).

As with any market-based system, the long term sustainability of carbon offset markets is not guaranteed. The markets have expanded rapidly over the last four years, but there have also been some large fluctuations in price. These have been due to regulatory problems, and the failure of the UN climate talks in Copenhagen in December 2009 means that there is continuing uncertainty in the carbon markets. The security of opportunities may also be affected by the evolution in standards used for carbon offset projects. As the industry becomes more standardised, some of the approaches that can help to engage communities may become more difficult for project developers to justify.

A key issue is that many of the factors governing whether carbon offset projects can offer opportunities for poor rural communities are outside the realm of the projects themselves. Local and national policies and legislation may have impacts on the types of projects that can be implemented and the approaches used (e.g. specifying guidelines for collaborative forest management). This is particularly true for forestry projects, in which land tenure security is one of the biggest barriers for project implementation. Solving such issues in a country such as Uganda could take a long time and ultimately has to be left to politics far removed from carbon offset projects. Implementation capacity of local and national government departments is another key issue which affects both the oversight of projects and their integration into wider development plans.

1.1 Recommendations

For project developers and those involved in market regulation (e.g. design of standards)

1. Pay greater attention to existing best practice relating to project links with communities in their design and implementation. This includes, for example:
 - a. Drawing on experience in establishing collaborative forest management systems;
 - b. Working with local organisations to develop skills in running projects and establishing governance systems that ensure independence from project implementers;
 - c. Approaches for conducting rapid social impact assessment and ongoing project monitoring;
 - d. Ensuring transparency with project participants in terms of the potential returns related to carbon and their timescale;
 - e. Consultation processes, particularly with regard to ensuring that the views of women are meaningfully represented in consultation processes.
2. If poverty reduction is a core aim of projects, specific targeting of poorer community members may be required in order to provide opportunities. Alternatively, establishing mechanisms through which whole communities can benefit (e.g. community funds or infrastructure investments) may help to target a wider cross-section of the community.
3. Increased scrutiny by project certifiers as to the social impacts of projects. This may require certifiers to have additional skills in order to assess such impacts and for additional time inputs in the certification process in order to gain an independent understanding of project impacts.
4. Thorough analysis, prior to project implementation, of alternative livelihood approaches that are promoted as part of projects, particularly where these form an important aspect of the overall benefits and may carry risks if they are not successful.
5. Ensure high levels of transparency in the carbon 'value chain' to ensure that communities and intermediaries are clear about who gains how much from carbon and over what timescale.

For local intermediary NGOs

1. Seek clarity on the terms of contract with buyers and project developers, especially with regards to responsibilities and timescale of delivery of emissions reductions and removals from projects. This should also include clarity on the redress mechanisms if carbon emissions reductions or removals are not delivered.

2. Develop robust monitoring systems with locally stored data in order to track the progress of individual participants and increase local ownership.
3. Work with communities to establish internal benefit sharing arrangements relating to carbon benefits. For example, on the governance of carbon shareholding agreements so that investments and returns are well understood.
4. Use local labour for project implementation (monitoring; training; labour for planting/building) where possible to increase added value for local communities.
5. Be careful of over reliance on voluntary labour for project implementation, especially when projects are expanding and requiring increasing levels of rigour in monitoring, etc. Labour costs should ideally be estimated in negotiations with buyers and/or external project developers.

For donors supporting market development

1. Support central and local government in their technical capacity to oversee project implementation. This could also extend to developing better national databases on land use emissions and removals, monitoring systems and reporting processes. This would also help to promote participation in any future climate change mechanism such as REDD+.
2. Support a broader approach to projects that are better linked to land and policies outside the boundaries of projects, such as agricultural land outside designated forestry areas. This could be through active engagement with governments in pilot project development and/or by supporting work that helps to link projects to wider policies and measures.
3. Supporting pilot project implementation. There continues to be a distinct lack of experience in implementing offset projects especially in Africa, but this will be essential for gaining a better understanding of their implications. Piloting of approaches to carbon offset projects that target poorer communities and individuals would also be useful. This may include investment approaches for land that is under communal ownership or deemed as too insecure for many investors.
4. Ensure that lessons learned from previous donor programmes and research are incorporated into project design. Most of the issues surrounding why and how carbon offset projects offer opportunities or present risks to poor people have arisen in more traditional development projects in the same sectors.
5. Develop quality control systems that can be applied to any donor investments, such as guidelines on minimum processes for social impact assessment.
6. Support more rigorous global comparative studies on the social impacts of carbon offset projects, drawing from those that already exist.

1.2 ACRONYMS

ADATS	Agricultural Development and Training Society
AR	Afforestation and reforestation projects
CDM	Clean Development Mechanism
CER	Certified Emissions Reductions
CFM	Collaborative Forest Management
CSU	Coolie Sangha Units
DOE	Designated Operational Entity
ERPA	Emissions Reduction Purchase Agreement
EU	European Union
GHG	Greenhouse gases
NFA	National Forest Authority (Uganda)
NGO	Non-governmental Organisation
PES	Payments for Environmental Services
RECPA	Rwoho Environmental Conservation and Protection Association
REDD	Reduced Emissions from Deforestation and Degradation
SUB	Sustainable Use of Biomass (Ugandan subsidiary of Global-Woods AG)
UNFCCC	United Nations Framework Convention on Climate Change
VER	Verified Emissions Reductions

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1 INTRODUCTION

This report presents findings from a research study looking at the opportunities that carbon offset projects offer for poor rural communities. Carbon offset projects frequently claim to offer social and environmental 'co-benefits', in addition to their impacts on atmospheric greenhouse gas levels. Examples of social benefits promoted include:

1. Additional and more stable employment from project implementation/operation
2. New sources of revenue, either from the sales of emission reductions or from the project's activities (e.g. acquisition of free or cheaper fuelwood and timber, sale of fruit or other agroforestry and non-timber forest products, diversification of economic activities, creation of long-term savings)
3. The acquisition of new knowledge and techniques, e.g. for tree planting or conservation agriculture
4. Health or education benefits, e.g. related to improved air quality or environmental awareness
5. Local institutional strengthening

A number of studies have tried to evaluate such benefits from different perspectives (Geoghegan et al., 2008; Chappell, 2008; Grieg-gran et al., 2005). However, there are still few detailed case studies describing carbon offset projects, particularly in terms of their institutional structures and carbon finance systems, and how both of these factors may affect the opportunities and risks for the poor.

The report therefore addresses three main questions:

1. What are the different approaches to establishing carbon offset projects in the forestry and bioenergy sectors?
2. Does the carbon offset aspect of these projects introduce new opportunities or risks for the poor? I.e. is the fact that these are *carbon offset* projects, rather than more traditional development projects, given rise to new opportunities or risks for the rural poor?
3. How does carbon finance influence the long-term sustainability of any new opportunities?

Definitions of important terms are given in Box 1.

Research has been conducted to analyse the existing data on carbon offset markets and the opportunities and risks they raise for the rural poor. This has been further informed by discussions with key informants working in the sector and more in depth research on a set of six case studies looking at different approaches to forestry and bioenergy carbon offset projects in Uganda and India.

The first part of the report deals with opportunities at the global scale, looking specifically at what types of projects are being implemented in the carbon offset markets, which of these are relevant in rural areas and to the rural poor, and the scale of the opportunities in terms of the number of projects. It defines a subset of offset project types in the forestry and bioenergy sectors that are commonly considered to offer benefits to the rural poor. Later chapters of the report look at evidence from six case studies of carbon offset projects in Uganda and India, analysing how they are structured, the opportunities and risks that arise for the rural poor, and whether the carbon finance dimensions of the projects raise new opportunities or risks.

Box 1: Definitions used in this report

Carbon offsets: Carbon offset projects are defined here as projects that reduce greenhouse gas emissions into the atmosphere, or remove greenhouse gases from the atmosphere with the resulting emissions reductions or removals traded through carbon markets to compensate for greenhouse gas emissions from other activities. Carbon offsets are measured in tonnes of carbon dioxide equivalent (tCO₂e) reduced or removed.

In order to understand the opportunities from such projects it is important to be clear about which interventions in the community are or are not related to the carbon offset project. In the case of forestry-based offsets, for example, community forestry may have pre-existed in the community, but have been enhanced by carbon offset interventions (e.g. through training, better forest inventory or management planning, etc.). Clarity is needed over the extent to which activities are integral to the carbon offset project or simply 'associated' activities intended to encourage people to participate in the project by providing short-term or 'bridging' benefits.

Rural communities: According to IFAD (2001), the rural poor typically live on farmsteads or in communities of 5-10,000 persons, separated from one another by farmland, pasture, trees or scrubland, and the majority spend most of their time on farms. For this study, distinctions need to be made between activities directed at communities (e.g. collaborative forest management), or groups within them, and those directed at individuals or households (e.g. individual tree planting or improved stoves).

Rural poor: An estimated 75% of the world's 1.2 billion poor people live in rural areas, including a wide range of individuals such as rainfed farmers, smallholder farmers, pastoralists, artisanal fishermen, wage labourers/landless, indigenous people, female-headed households, displaced people, women and the elderly (IFAD, 2001). Their poverty may be linked to remoteness and low-fertility soils, being landless and working in insecure and low-income jobs, and belonging to ethnic minorities or being women. The important point for this study is to assess the differentiated impacts of carbon offset activities on this very heterogeneous group.

Opportunities: The World Bank (2001) sees expanded opportunities as one of three key aspects of poverty reduction:

1. Expanding opportunities such as jobs, credit, roads, electricity, markets for produce, schools, etc.
2. Increasing security and reducing vulnerability, for example through enhancing assets, insurance and diversification.
3. Empowering people to shape decisions, for example through changes in governance that make public institutions more efficient and accountable, and by strengthening participation of poor people in political processes and local decision-making.

We are interested not only in one-off benefits, but in the flows (and interactions) of different benefits over time. Thus, a project may initially provide financial benefits which households then use to improve their natural capital (e.g. purchase of livestock) and human capacity (through education) enabling them to engage in other more lucrative income-generating activities. Some project activities may also (inadvertently) impose costs on individuals or particular groups of households leading to increased vulnerability.

2 METHODOLOGY

The research for this report was carried out in two stages:

Stage one: a scoping phase

- A review of the literature on the developmental dimensions of carbon offsets to identify evidence relating to the benefits and possible risks of such projects for poor rural communities;
- Interviews with ten key informants involved in developing or promoting carbon offset projects to elicit views on the types of projects which are associated with benefits for the rural poor and why; and to suggest 'best practice' case studies appropriate for further research;
- Compilation of a scoping report (Peskest et al., 2008a), which summarised findings from the above.

Stage two: Case studies

- A survey of potential case studies in the forestry and bioenergy sectors, based on a simple set of criteria²
- Background research on six shortlisted case studies, including discussions with project developers and the location and review of project documentation;
- Fieldwork looking at six case studies in Uganda and India. The aim with these case studies was to compare different approaches to three carbon forestry and three carbon bioenergy projects within the same policy context. The aim was firstly to try to produce detailed descriptions of the institutional structuring of projects, as there are few readily accessible examples of projects available (particularly in Africa). Secondly, it was to try to understand how some of the features that make these projects 'carbon offset' projects affect the opportunities or risks for the rural poor.

The case study fieldwork included a total of five weeks in-country research with local research partners (Sustainable Development Consultants in Uganda and the Indian Institute of Science in India). Time was divided between research on the policy context, through key informant interviews with policy makers, NGOs, academics and the private sector, and short field trips (1-2 days) to project sites, where key informant interviews and focus groups were held with local government staff, project staff, project participants and non-participants.

It was judged important to look at projects in Africa because there are few existing case studies of carbon offset projects but significant interest in expanding the number of projects being implemented. Uganda was chosen as a focal country because there are a number of carbon forestry projects there and they are relatively well established compared with those in most African countries. India was chosen because it is one of the few countries where a significant number of small-scale bioenergy projects is being implemented in close proximity (such projects are few and far between globally – see chapter 3). It also provided the possibility of understanding (and comparing with Uganda) some of the institutional aspects of carbon finance that make India attractive to offset providers.

² This included criteria such as forestry and bio-energy projects only; projects that present themselves as offering benefits or opportunities beyond just the carbon abatement/sequestration, which tend to be those which use voluntary standards (e.g., Plan Vivo, CCB, etc) or have received awards (e.g., Ashden Awards); projects that were recommended through interviews, or ones that we had heard about through word of mouth. Further narrowing down was based on proximity of projects to one another; length of operation; types of approaches used (e.g. large vs. small-scale); how much information was available. For further details please contact the corresponding author.

There were a number of challenges in conducting research in this area. In particular it was difficult to access detailed financial information about revenue flows from carbon, because such information is often kept confidential. It was also problematic to get access to local officials working in the sector in India, making it difficult to get first hand insights into policy barriers and opportunities.

3 BACKGROUND TO CARBON OFFSETS

The aim of this chapter is to outline how carbon offset projects are distributed across countries and also the types of projects that operate in rural areas. After outlining what carbon offset markets are and how they work, it investigates three questions:

1. How are carbon offset projects distributed across developing countries?
2. What types of projects operate in rural areas and are associated with opportunities for the rural poor?
3. How significant are forestry and bioenergy carbon offset projects in relation to the wider carbon offset markets?

3.1 What are carbon offset markets?

The term 'carbon offset' describes a system in which greenhouse gas (GHG) emissions from one activity (e.g. from industrial activities or transport) are compensated for by implementing another activity that either (i) prevents an equivalent amount of GHG emissions from occurring; or (ii) results in the removal of an equivalent amount of GHGs from the atmosphere. Because of rapid atmospheric mixing of GHGs, an activity in one place can legitimately be 'offset' in this way by the implementation of an activity in a completely different place, and differences in pollution abatement costs can be exploited. By establishing a price for GHGs (through legislation and increased public interest in tackling climate change) markets for such carbon offsets have been established. There are two main carbon markets in existence:

1. **The regulated carbon market**, which includes the Clean Development Mechanism (CDM) carbon projects. The CDM regulated market is governed by rules established under the Kyoto Protocol. This is a legally binding treaty under which developed countries, or the industries that they regulate, can purchase carbon credits from developing countries to meet legally binding emissions reduction targets; and
2. **The unregulated voluntary markets** which exist outside of international rules. They have come about mainly because companies and individuals that are not regulated under international agreements have become interested in taking voluntary action to tackle climate change (e.g. for the purposes of corporate social responsibility). There is a multitude of different standards and systems in operation within the voluntary markets, meaning that they are in fact a set of separate trading systems. However, as with the CDM, there are project-based systems where carbon offset credits are purchased from projects in developing countries.

The CDM market is the largest of the two project-based carbon markets³. Whilst both showed nearly exponential growth until 2007, they have since been hit by the global economic crisis.

Confirmed transactions for primary 'certified emissions reductions' credits (CERs) declined nearly 30% to around 389 million CERs from 552 million CERs in 2007. The value of these transactions declined 12% to around US\$6.5 billion in 2008, compared to US\$7.4 billion reported in 2007. The voluntary market saw transactions of 54 MtCO₂e in 2008 (up 26% over 2007) for a value of US\$397 million, but growth was much slower than in previous years (Capoor and Ambrosi, 2009).

³ This is not including cap and trade markets such as European Union Emission Trading Scheme (EU ETS) which mainly allow for the trading of emissions allowances within the EU.

The types of projects that are implemented under these different markets are diverse and range from different forms of forestry sequestration project (in which credits are gained for the CO₂ removed from the atmosphere when trees grow) to energy efficiency and renewable energy projects (which prevent CO₂ emissions into the atmosphere). The wide range of project types is listed in Table 1.

Project type	Description
Afforestation	'Afforestation' is a conversion of land that has not been forested for at least 50 years to forested land
Agriculture	Projects including use of renewables for irrigation and use of alternative fertilisers.
Biomass energy	Projects such as producing energy from bagasse, agricultural residues and forest residues
Cement	Production of cement using alternative fuels and cement component materials that emit less CO ₂
Coal bed/mine methane	Projects capturing and using methane from coal production
Energy distribution	District heating systems, boilers and efficient electricity distribution
EE households	Energy efficiency improvements through e.g. lighting systems, stoves
EE industry	Energy efficiency improvements through industrial processes in a range of sectors
EE own generation	Energy efficiency by generating power from wastes in industrial processes, e.g. including chemicals, glass etc.
EE service	Energy efficiency improvements, e.g. in new building design, air conditioning use, etc.
EE supply side	Projects that increase the energy efficiency of supply for example of electricity generation in coal power plants
Fossil fuel switch	Reducing fossil fuel use by replacing with another fuel
Fugitive	Reducing waste gas emissions, e.g. from oil field flaring
Geothermal	Geothermal energy production for electricity and heat
HFCs	Projects that decompose HFCs into gases that have lower greenhouse gas potential
Hydro	Run of river, existing dam and new dams for energy production
Landfill gas	Reduced emissions from flaring, use of landfill emissions for energy production
Methane avoidance	Avoiding methane emissions from manure, industrial solid wastes
N₂O	Projects that reduce N ₂ O emissions from industrial processes
Reduced emissions from deforestation and degradation (REDD)	Could include financing Protected Areas; Community forestry; Conservation concessions; Reduced Impact Logging etc.
Reforestation	'Reforestation' involves replanting trees on non-forested land that once was forested
Solar	Solar voltaic energy generation (producing electricity), solar water heating and solar cook stoves
Tidal	Energy production from tidal power
Transport	Efficiency improvements e.g. through mode shifting from road to rail
Wind	Electricity production from wind power

Table 1: Types of carbon offset projects. Source: adapted from UNEP Risoe August 2009

3.2 Main project types and global distribution of projects

There are currently 4588 projects in the CDM pipeline (under validation, awaiting registration or registered) (UNEP Risoe, August 2009). These are being implemented

in five main project categories: Hydro power, wind power, biomass energy, methane capture and energy efficiency (Figure 1).

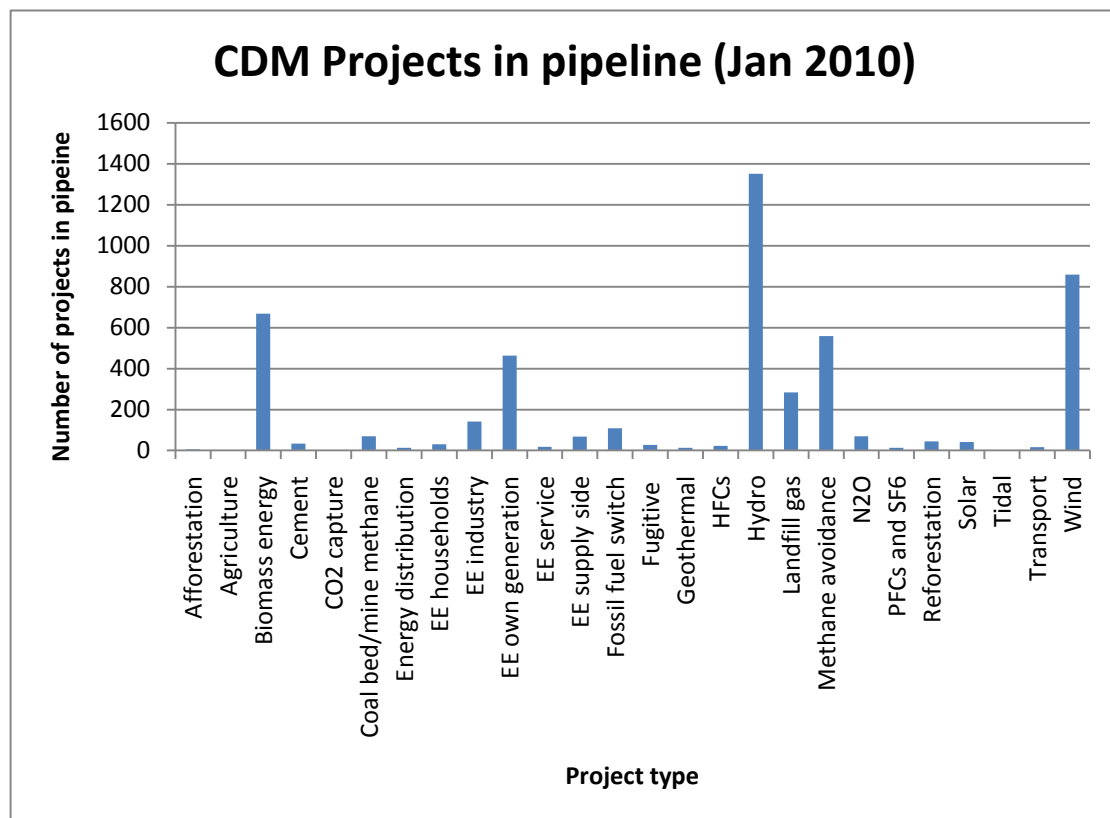


Figure 1: CDM project in pipeline (Jan 2010). Source: UNEP Risoe Centre

Most of these projects are being implemented in Asia and Latin America, with very few projects in Africa. Despite efforts for the development of CDM projects in Africa, only 2.4% (120 projects in the pipeline) are located in the region. Only 38 projects have so far been registered. The reasons for this trend include:

1. The large number of industries with high emissions in emerging economies such as China, India and Brazil. There are therefore many more possibilities for implementing projects in these industries to reduce emissions;
2. Economies of scale favouring investments in larger projects associated with large emissions sources, which are more common in emerging economies;
3. High risks associated with investments in countries with poor governance;
4. Complex technical requirements for establishing projects, with limited expertise in countries;
5. Rules governing emissions trading systems such as the EU emissions trading system (EU ETS). Trading of carbon offset credits from forestry projects is not permitted under the EU ETS because of technical concerns.

Data on the voluntary carbon markets is much more fragmented because there is no central information repository on projects, credits sold, etc. The main types of projects being implemented (by number of projects in 2008) include hydro power (32%), landfill (16%), wind power (15%), afforestation/reforestation conservation projects (7%), geological sequestration (5%), energy efficiency (4%), biomass renewable energy (3%) and agricultural methane capture (3%) (Hamilton et al., 2009). The voluntary market is much smaller than the CDM both in terms of the volume of emissions reductions and financial volumes transacted (Table 2).

African voluntary carbon projects accounted for just 1.2% of volumes transacted in the voluntary market in 2008. Most transactions occurred from projects in Asia.

	CDM market	Voluntary market
Volume transacted in 2008 (tCO₂e)	389 million in total (primary CERs ⁴)	54 million
Total financial value of transactions in 2007 (US\$)	6,519 million	397 million
Project size in 2008 (tCO₂e/ yr)	Approx. 138,000 (average size of projects in pipeline). 86% of projects in pipelines are in the range of 10,000 – 500,000.	46% of transaction volume in 2008 was generated by very large projects, 500,000 tCO ₂ e/year or above
Project locations	Asia (81%) Latin America (13.5%) Africa (3.2%) Europe and Central Asia (1.2%) Middle East (1.1%) (Figures based on expected CERs by 2012)	Asia (45%) North America (29%) Latin America (4%) Australia and New Zealand (4%) Africa (1.2%) (Figures based on volumes transacted in 2008)
Project types (top four)	Hydro (27%); Wind (17%); Biomass energy (14%); Methane Avoidance (11%) (by number of projects)	Hydro power (32%), landfill (16%), wind power (15%), afforestation/reforestation conservation projects (7%) (by transaction volume)
Main drivers of demand	Compliance with internationally agreed targets for developed countries' governments and with targets imposed by the governments for companies.	Corporate Social Responsibility and Public Relations/ branding
Standards & procedures	CDM project cycle including 3rd party verification by Designated Operational Entities, regulated under the decision made by the Parties of Kyoto Protocol.	No mandatory and universal standards, although many projects use 3rd party verification and some independent standards.

Table 2: Comparison between CDM and voluntary carbon markets. Source: Capoor and Ambrosi, 2009; Hamilton et al., 2009; UNEP Risoe Centre, 2010

3.3 What types of projects are associated with greater opportunities for the rural poor?

There are many types of carbon offset projects being implemented in rural areas. Based on the categorisation in Table 1, these include:

1. **Afforestation and reforestation projects**, ranging from small-scale projects planting on farmers' private land to large-scale commercial plantations;
2. **Agriculture projects**, including methane capture from rice paddies and irrigation using low emissions pumps;
3. **Biomass energy projects**, including a wide range of technologies such as efficient wood fuel cooking stoves, biogas cooking stoves, liquid biofuels, localised and grid connected electricity generation from biomass;
4. **Methane avoidance projects**, for example from animal manure in large-scale livestock production systems;
5. **Solar projects**, including domestic and community solar photovoltaic electricity generation, solar cooking stoves and solar water heating;

⁴ A primary transaction is a transaction between the original owner of credits and buyers and a secondary transaction is a transaction between a seller, who is not the original owner, and buyers,

6. **Hydro-power projects**, ranging from micro-hydro run of river electricity generation to large-scale grid connected hydro power;
7. **Reduced emissions from deforestation and degradation projects**, such as improved enforcement of protected areas, scaled up community forestry programmes, payments for environmental services and sustainable forest management. Note that avoided deforestation projects are only being implemented in the voluntary carbon markets due to rules under the Kyoto Protocol that restrict such projects in the CDM.
8. **Wind energy projects**, ranging from small-scale domestic wind turbines for electricity generation to large-scale grid connected turbines;
9. **Others**, including some rare project types such as using treadle pumps to replace diesel pumps for irrigation systems.

The initial review work for this project (including interviews with people involved in carbon markets and reviews of literature on 'pro-poor' carbon offsets) indicated that certain types of forestry, biomass energy and methane avoidance projects are commonly associated with offering greater benefits to the poor. The reasons for this include:

1. These technologies can be implemented by poor people themselves as they are simple and have lower costs, so are more likely to be adopted and to have direct benefits for individuals and households;
2. The rural poor have few emissions that can be 'offset'. Some of the main sources of emissions are deforestation relating to energy production, particularly for cooking and emissions from agricultural activities such as manure production and burning of agricultural residues. Technologies relating to cooking and other thermal applications are therefore more applicable to poor rural households.
3. Sequestration activities (where carbon is removed from the atmosphere), particularly through tree planting do not rely on emissions being avoided, and are therefore also suitable in cases where there are few emissions in the first place. Tree planting is also applicable in rural areas, for obvious reasons.

Solar power, hydro power and wind energy on the other hand, are more difficult for poor rural households to implement themselves and are often used to feed electricity grids (which poor households will often not be able to access) or communal power supplies. There are therefore likely to be fewer direct benefits for the rural poor from these technologies.

The association of forestry and bioenergy project types with pro-poor benefits does not necessarily mean such projects will offer the greatest potential to provide opportunities for the rural poor. In fact, much of the literature on 'traditional' (i.e. without carbon finance) approaches to projects such as community forestry, efficient cook stoves and household and community biogas energy generation, indicates that opportunities for the poor are often limited. The reasons for this include factors such as elite capture, high input and implementation costs, failure to apply good practice, culturally inappropriate technologies, poor targeting of subsidies, poor maintenance, etc. (Schreckenber and Luttrell, 2009; Barnes et al., 1994; IOB, 2008; Geoghegan et al., 2008).

The literature on payments for environmental services (PES) indicates that whilst the PES approach 'was conceptualized and undertaken as a mechanism to improve the efficiency of natural resource management, and not as a mechanism for poverty reduction' (Pagiola et al., 2005) it can provide a number of livelihood benefits (Landell-Mills and Porras, 2002; Grieg-Gran et al., 2005; Pagiola et al., 2005; Porras et al., 2008; Wunder, 2008), including: increased income above opportunity costs (Wunder et al., 2008), increased tenure security (Grieg-Gran et al., 2005; Asquith et

al., 2008; Engel and Palmer, 2008) and increased social capital (Grieg-Gran et al., 2005). However, high transaction costs can be a barrier to participation (Grieg-Gran et al., 2005; Pagiola et al., 2008) and indirect effects can occur such as reduced quality of roads and water, increased prices of local produce (Grieg-Gran et al., 2005). Relatively little is known about the impacts on non-participants (Tacconi et al., 2009).

There has certainly been much more focus on energy and forestry projects in the literature on the developmental impacts of carbon offset projects, but this may be a function of the interests involved and the approach taken to defining opportunities for the poor. Many of the actors involved in the markets are interested in promoting small-scale and 'intermediate' technologies. Terms such as 'co-benefits' and 'community benefits' tend to be poorly defined (Peskett and Iwata, 2007), and there is no standardised approach to measuring benefits. Aside from a few studies investigating the broader sustainable development impacts of the CDM (see for example Olsen, 2007; Schneider, 2007; Cosbey et al., 2006), the focus is generally on very localised impacts on individual and group participants rather than broader measures such as value added or contributions to country growth (Peskett et al., 2008b). These factors mean that there is far less information on, for example, the developmental impacts of larger-scale projects or in terms of broader impact measures (e.g., contribution of investments in carbon markets to economic growth).

Overall, there are still large gaps in the evidence base surrounding carbon offset projects and the opportunities that they may offer. The scoping report prepared for this study found the following gaps in our current understanding:

1. how different project structures change the opportunities for the rural poor (e.g., commercial vs. NGO, variations in project finance mechanisms, governance, etc.);
2. how significant some of the reported benefits are, specifically around income and employment generation and cost savings, and how this compares to the status quo;
3. whether the 'poor' are receiving the benefits, which more broadly emphasises a lack of understanding of who constitutes the poor, including a lack of clear and simple frameworks and associated criteria to assess such issues;
4. what, if any, are the distinctions between regulated and voluntary market projects in terms of the development co-benefits for the rural poor;
5. how poor rural communities themselves view projects;
6. how carbon offset projects differ from traditional foreign direct investment projects, or how carbon offset projects which emphasise social co-benefits differ from traditional integrated conservation and development projects. A broader theme is the lack of understanding of how significant the carbon component is for delivering development co-benefits in these projects;
7. whether such projects help foster broader sustainable economic growth.

The current report gives particular insights into gaps one to three and gap six.

3.4 Global distribution of forestry and bioenergy projects

Based on the findings presented above, a sub-set of technology types in the forestry and bioenergy categories has been selected as the focus of this report. These are listed in Table 3.

Type	Sub-type	Description
Forestry projects	<i>Tree planting by individuals</i>	In these projects carbon offsets are generated from tree planting activities on private land. Credits are purchased from land owners, who are usually single

		households.
	<i>Reforestation through community action</i>	In these projects carbon offsets are generated from tree planting activities on communal lands. Credits are purchased from land owners, who are usually community groups with internal agreements governing the distribution of benefits.
Biomass energy projects	<i>Domestic biogas digesters</i>	In these projects, emissions reductions are generated by replacement of unsustainably harvested wood fuel for cooking with biogas from animal manure. The technology is funded through the sale of carbon credits by the project implementers.
	<i>Localised biomass power generation</i>	In these projects, agricultural residues are used to generate heat that is converted to electricity through combustion and boiling. This displaces the use of coal and other non-renewable fuels for electricity production. The technology is funded through the sale of carbon credits by the project implementers.. Farmers can be involved through the biomass supply chain.

Table 3: Types of carbon offset projects looked at in this report

There is very little data on the numbers of such projects globally, given the disaggregated nature of the carbon markets and a lack of disaggregation in existing statistics:

Biogas projects: There are around 516 (11.6%) CDM biogas projects in the project pipeline (Blank et al., 2009). Most of these projects are being implemented in Thailand, India, China, Malaysia and the Philippines. Most of the registered projects are on commercial livestock farms and the emissions reductions take place where there are changes in manure management and where fuel switching occurs for energy generation. There are about seven CDM biogas projects using domestic biogas production for home use (information from CD4CDM 2010).

Biomass energy from agricultural residues: There are 344 biomass energy generation projects in the CDM pipeline using agricultural residues. These are often implemented in industries such as rice mills, where the fuel comes from on site sources and the energy generated is used on site. There are therefore few direct benefits beyond those experienced by the implementers themselves. Some projects adopt more innovative supply chains in which farmers are involved in providing biomass for power generation and where they may also benefit from electricity produced for the grid. It is not possible to determine how many such projects exist, though the numbers are likely to be extremely low.

Clean cook stoves: Efficient cooking stoves which reduce fuel wood consumption by increased efficiency in burning have been promoted by many donors and governments over the last 30 years for their dual environmental and social benefits. These technologies are now beginning to be funded through the carbon offset markets, though they have until recently been restricted to the voluntary carbon markets. There are two methodologies approved under the CDM. As of January 2010 there were 4 CDM cook stove projects in the pipeline and 9 voluntary projects under the Gold Standard. One and three of these project types, respectively, had been registered (Blunck et al., 2010)⁵. These have not been included in this study because

⁵ The UNFCCC EB approved two small-scale methodologies with effect of 1 February 2008, AMS I.E: Switch from Non-Renewable Biomass for Thermal Applications by the User and AMS II.G: Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass. AMS I.E cannot be used by

of their restricted scope at the time of fieldwork (summer 2009), the fact that the only project in Uganda is being implemented in an urban area, and there is a lack of such projects in India linked with carbon finance.

Forestry projects: There are currently 50 forestry projects in the CDM project pipeline. 22 of these are 'small-scale' projects, which are more likely to be implemented over smaller geographic areas and have more community involvement according to rules under the Kyoto Protocol (CDM Rulebook 2009). However, it is not possible to determine the exact numbers of community forestry projects or those working with farmers on their private land. 9% of the transaction volume in the voluntary markets was from forestry projects. Of the three major types of forest carbon projects, AR projects transacted the highest volume of credits (59%), followed by REDD at 24%, and finally Integrated Forest Management at 8% (Hamilton et al., 2009).

These figures illustrate that these project types that are commonly associated with greater benefits for the rural poor are still relatively scarce. At a macro level it can therefore be concluded that the opportunities for the rural poor are quite limited. However, market projections (Capoor and Ambrosi, 2009 and Hamilton et al., 2009) indicate that the markets are likely to continue growing, despite recent setbacks related to the global financial crisis and continued uncertainties about the future of the UNFCCC. Current drafts of US climate policy foresee a large role for international forest based carbon offsets, which could result in large demand for carbon credits from REDD and AR.

stove projects disseminating efficient biomass cooking stoves but only applies for projects introducing 100% renewable energy and zero emission technologies such as solar or biogas cookers (Blunck et al. 2010).

4 CASE STUDIES: OVERVIEW

This chapter briefly describes the six case studies that were the focus of this project. A full report on each case study is available in appendices 1 and 2.

4.1 *Forestry projects in Uganda*

4.1.1 Nile Basin Reforestation Project

The Uganda Nile Basin Reforestation Project consists of five small-scale Clean Development Mechanism (CDM) projects being implemented in the Rwoho Forest Reserve in South Western Uganda. It spans three districts (Mbarara, Ntungamo and Isingiro) near to the Rwandan border. Around 50% of the 9100 ha reserve is available for reforestation, mainly with pine trees (*Pinus caribaea* 75%), but there have also been attempts to plant the indigenous trees *Maesopsis eminii* (20%) and *Prunus africana* (5%). The total emission reductions from all five projects are expected to be approximately 260,000 tCO₂e by 2017. It is being implemented by the National Forest Authority (NFA) with carbon finance provided by the Biocarbon Fund – an initiative of the World Bank and International Bank for Reconstruction and Development (IBRD). The upfront costs are being provided by the NFA. Although planting has occurred in most project sites, only one of the five projects has so far been registered as a CDM project.

Because the project is being exclusively implemented on NFA land, the main relationship with local communities is through the impacts of changing land uses on local livelihoods (e.g. access to reserve lands and employment on the plantation) and through more formal Collaborative Forest Management (CFM) Agreements with local community associations. In one of the five projects, a CFM agreement has been signed between the NFA and the Rwoho Environmental Conservation and Protection Association (RECPA). This agreement gives RECPA members limited access rights to a 200 ha area of the forest reserve and so far a 60 ha area within this has been allocated for them to manage as part of the carbon project. RECPA is provided with free seedlings and is entitled to the revenues from timber and to the carbon revenues from the area of the carbon project that it manages. There is no formal contract between RECPA and the NFA beyond the CFM agreement, but it is expected that carbon revenues will be paid by the NFA into the RECPA bank account. RECPA has its own governance structure, which includes an internal 'carbon group' currently consisting of 73 members. Membership of the carbon group is contingent upon buying up to six shares to be part of the scheme. These shares help to cover maintenance and planting costs. Carbon revenues will then be divided depending on the number of shares, with a small proportion going to the wider RECPA group.

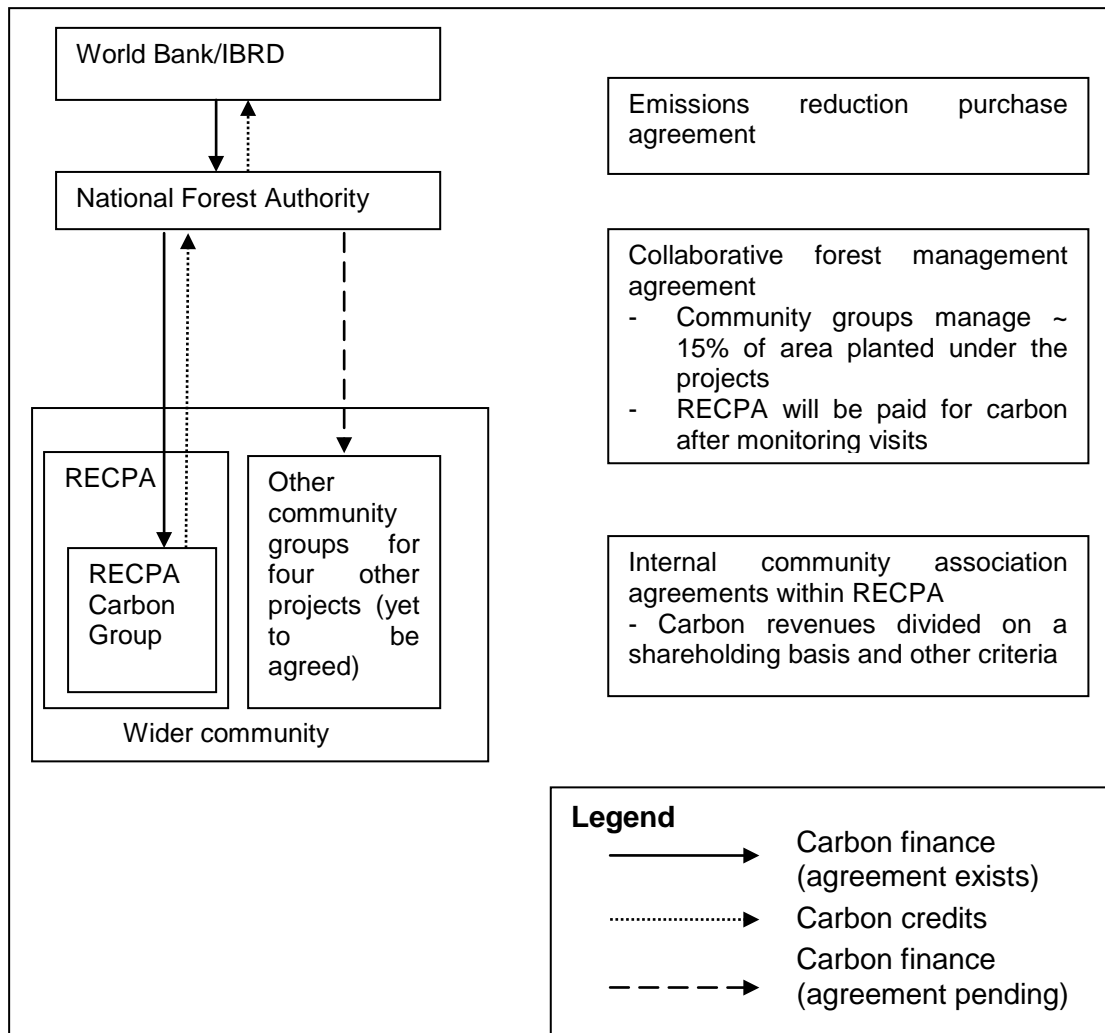


Figure 2: Flow of carbon finance and carbon credits⁶ between institutions in the Nile Basin Reforestation Project, Uganda

4.1.2 Kikonda project

The Kikonda forest reserve project is a commercial plantation in central Uganda being implemented by German-based company, Global-Woods AG (through a local subsidiary called 'Sustainable Use of Biomass' – SUB⁷) and certified by the CarbonFix standard. 1000 ha of trees have so far been planted on a National Forest Authority owned Central Forest Reserve totalling 12186 ha in central Uganda. 200,000 tCO₂ are estimated to have been sequestered within the first 1000 ha that have been validated. The main opportunities for communities surrounding the plantation are employment, support for private tree planting activities, including through a community group called KiCoFa, and direct payments for carbon through newly formed collaborative forest management associations.

SUB is the originator of carbon credits from the plantation, being responsible for all plantation activities (though carried out within the rules specified by the National

⁶ Note that the term 'carbon credits' is used here for all projects in a general sense to refer to the transfer of certified emissions reductions/removals resulting from activities. The transfer of actual certificates or formal credits (e.g. CERs transferred in CDM projects) may occur between fewer parties. For example, in this project, it is only the NFA that has a contract with the World Bank to 'sell' CERs, although a proportion of what they sell will originate from activities implemented on community managed land and governed by a separate agreement between the NFA and communities. Specific distinctions are made in the text where necessary.

⁷ Revision August 2010: Following a re-structuring of the company, the subsidiary was closed down in early 2010. global-woods AG remains active through its branch office in Uganda and has contracted out most field work to a number of Ugandan forest service enterprises.

Forest Authority). They can be sold directly to buyers, through brokers or directly online. Carbon payments to communities are being managed through two different systems, though first payments have yet to be made:

1. Contracts between SUB and individual or institutional (e.g. schools and churches) members of Kicofa who are planting trees on their own land;
2. Contracts between SUB and community groups who are planting trees on a 100 metre wide perimeter strip of reserve land.

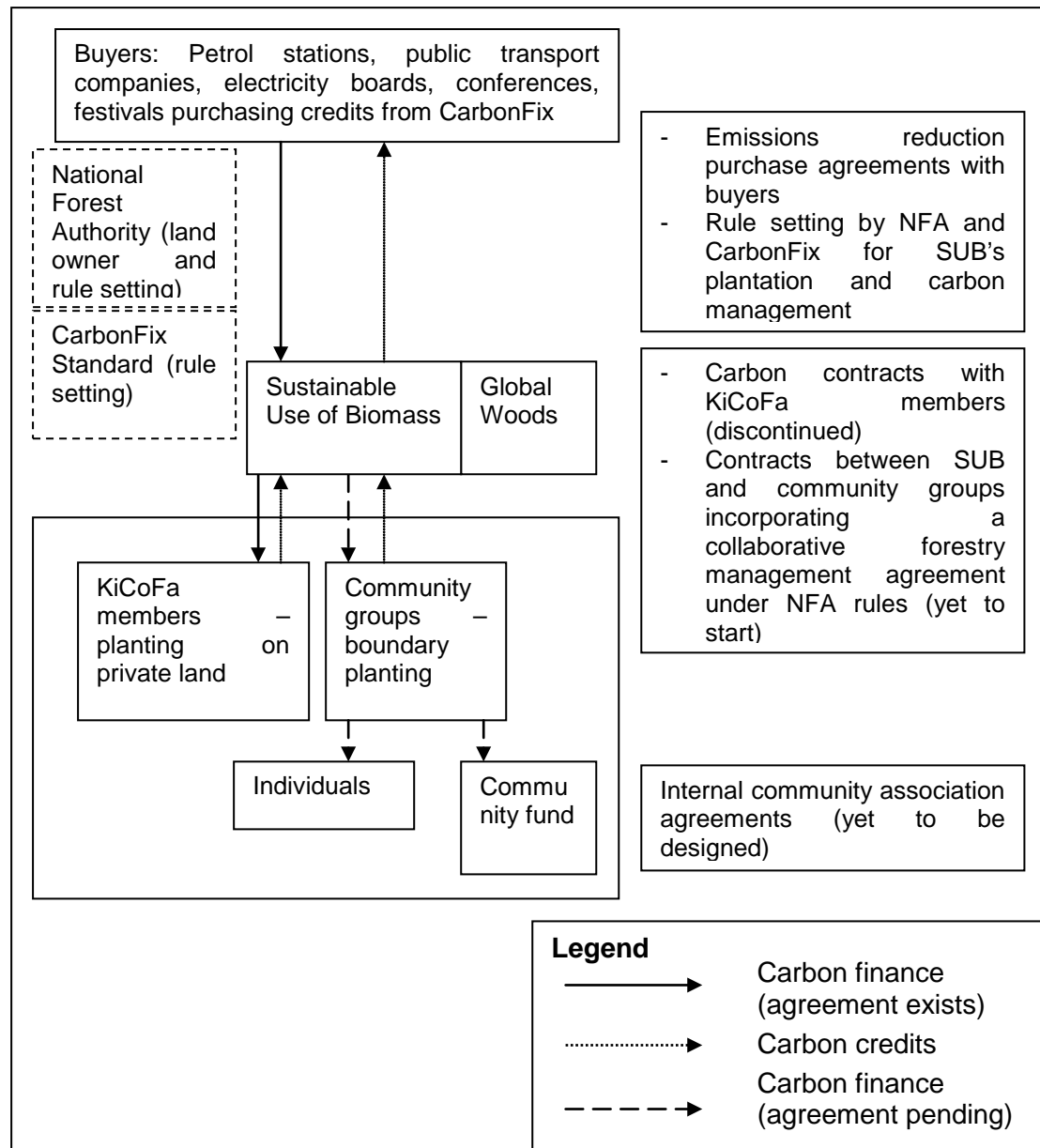


Figure 3: Flow of carbon finance and carbon credits between institutions in the Kikonda Project, Uganda

4.1.3 Plan Vivo project

The Plan Vivo carbon offset project⁸ uses carbon finance to fund the planting of indigenous trees by producers on their own land with explicit objectives of poverty reduction and environmental protection. The project spans three districts in Western Uganda and is managed by ECOTRUST, an environmental NGO based in Kampala.

⁸ This is formally called the 'Trees for Global Benefit' project, implemented in accordance with the Plan Vivo system. It is referred to here as the 'Plan Vivo' project in accordance with much of the project documentation.

This case study focuses on project activities in Bushenyi District. The Plan Vivo project grew out of an existing relationship between ECOTRUST and the Biteriko Women’s Group (BWIDO) which was originally started in the late nineties in order to create a savings and credit scheme for women implementing projects such as clean cook stove dissemination, goat breeding and eucalyptus planting. The carbon project began in 2003 with significant external support from donors and NGOs. A total of 345 producers have registered sale agreements since 2003 and the project is expanding rapidly – 207 producers were allocated sale agreements in 2008. The project also expanded to Hoima and Masindi Districts in 2007 and is now planning to extend to other areas of Uganda.

Under the project each participant has to implement the ‘Plan Vivo’ system for tree planting which consists of a seven step cycle for generating Verified Emissions Reduction (VER) carbon credits. Following introduction to the project by local ECOTRUST volunteers, producers develop simple plans of their land holdings detailing current uses and plans for future management schemes defined in the Plan Vivo system. These plans are evaluated and if they meet criteria relating to land ownership, land size and access to a bank account, farmers are registered with ECOTRUST and become eligible for carbon payments based on the numbers and types of trees that they are planning to grow. ECOTRUST acts as an intermediary between carbon buyers and producers, managing the ‘Carbon Fund’ that receives payments from buyers and paying producers that have registered Plan Vivos. It makes payments to farmers in five instalments over a ten year period, though these are contingent on the growth rates of trees and high survival rates. ECOTRUST carries out regular monitoring of each Plan Vivo through a group of volunteer local coordinators who visit sites to count trees and monitor growth.

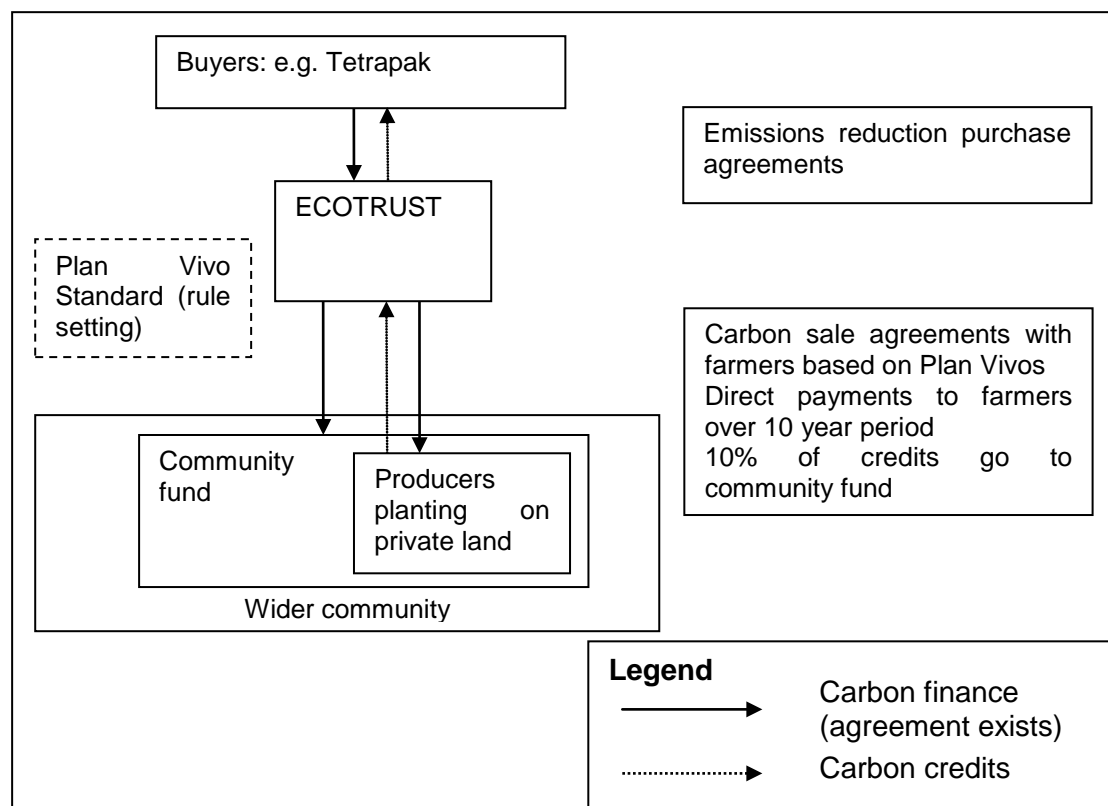


Figure 4: Flow of carbon finance and carbon credits between institutions in the Plan Vivo Project, Uganda

4.2 Bioenergy projects in India

4.2.1 Bagepalli biogas project

The Bagepalli Biogas project is a Gold Standard CDM project implementing 5,500 household biogas digester units in the Kolar District of Karnataka State, India. The Gold Standard exists to assure carbon buyers that the project is making greater contributions to environmental and social sustainability than standard CDM projects. Each household uses the dung of its cattle to feed the digester to produce biogas for cooking with the aim of replacing inefficient wood-fired stoves with renewable and efficient biogas stoves. Greenhouse gas emissions are reduced through reductions in the use of unsustainably harvested and calorifically inefficient biomass for cooking and fugitive emissions from cow manure. 19,800 tCO₂e per annum are expected to be reduced through the project.

The project is being managed and implemented by the Agricultural Development and Training Society (ADATS), a well established local NGO which operates through village level institutions called 'Coolie Sangha Units' (CSUs). The CSUs aim to help the poorest members of communities and particularly women by providing benefits to the communities either through direct social services (e.g. women's healthcare, education, etc.) or through encouraging the government to act on their commitments (the organisation now has significant political presence both locally and nationally) in return for a small membership charge. It is governed through democratic systems within the membership base and villagers are represented through regular meetings for all members and separate meetings for women members. There are currently around 500 active village level Coolie Sangha Units involving around 14,000 families.

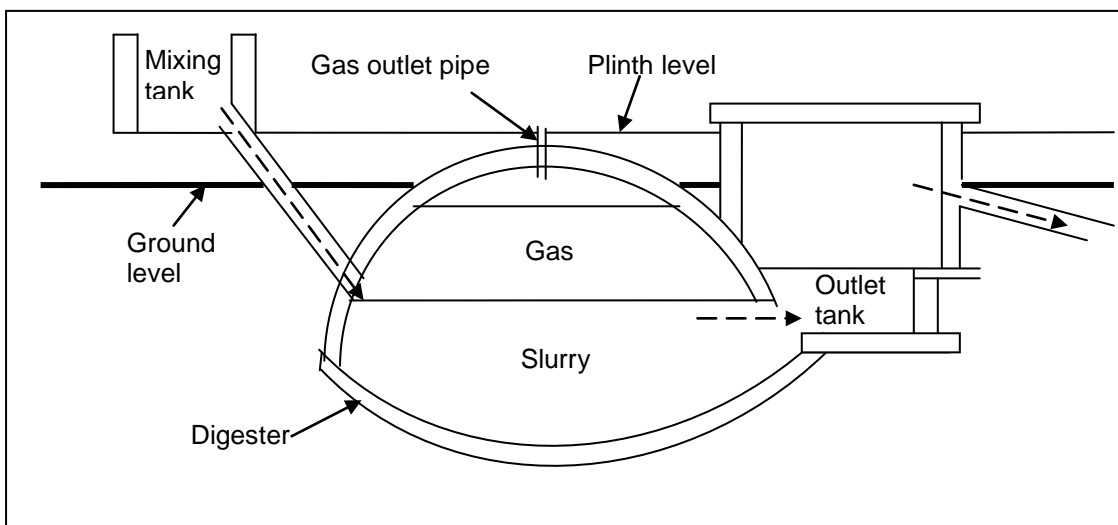


Figure 5: Components of the Deenbandhu Biogas Plant.

Source: <http://unesdoc.unesco.org/images/0015/001587/158792EB.pdf>

ADATS has been responsible for developing the carbon project along with the investor, Velcan Energy, but the Coolie Sangha Units have been instrumental in identifying sites and assessing eligibility requirements. Each CSU has a team working with the biogas units, which is involved in a rigorous monitoring system coordinated by ADATS. Carbon finance has been used to cover the upfront costs of the units and maintenance costs over the first seven years of the project. In subsequent crediting periods carbon payments will be made directly to households.

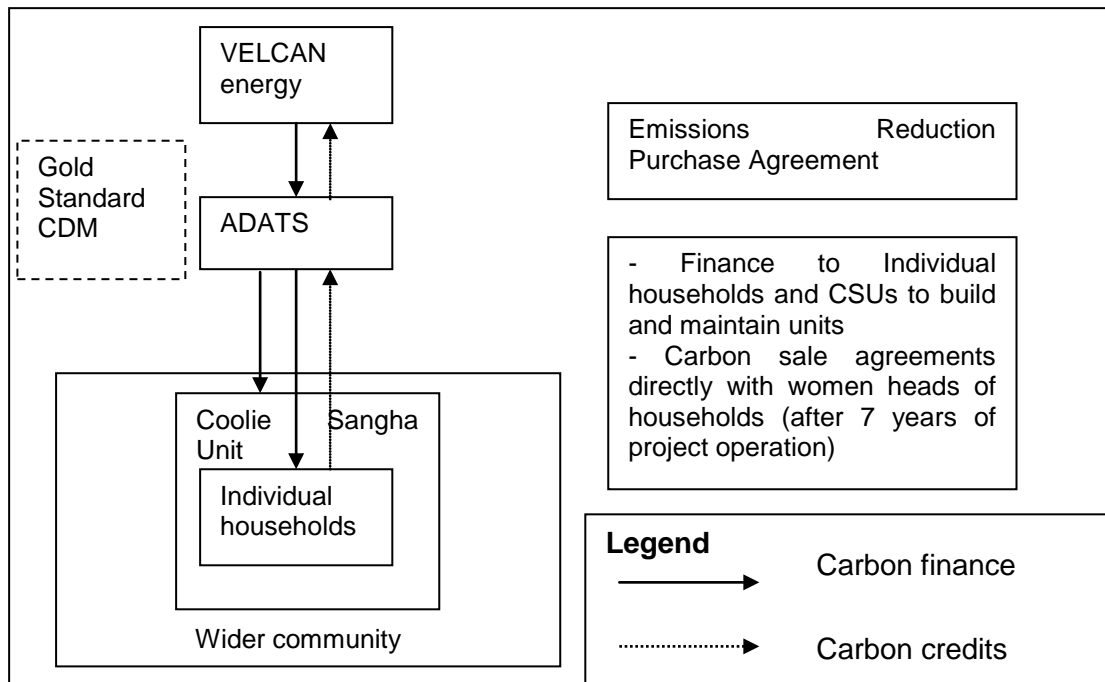


Figure 6: Flow of carbon finance and carbon credits between institutions in the Bagepalli biogas project, India

4.2.2 SKG Sangha Hassan Composite Vermicompost Biogas Project

The Hassan Composite Vermicompost Biogas Project is a Voluntary Gold Standard project which has implemented 500 household biogas digesters and vermicompost units in the Hassan District of Karnataka State, India. The aim of the project is to improve the living conditions of rural Hassan households, while simultaneously reducing pressure on forests and reducing GHG emissions. The technology used for the biogas digesters is the standard Deenbandhu Model, almost identical to that being implemented in the Bagepalli project. However, the vermicompost unit is an additional feature which is essentially a raised concrete tank that is used for making and storing compost. The project is being managed and implemented by SKG Sangha – an NGO founded in 1993 and implementing similar projects across Karnataka. They are working with a French not-for-profit organisation called Good Planet which has undertaken most of the design of the carbon project. Implementation is being carried out by the local SKG Sangha office, but Good Planet makes regular monitoring visits from France.

The project is micro-scale with assessed project emission reductions of 2,668 tCO₂e per year. Carbon credits from the project are sold through the French carbon offsetting organisation, Action Carbone, which is an initiative of Good Planet. The emissions reduction purchase agreement with SKG Sangha is for the sale of carbon credits from the project over a five year period, although the project duration (the number of years that the project must be maintained) is ten years. Finance has been provided to SKG Sangha upfront to cover 75% of construction and maintenance costs over the period, with the remaining 25% covered by the households. No carbon payments are made directly to households.

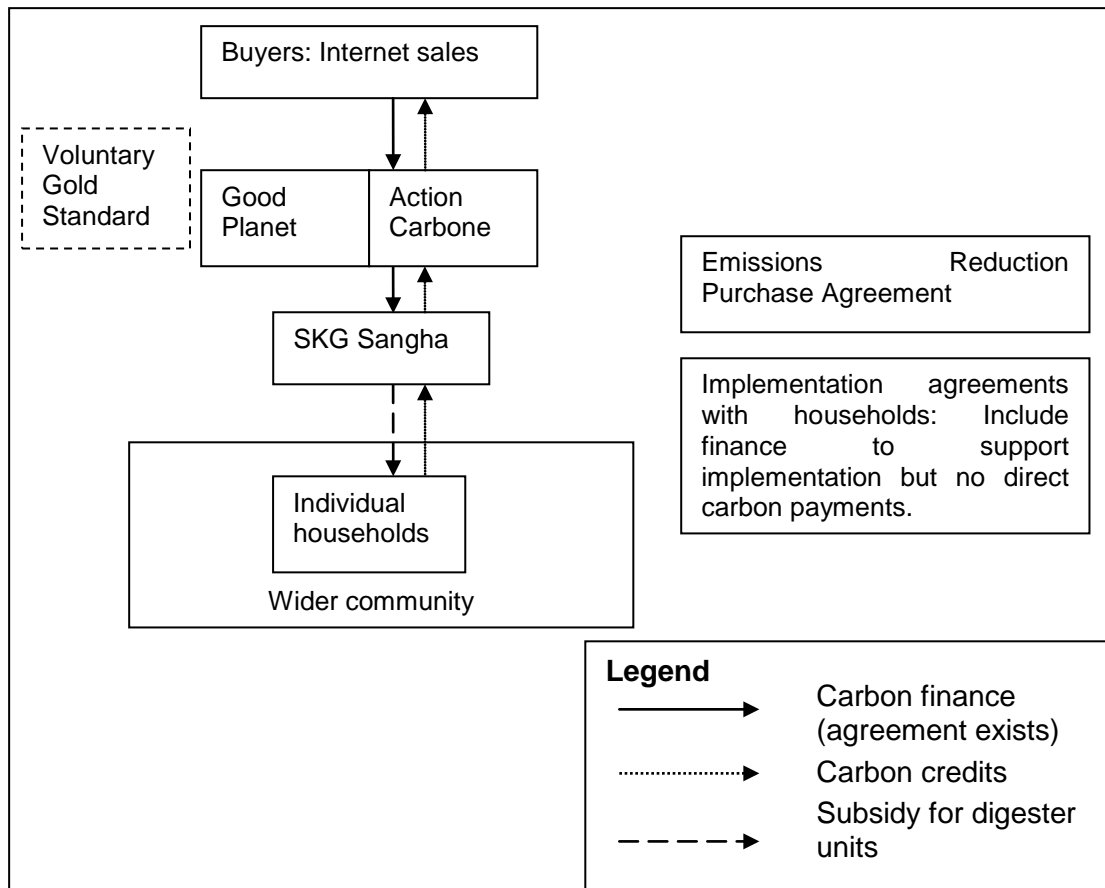


Figure 7: Flow of carbon finance and carbon credits between institutions in the SKG Sangha Hassan Composite Vermicompost project, India

4.2.3 Malavalli 4.5MW power plant

The Malavalli 4.5MW power plant is a Gold Standard CDM-registered carbon offset project located in rural Mandya District, 125km from Bangalore in Southern India. The plant generates electricity by burning crop residues from surrounding farms, avoiding greenhouse gas emissions from fossil fuels (usually coal) that would have been used to provide electricity in such an area. Approximately 20,000 tCO₂e per annum are calculated to be avoided by the plant.

Electricity is generated through the 'Rankine' cycle, in which the heat from burning biomass is turned into steam, which in turn drives a steam turbine and an electric generator. Approximately 140 tons of biomass are required every day (including sugarcane trash, coconut fronds and woody branches and toppings which are sourced from within a 150km radius). The electricity is delivered to a local electricity substation and distributed through the grid to around 40 villages in the vicinity of the plant. Benefits to local communities arise from both the electricity delivered and a new supply chain that has been established to deliver agro-residues to the plant. This includes vendors who are contracted by the plant to source biomass of suitable quality; labourers who work for the vendors, usually in gangs of up to six people; and farmers who supply agro-residues from their fields. An important feature of the project is a not-for-profit company called 'Grameena Abhivrudhi Mandali' (GAM) which has been established to help manage electricity distribution, incorporate local development goals into the running of the plant and raise awareness about issues relating to cropping and energy use in villages.

Carbon finance for the project has been generated through sales of carbon credits from the Malavalli power plant, some of which have been sold through South Pole Carbon Asset Management Ltd. and some through a not-for-profit company called

'Myclimate'. None of the payments for carbon are made directly to project beneficiaries (e.g. those in the supply chain) and there appear to be no formal contractual agreements between farmers and the vendors.

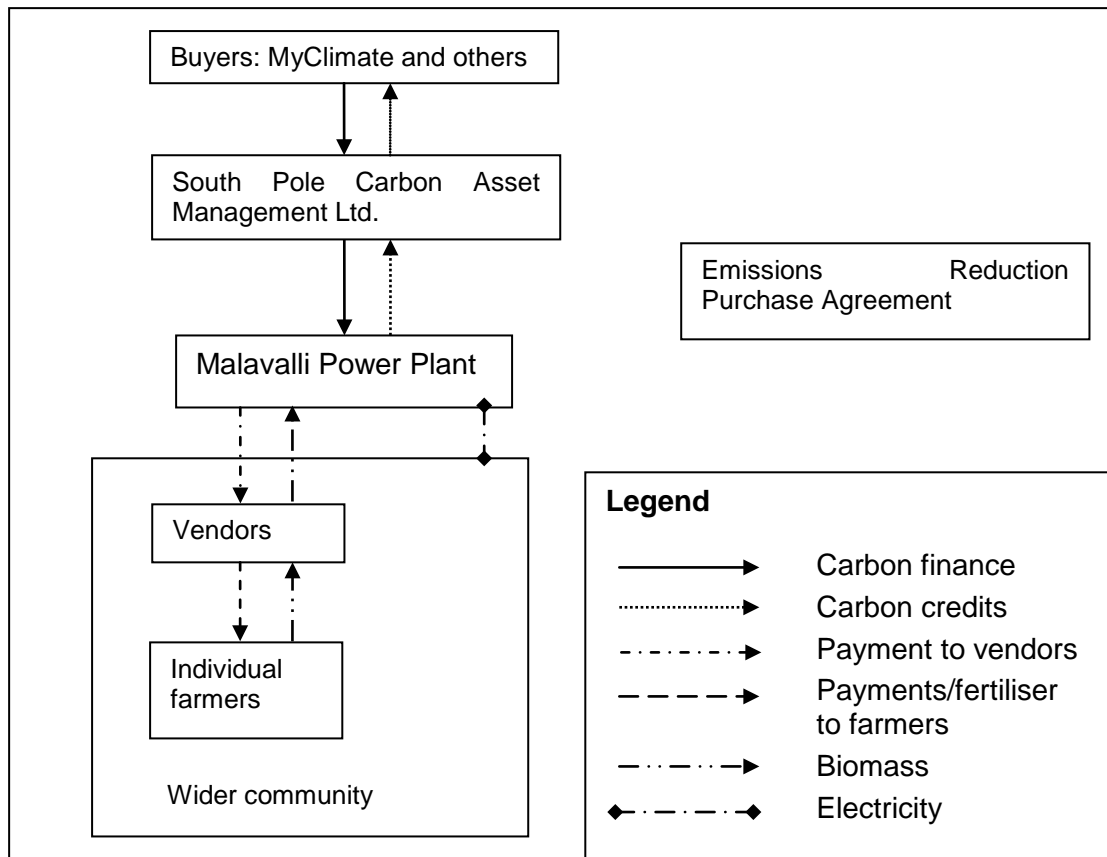


Figure 8: Flow of carbon finance and carbon credits between institutions in the Malavalli 4.5MW power plant project, India

5 FINDINGS FROM CASE STUDIES: FORESTRY PROJECTS

The following sections discuss the implications of the projects studied for the rural poor. Section 5.1 gives a summary of general opportunities, risks and barriers. Section 5.2 discusses opportunities, risks and barriers that relate more specifically to the fact that these are carbon offset projects. Comparison is made with findings from the wider literature where possible.

5.1 General opportunities, risks and barriers

Forestry projects can offer a number of benefits to poor rural communities. These may vary in terms of how projects are structured, their scale and who is implementing them. In the projects reviewed here, there are significant differences between the large-scale Nile Basin and Kikonda projects, and the Plan Vivo project. The former involve plantations on government owned land managed by either the government or the private sector, whilst the latter involves planting by producers on their own land with support from a local NGO. The benefits and risks are outlined in Table 5-B and described fully in the case studies in Appendix 1.

In the plantation projects, the main benefits for participants will be through timber sales (where collaborative forest management (CFM) agreements exist), training, and possibly income from alternative livelihood activities (e.g., *Jatropha* planting). Local communities may benefit significantly from new and relatively stable employment opportunities, forest product use rights in the CFM areas and investments in local infrastructure. However, there are significant costs involved, which may include reduced access to agricultural land, fuelwood, water, and wood for charcoal production. Price inflation of key products and reduced local environmental quality may also be problematic. Similar impacts have been reported in other forestry carbon offset projects, which also highlight that net income and employment can decrease in project implementation (Grieg-Gran et al., 2005; Smith and Scherr, 2002; Asquith et al., 2002).

The nature of agreements between the government/company and community groups appears to be a key determining factor in the extent of these benefits and risks. In both projects the Collaborative Forest Management agreements are key to ensuring that communities are not prevented from entering the plantations altogether. How groups have been established and their structure also appears to be a key determinant of benefits/risks. For example, in one of its five sites, the Nile Basin project is working with a well established community association (RECPA) which is independent of the National Forest Authority. Eligibility requirements for joining RECPA may preclude participation by some community members. The fact that the association will benefit from timber, carbon and the CFM arrangement, whilst the wider community will only benefit from the CFM arrangement means that inequality is likely to be increased. Similar issues arise in the Kikonda project, though these may be exacerbated by the prominent role of the company in group formation.

The Plan Vivo project offers significant non-carbon related benefits to participants in terms of future timber sales and training. They could face some risks in terms of high input costs and slow returns. The wider community may also benefit through improved environmental quality. However, eligibility requirements to participate appear to prevent poorer community members from participating and further risks may result from land concentration. The existence of capable community organisations with strong leadership as well as clear rules surrounding how the project is implemented (e.g., allowing agroforestry and careful site selection) are key factors in enhancing project benefits/reducing risks. This is broadly in line with the wider literature on community forestry (Pagdee et al., 2006).

Project	Explicit targeting of the poorest	Investment required by hh/ group	Group membership	Household or group returns	Benefits to the community (beyond participants)	Possible costs
Nile Basin Reforestation project	No, but Biocarbon Fund has a 'poverty alleviation' requirement	<ul style="list-style-type: none"> Labour for planting and management Paying forest guard 	Households pay 10,000UGX to join, plus an annual subscription of 5,000UGX. Membership of carbon group is 100,000UGX for a share (up to a maximum of 6 shares/person)	<ul style="list-style-type: none"> Income from timber sales Free seedlings for group Training in tree-planting Income from carbon sales (up to \$78 per share/yr for first 10 years) Potential wider benefits from group membership 	<ul style="list-style-type: none"> Increased and stable employment opportunities in long term (~US\$1 per day) Usage rights for CFM areas Possible savings and credit support related to carbon for wider community group Greater availability of wood products in the future 	<ul style="list-style-type: none"> Loss of (illegal) access to agricultural and grazing land Loss of access to water Loss of fuelwood supply Competition for labour Possible price inflation of milk and beef (350%) Low understanding of possible carbon income – could result in low returns if many shares are sold
Kikonda Forest Reserve	No	<ul style="list-style-type: none"> Labour for planting and management 	Requirement to own land (no size limits set)	<ul style="list-style-type: none"> Income from timber sales Training in tree planting and support from the forestry company Free seedlings for group members Income from carbon sales (for new CFM carbon arrangement, not original planting on private land scheme) Possible returns from biodiesel sales from experimental individual Jatropha plantations 	<ul style="list-style-type: none"> Job creation for plantation labour (though most are external) Support for local school teacher Possible carbon income (10% from CFM areas) Better environmental protection compared with government plantations Greater availability of wood products in the future 	<ul style="list-style-type: none"> Loss of agricultural and grazing land Loss of access to water Loss of fuelwood supply Competition for labour Community group formed by company – may be transient Erosion on steep slopes Charcoal producers lose income in long term Problematic land tenure means the private planting carbon scheme will not receive carbon payments
Plan Vivo (Trees for Global Benefit)	No	<ul style="list-style-type: none"> Labour for planting and management Purchasing seedlings Replacing trees if numbers drop below 85% of original 	<ul style="list-style-type: none"> 5000UGX fee to join, though this can be paid after receipt of the first carbon payment Sufficient land A bank account Assurance of customary land title by the local village chairperson 	<ul style="list-style-type: none"> Future income from sale of high value indigenous hardwoods Sales from fruit trees and other NTFPs Training in tree-planting, seminars on environmental issues Carbon sales income (average of US\$1000 per household over 10 years) Frontloaded carbon returns support input costs Community carbon fund may support wider activities for participants (10% of carbon sales) 	<ul style="list-style-type: none"> Decreased soil erosion (slope planting) Enhanced biodiversity Nursery development Local coordinator training Greater availability of wood products in the future 	<ul style="list-style-type: none"> Possible increase in crop damage from wild animals Possible land concentration as participants purchase more land Little training and investment in nursery development – could lead to higher tree loss Delayed payments resulting in cash flow problems High input costs due to tree damage (up to 50% of carbon income) Slow returns from indigenous fruit species Upfront carbon sales = delivery risk for ECOTRUST High transaction costs Possible reduction in tree-planting by non-participants

Table 4: Summary of risks and opportunities associated with the three forestry carbon projects. Exchange rate US\$1= 1,906.50 UGX (www.xe.com 29/12/09)

5.2 Opportunities, risks and barriers relating to carbon

There are some opportunities, risks and barriers that relate specifically to features of the projects that make them carbon offset projects. These features include:

- 1. Carbon finance:** In some projects this can increase net income or support project implementation that would otherwise be infeasible. However, benefits may vary depending on factors such as how prices are negotiated, price variation between producers, how payments are scheduled, the standards used, which beneficiaries are targeted and the types of benefits offered.
- 2. Additionality, leakage and permanence:** These factors can affect where projects can be carried out and there may be some risks/barriers for producers in terms of requirements to replace trees if they are lost, inability to participate where land tenure is insecure and the suitability of alternative livelihood activities.
- 3. Monitoring and assessment processes:** Monitoring and assessment processes relating to running and establishing carbon projects can have benefits in terms of improving maintenance and stakeholder consultation. These vary depending on the standards used and they may introduce new barriers in terms of transaction costs.
- 4. Local and national policy environment:** At the local level, lack of coordination between projects and government institutions can increase permanence and leakage risks and may reduce long term capacity development within government. National level policies, for example on ecosystem service rights or collaborative forest management guidelines can also affect the benefits, risks and barriers for the poor.

These issues are considered in more detail below.

5.2.1 Carbon finance

Income from carbon sales and price establishment

The prices paid for carbon vary significantly between projects and they are not easily comparable. This is because the 'product' also varies depending on whether the carbon credits being purchased are permanent or temporary, whether they are purchased upfront or after verification and on the negotiation between buyers and sellers.

In two of the projects reviewed here (carbon prices are not known for the Kikonda project), the net income to producers from carbon is relatively low when compared to other income sources and the value of the timber that they will gain from participating in the projects. Nevertheless, it constitutes an additional income source.

Producers appear to have no role in negotiating the carbon price. In all of the projects, this has been negotiated by the intermediary organisation implementing the project. This is not necessarily a problem (and it may be unreasonable to expect producers and buyers to negotiate directly), but if the terms of contract and price are poorly understood (e.g., as they appear to be in the Nile Basin project), this could result in payments that are much lower than what is required by communities to manage their land in accordance with the contracts. The power of the intermediary organisation and lack of transparency potentially increases vulnerability of producers to unscrupulous practices (though these were not noted in the case studies). The fact that there are so few carbon 'intermediaries' also makes producers vulnerable to the potential collapse of the intermediary they are contracted through.

Price variation between producers is also an issue in the Plan Vivo project where prices can vary between \$4 and \$10 per tonne of carbon, with different producers receiving different prices. The rationale for having such a pricing system (rather than one set price established by ECOTRUST) is that buyers are keen to have direct agreement with individuals. However, it has resulted in some concerns among producers noted in the ECOTRUST Annual Report (2008), which could undermine their confidence in the project and the understanding of carbon as a commodity (though in practice it appears that most farmers are fairly unaware of the differences in price – Fisher pers comm. Nov 2009).

Scheduling of carbon payments

The scheduling of carbon payments is an important factor in tree-planting projects because they tie up land for long periods of time and have significant upfront costs. Payment scheduling is handled differently in the projects. In the Plan Vivo project, payments made over the first ten year period are beneficial to producers because they provide upfront capital for labour and seedlings. The Kikonda project has also sold carbon upfront, benefitting the company, but not as yet the communities involved in the carbon scheme.

However, upfront sales also introduce permanence risks because carbon is being sold before it has been sequestered. These risks are most likely to be borne by the implementing organisations, rather than producers themselves but they could still affect the sustainability of the projects and their benefits in the long run. In the case of the Plan Vivo project, this problem may be particularly acute because all carbon payments are made within the first ten years of the project, whilst the agreements stipulate that trees need to be maintained for 25 years⁹. There is therefore a 15 year period in which the implementing NGO has no financial incentives to apply. The assumptions made by ECOTRUST about the economics may hold true for the current harvest cycle, but are unlikely to be the case for subsequent harvests (Wunder et al., 2008), which would reduce the long term viability of the project as an alternative approach without maintained incentives.

Targeted beneficiaries: individuals versus groups

Carbon finance agreements can be made between different types of actors. At the local level, a key distinction is whether agreements are made between individuals or groups. This could have implications for equity in benefit sharing.

Where agreements are made with individuals, participation is likely to be contingent upon how well networked individuals are, their ability to understand the market and their ability to pay upfront costs, which may lead to elite capture – a common problem in community forestry projects (McDermott and Schreckenberg, 2009; Pagdee et al., 2006). For example, in the Plan Vivo project, priority of allocation of buyers is given to those who have demonstrated commitment by planting after their Plan Vivo has been approved. This would tend to favour wealthier farmers who are able to cover upfront costs associated with the scheme.

Where agreements are made with communities, the community group structure is important. Agreements are usually made with formalised community groups, often defined by a constitution. Key factors that influence how benefits are distributed include:

⁹ See appendix 1 for a discussion of contract length, which appears to have been revised downwards during the project.

- **Recruitment processes for group members:** Existing studies indicate that linking projects into existing and well established community structures is important for project sustainability (Boyd et al., 2007). In the first Nile Basin project to be registered the carbon finance agreement is with a well established group with other shared interests and activities. This does not appear to be the case with other projects that are part of the same bundle and progress at these sites has been much slower. In the Kikonda project, groups have been formed especially for the carbon agreements and management systems, and they appear to be much weaker.
- **Governance structures:** In the Kikonda project, one of the company employees has a major role in running the first and largest group, which is more of a structure for the company to liaise with local residents than a group that represents the interests of the community. Subsequent smaller CFM groups, within which each member has an individual plot of land to be planted, have been set up by the company with people interested in tree-planting rather than with people linked in any spatial, ethnic or other community. While this is a pragmatic approach on the part of the company to achieve its community-planting targets as efficiently as possible, it doesn't necessarily ensure the involvement of and interaction with community members who might be affected by the plantation.
- **Shareholding arrangements:** These can affect the level of benefits for each group member and who can take part. In the Nile Basin project, for example, the carbon agreement has been made with an existing community group, which has established an internal 'carbon group'. Shareholding arrangements have been established and members will receive carbon payments in proportion to their shares. A problem that may arise here is that there is no limit to the number of shares that can be issued, reducing the net benefits for each individual. This problem is compounded by the fact that there is a lack of clarity in the group about the expected level of annual payments that they may receive. More fundamentally, the added cost of joining the carbon group makes it even more unlikely that the poorer members of the community can benefit from the project.

As women bear the brunt of obtaining fuelwood for their families, their involvement in forestry projects is highly desirable. The Plan Vivo project achieves this through its initial work with a women's group, its insistence that a proportion of members of new groups are women, and its inclusion of women amongst its volunteer facilitators. The location of project activities on the homestead and opportunities to plant fruit trees both contribute to attracting women. The plantation projects provide employment, which appears to be taken up by women (as and when household duties allow), but involvement of women within the collaborative forest management groups is low or tokenistic. In one of the groups being established to participate in the Nile Basin project, for example, the requirement that there be some women participants was dealt with by all the male participants simply registering their wives.

One of the issues for both individual and group contracted carbon projects, surrounds how non-participants are involved. In all three projects reviewed here, only a small sub-set of the community benefits directly from the carbon payments, though a small community carbon fund is being established for the Kikonda project and a school teacher is supported, both of which have benefits for the wider community. In the Plan Vivo project there is some indication that participants have increased their landholding size since becoming members. It is not clear whether this is a positive sign of their increased income or that they were reasonably well-off to start with and bought up more land to shift their crops on to. With few provisions for non-participants, such projects could increase inequality and possibly lead to conflict, which would affect their sustainability. In both the individual and community-planting

projects, non-participants queried why they could not be paid for their own tree-planting activities leading to concerns that projects might act as a disincentive to tree-planting that might otherwise take place.

Types of benefits

Carbon payments are not made directly to individuals or groups in some carbon forestry projects. Instead, carbon finance is used by project developers to provide other benefits to communities, such as building schools, health centres or roads. There are other projects in the East Africa region that have adopted this approach (e.g. Green Resources operating in Tanzania and Uganda). Eschewing individual payments in this has been suggested by a number of authors (van Noordwijk et al., 2004; Rosa et al., 2003) but may bring difficulties if trying to integrate strong performance conditions into projects (Wunder, 2005).

5.2.2 **Additionality, leakage and permanence**

The additionality criterion for forestry carbon projects requires that the land without the project would not be forested, which usually means that it is under some form of pressure to keep it without forest. This may include grazing, fuel wood harvesting, burning or certain ecological or climatic factors. Forest definitions and the length of time that land has been without forest is also key to ensuring additionality – if the forest definition allows for significant tree cover before land is classified as forest, there is a danger that a lot of carbon in existing trees could be lost during clearance for plantations. At a macro level, these factors affect where carbon forestry activities can take place. At a micro level, they mean that carbon projects often have to identify alternative livelihood activities for local communities, which could result in risks if these are not well suited to them. Alternatively, as in the Plan Vivo project, additional requirements exist for the minimum size of land holding and planting in areas less suitable for agriculture. Whilst this avoids potential negative impacts, such restrictions could also prevent smaller land owners from participating in the project.

In order to guarantee permanence of carbon sequestration over long periods of time, risks that lands may change hands and management regime need to be carefully controlled. Land tenure security therefore has major implications for establishing carbon projects, which is likely to prevent poor people in many countries from accessing carbon markets. For example, in the Kikonda project, the first initiative to sell carbon from trees grown on the private land of the community group has fallen through because they are tenant farmers. The new arrangements establish carbon payment systems linked to a collaborative forest management agreement for the community to manage trees on the plantation, which is land leased by the company from the government and therefore much more secure.

Permanence also raises issues for communities related to their being liable for the loss of trees. Permanence risks can be managed through a range of different tools:

- **Maintaining a pool of credits that are withheld from sale:** the Plan Vivo project and the Kikonda project both include such 'buffer' pools which enable any losses to be compensated. These are set at 10% and 30% respectively.
- **Requirements for re-planting trees that are lost**
- **Implementing systems to reduce risks** such as fire management plans

The requirement to replace trees (which has already been necessary in all projects reviewed here) and withholding credits from sale reduces net income from carbon for producers. In both the Kikonda project and Nile Basin projects, there could still be significant risks because many of the people living along the plantation boundary are

not members of the carbon group, which gives them little incentive to protect the plantation from fire and grazing. This could obviously affect the sustainability of these projects in the long term.

5.2.3 Monitoring and assessment processes

The accurate quantification of carbon sequestration over long time periods means that carbon forestry projects are required to put in place rigorous monitoring plans to measure the amount of carbon sequestered. This includes pre-assessment in order to project how much carbon may be sequestered, periodic monitoring of tree growth and carbon stocks, and third party verification. There is some evidence that these processes can improve how projects are run, for example by ensuring that better fire management strategies are in place and better records are kept. Quarterly visits by local Plan Vivo coordinators provides farmers with regular advice on their tree crops, particularly important given the absence of any relevant government extension. This could help to improve the sustainability of carbon forestry projects compared with more traditional forestry projects.

Social impact assessment and monitoring requirements vary depending on the standards used. Most carbon standards require that some form of community consultation is carried out which may offer greater opportunities for benefits over more traditional project approaches. However, these processes may not be particularly representative, and other studies have found that these processes are often poorly conducted if at all (May et al., 2004) or can decline in priority as projects progress (Nelson and de Jong, 2003). In the projects reviewed in this study, initial consultation varied from detailed plot-by-plot assessments in the Plan Vivo project to a baseline social impact study in the Kikonda project and a more general stakeholder consultation through a workshop and small survey in the Nile Basin project. There are no requirements for ongoing social impact assessment in the CDM (Peskett and Iwata, 2007). One of the concerns in the Kikonda project is that it is now certified both with CarbonFix and the Climate, Community and Biodiversity Alliance Standard, both of which are supposed to require high standards in terms of analysing and mitigating social impacts of projects (CCBA, 2008). Whilst the risks for the wider community have been documented in the assessments for these standards, the processes for their mitigation appear to have been poorly assessed.

Monitoring and assessment processes result in high upfront and transaction costs for carbon projects (Lipper and Cavatassi, 2003). These can act as a barrier for smaller projects to enter the market (Cacho et al., 2003) and there are concerns that it could increase land concentration (May et al., 2004). In the case of the Plan Vivo project, it relies on volunteer coordinators visiting each plot every three months. This is a very time intensive process which raises the question of whether the approach will be sustainable as it is scaled up. The 'professionalisation' of the carbon markets over time may also raise challenges. Standards are becoming much more rigorous in relation to factors such as the suggested size of credit buffers (which is equal to 10% of credits in the Plan Vivo, but between 5% and 60% in standards such as the Voluntary Carbon Standard, depending on the risk class (VCS, 2007)) and the tree growth data used to determine carbon sequestration volumes (which is limited for many species).

The project standards may help to improve the environmental impact of projects compared with more traditional approaches. This is much greater in the Plan Vivo project because of the requirement to plant indigenous trees on land that was not forested. The requirement to plant on slopes where possible may help with soil erosion. Some concerns have been raised, however, that the increase in forest cover

will lead to an increase in pests such as monkeys, which will increase crop damage in surrounding farms. Both the CDM and CarbonFix standards, whilst allowing plantation development, which is often associated with biodiversity loss and negative environmental impacts (Kanowski et al., 2005; Scholes and Biggs, 2005; Barlow et al., 2007), also have specific requirements in terms of remaining forested areas on the plantations. Any areas that are classed as forest have to be maintained and boundaries left between them and the plantation. The same is true for wetlands and water sources. The increased scrutiny of monitoring processes associated with the carbon project appears to enhance the enforcement of these approaches.

5.2.4 Local and national policy environment

Linkages between projects and local government institutions may affect their sustainability. This could, for example, arise through a lack of coordination with government departments responsible for land adjacent to plantations, as observed in both the Nile Basin and Kikonda projects. Greater coordination could help reduce leakage and permanence risks, for example through promoting zero grazing cattle outside reserves, in order to reduce encroachment and reduce the volume of land needed for grazing. Increased coordination could also help to develop the capacity of local governments to understand carbon projects, which would improve the efficiency of implementation and the wider development of projects.

National government policy also affects project sustainability and opportunities for poor producers. A key issue surrounds legislation on environmental service rights which are usually linked to land ownership. If this lies with the state, then there is a risk that producers will have little negotiating power to claim benefits from carbon and/or a perverse incentive for governments to resist devolving rights to communities and individuals. Thus, the carbon rights in the Nile Basin project lie with the National Forest Authority which only has an informal agreement to share a proportion of the proceeds with the community group. Forest legislation is also a key factor in benefit sharing. For example, collaborative forest management agreements and related implementation guidelines are the basis on which the Nile Basin project interacts with local communities and determines the sharing of carbon benefits. Yet these are considered to be relatively weak instruments in Uganda, having a lifespan of only 10 years and often being poorly implemented (EMPAFORM, 2006).

5.3 Summary

The projects reviewed here indicate that forest carbon finance can offer some new opportunities for rural communities over medium timescales. These mainly arise in terms of new income sources for those who can participate and, if additionality arguments can be believed at the macro scale (i.e. that these projects would not be here were it not for carbon finance), then most of the associated employment opportunities would not exist without carbon finance. Carbon finance appears to have enhanced monitoring and assessment procedures, which may have helped to improve project management, but it is questionable how meaningful the community consultation processes have been in practice.

However, the financial opportunities are not that large in relation to other income sources and there are significant risks surrounding whether they will be realised to the extent projected. There are also significant barriers to participation in all cases, which look to be excluding poorer community members from participating in the projects. The rules surrounding carbon finance appear to introduce new barriers to participation compared with similar development projects financed through more traditional means. They may also raise new risks to intermediary NGOs entering into

long term contracts with buyers. The limited number of beneficiaries within communities means that increased inequality may arise, especially where projects raise significant livelihood risks for those residing near or in plantations (as is the case in both plantation projects).

One of the main determining factors in terms of whether opportunities can occur relates to the nature of agreements between communities and intermediaries/carbon buyers. The models used in these projects differ particularly in relation to whether groups or individuals are the main participants. Where groups are involved, there are concerns about how groups have been formed, how they are governed and the understanding within the group about what they are signing up to. In both of the plantation projects, the managers appear to be developing many of the community aspects through trial and error, drawing little on experience from local and international best practice. This is arguably more of a concern in the Kikonda project, where the company probably has more capacity than the NFA and where additional standards should have enhanced approaches to dealing with social impacts. The Plan Vivo project, whilst participation criteria seem to favour better-off community members, appears to offer the most sustainable approach. This is because it deals with individuals, so the implementers have a good idea of how it is working and participants know more about what they are involved in.

The wider policy and institutional environment has implications in terms of the opportunities that may be realised. Key among these are land and forestry policies, which underpin decisions about where carbon projects can be implemented and how they work with communities; coordination between different government departments and between the private sector and government; and capacity within government. Of course these are certainly not new issues, and are difficult to resolve, but they point to focal areas which may help to increase the opportunities associated with forestry carbon offset projects.

6 FINDINGS FROM CASE STUDIES: BIOENERGY PROJECTS

The following sections discuss the implications of the projects studied for the rural poor. Section 6.1 gives a summary of general opportunities, risks and barriers. Section 6.2 discusses opportunities, risks and barriers that relate more specifically to the fact that these are carbon offset projects. Comparison is made with findings from the wider literature where possible.

6.1 General opportunities, risks and barriers

Bioenergy projects can offer new opportunities for rural producers. In the household biogas projects key benefits relate to reduced time for collecting firewood, improved air quality in the house and improved fertiliser. In the SKG Sangha project, fertiliser sales may also increase household income, although this depends on whether there is a market for this. There are some benefits to the wider community in terms of more sustainable use of forest resources. However, it is unlikely that the poorest members of communities will benefit from biogas projects because of the eligibility requirements to own enough cattle to feed the digesters and in some cases the need to cover a proportion of the upfront costs. This may increase inequality in villages where such projects are implemented. A lack of ongoing maintenance has also led to the failure of many biogas schemes (Reddy, 2004).

A key factor in the implementation of biogas projects appears to be how community institutions and implementing NGOs support participants. In the two projects reviewed here, there are significant differences in the structures that exist. The Bagepalli project has been built around an existing community structure that helps to support participants through monitoring and maintenance, promoting the involvement of women, training of local masons, providing insurance (in the form of help from the community group) and covering the majority of build costs. The SKG Sangha project is implemented by a local NGO, but such structures do not exist. Instead, there is more reliance on external monitoring and maintenance services, less locally sourced labour and less subsidisation. This could affect the sustainability and scalability of the project.

The Malavalli biomass project also provides some benefits for local farmers through the biomass supply chain. The benefits, which include selling biomass and possibly receiving organic fertiliser, are relatively small, but there appear to be few opportunity costs. The requirement to have land and suitable crops may preclude participation by the landless, but there are no eligibility requirements beyond this. There are significant benefits in terms of employment creation for workers at the plant, for vendors to manage the supply chain and for gangs of labour to collect biomass. Income potential for labourers is higher and more stable throughout the year than standard agricultural labour jobs.

There may be some risks relating to opportunity costs if certain feedstocks are used and instability of the biomass supply chain (e.g., due to drought or price increases leading to changes in predominant local crop types) may affect long term sustainability.

These benefits and risks are summarised in Table 5..

Project	Explicit targeting of the poorest	Household participation criteria	Investment required by household or group	Group membership	Household returns	Benefits to the community (beyond participants)	Possible costs
Bagepalli CDM Biogas programme	No	<ul style="list-style-type: none"> • Owning a house • At least 10 ft sq of space for biogas unit • Owning a cow and a calf • Membership of the CSU or agrees to village CSU monitoring biogas units for 21 years 	<ul style="list-style-type: none"> • Labour • CSU membership 	Households pay 2% of their income to be members of a village-level Coolie Sangha Unit (CSU), which works with ADATS NGO.	<ul style="list-style-type: none"> • Efficient stove (reduced smoke, faster cooking) • Less time spent collecting fuelwood • Slurry used as fertiliser leading to crop improvements • CER revenue will run from 7-21 years and may amount to \$100 p.a. • Women benefit directly from carbon sales after 7 years 	<ul style="list-style-type: none"> • Less unsustainable use of fuelwood resources (97% of fuelwood is replaced by biogas) • Job creation and training for 123 local masons • Coolie Sangha model elevates status of women 	<ul style="list-style-type: none"> • Only 17% of hh participate – may lead to increased inequity • Eligibility requirements exclude poorer hh
SKG Biogas and vermicompost units	Small landholders	<ul style="list-style-type: none"> • At least 4 cows • Max land holding of 5 acres • Consuming significant amounts of fuelwood 	<ul style="list-style-type: none"> • 8000 Rupees towards construction 	n/a	<ul style="list-style-type: none"> • Efficient stove, (reduced smoke, faster cooking) • Less time spent collecting fuelwood • Potential incomes from sale of compost and/or improved yields 	<ul style="list-style-type: none"> • Less unsustainable use of local fuelwood resources • Job creation and training for masons (not local) 	<ul style="list-style-type: none"> • Eligibility requirements exclude poorer hh • No market for compost • Lack of representation in stakeholder consultations • External monitoring and assessment – little local skills development • Tokenistic involvement of women • Lack of clarity over agreement with SKG
Malavalli	No	<ul style="list-style-type: none"> • Growing appropriate feedstock 	<ul style="list-style-type: none"> • Harvesting 	n/a	<ul style="list-style-type: none"> • Income from biomass sales (~400 rupees per acre) • Potentially organic fertiliser provision 	<ul style="list-style-type: none"> • Increased employment (450-650 jobs) • Increased income for plant employees • Increased income for labourers (Gang members receive around 150-200 rupees per day and gang leaders 200-250.) • Increased income for vendors (15000-20000 rupees per month) • Improved electricity supply • GAM outreach programme improving electricity usage 	<ul style="list-style-type: none"> • Pressures to source biomass from wider area and other feedstocks, could result in opportunity costs (e.g., rice husks which have other uses are 20% of feedstock) • Trash that is usually burnt is removed from land – possible loss of nutrients (if fertilisers produced by plant are not provided to farmers) • Ad-hoc farmer selection and vendor selection – possible elite capture • Instability of biomass supply could affect long term sustainability and scalability of plant and its benefits

Table 5: Summary of opportunities and risks from relating to the three bioenergy projects. Exchange rate US\$1 = 1INR (www.xe.com 29/12/09)

6.2 Opportunities, risks and barriers relating to carbon

There are some opportunities, risks and barriers that relate specifically to features of the projects that make them carbon offset projects. These features include:

1. **Carbon finance:** In some projects this can increase net income or support project implementation that would otherwise be infeasible. However, benefits may vary depending on factors such as how prices are negotiated, how payments are scheduled, the standards used, which beneficiaries are targeted and the types of benefits offered.
2. **Additionality and permanence:** These factors can affect where projects can be carried out and there may be some risks for producers in terms of pressure to maintain their use of technologies
3. **Monitoring and assessment processes:** Monitoring and assessment processes relating to running and establishing carbon projects can have benefits in terms of improving maintenance and stakeholder consultation. However, they may introduce new barriers in terms of transaction costs. How and by whom such processes are carried out may also affect the equity of benefits and the sustainability and scalability of projects.
4. **Local and national policy environment:** Carbon finance can help to overcome financial barriers for governments. The types of policies at the national and international level can also act as barriers, or help to support projects.

The following sections review these issues in more detail.

6.2.1 Carbon finance

Income from carbon sales and price establishment

Making direct carbon payments to producers involved in energy offset projects appears to be less common than in forestry projects. In the projects studied here, this is only the case with the Bagepalli project. Instead, carbon finance is used to partially or fully cover the costs of the technology. Carbon finance can be significant – in the projects studied here, between 20% (Malavalli project) and 100% (Bagepalli) of building and maintenance costs have been covered by carbon finance. This is enough to make such projects financially feasible.

Carbon prices are very variable between projects, depending partly on the standard used and negotiation between buyers and sellers. Producers implementing the technology have played no role in negotiating carbon prices. The Gold Standard has been used in all three projects and is thought to have had a positive impact on the price¹⁰ and the net income from carbon sales. This indicates that such standards could improve the opportunities for poor rural producers.

Scheduling of carbon payments

In the two biogas projects, upfront finance has been provided by the project investors to cover costs relating to building and maintenance. The actual prices of credits sold through the carbon market are much higher, resulting in profits for the project implementers. This raises questions about what a reasonable level of profit should be

¹⁰ Hanssen and Sundemo (2007) in their study of the Malavalli project, made estimates of potential returns to investment between cases without any carbon finance and those with carbon finance from selling 'Gold Standard' carbon credits. The results range between -8.5% and 20.5%, illustrating the difference that carbon finance can make in such a project.

and how ongoing income from the carbon sales is used. A significant feature of the Bagepalli project is that after the first seven years, income from carbon sales will go directly to the women heads of households with biogas units. This is partly possible because the implementing NGO is well financed through other sources (allowing it to implement rigorous monitoring systems, etc.), but nevertheless, it will result in significant increases in income. In the SKG Sangha project all carbon income is channelled into establishing the project over the first seven years. It is unclear how income from sales beyond this time will be used, though there is talk of expanding the project over a wider area.

Targeted beneficiaries

In the biogas projects, agreements to build biogas units are made between the implementing NGOs and individual households. However, there are some differences in how these relationships are established that could affect the opportunities associated with the projects:

- **Who the agreement is made with:** In both biogas projects reviewed here, agreements are made with the woman head of the household which may enhance equity. However, in the SKG Sangha project this appears to be much more tokenistic – whilst the agreements have been signed by women, there is little evidence for meaningful participation in decision making.
- **Eligibility requirements:** Cow ownership, levels of wood fuel consumption and minimum land requirements for building units all affect the types of households that can participate and mean that poorer members of communities are less likely to be able to participate. Such trends are well documented in other studies (Geoghegan et al., 2008).
- **Proportion of costs covered by households:** In the Bagepalli project, none of the build costs have to be covered by households. In the SKG Sangha project 25% of build costs have to be covered by households. This might enhance ownership over the units, but it has implications for the ability of poorer households to participate.
- **Selection processes:** In addition to the eligibility requirements, who makes the selection is important in order to avoid bias.

6.2.2 **Additionality and permanence**

Additionality requirements impose constraints on where projects are carried out. Biogas digesters, for example, are only additional where there are high levels of unsustainable biomass use and/or high methane emissions from cattle. Projects are therefore more suitable in areas where there is significant pressure on natural resources (e.g., areas with high population density).

Permanence is less of a problem in energy projects (which avoid carbon emissions) than in forestry projects (which sequester carbon from the atmosphere), but investors are still keen to achieve predicted emissions reductions. Risks could arise in terms of the burden of liability that is placed on sellers to use and maintain technologies. In biogas projects, some of the main risks include the failure of the technology (for example, leaks forming in the lining of the digesters) and the loss of fuel (particularly through the death of cows). Provisions for maintenance by the implementing NGOs and cow insurance can help to reduce these risks. Membership of supportive group structures (such as the Coolie Sangha in the Bagepalli project) can also help.

It is not clear what would happen if households voluntarily opted out of using their biogas units, though this seems an unlikely scenario as project participants appear to be happy with their systems. However, such a situation could occur, especially in

areas closer to cities where land price inflation could incentivise farmers to sell their land. This is a risk that has been considered in due diligence procedures for the Bagepalli project but was considered negligible.

In larger projects such as Malavalli, similar pressures to deliver credits could have impacts on local communities and people involved in biomass supply chains. The requirement for continuously supplied high quality biomass has meant sourcing from much further afield and buying in alternative fuels. Fuels such as rice husks (20% of fuel stock) could have opportunity costs, as they are used for milling processes in nearby industries. The vendors may also face some risks as their payments are based on quality control of moisture content in fuels as they are delivered to the plant. This may affect the ability of some farmers to sell their crop residues, but it does not appear to have been an issue to date.

6.2.3 Monitoring and assessment

One of the differences between carbon bioenergy projects and more traditional approaches to bioenergy projects is the monitoring process. Traditionally, biogas projects are often implemented with little follow up monitoring to check whether the digesters are working properly or being used. Because carbon credits are being sold from carbon biogas projects for a set period of time (initially seven years but renewable in the Bagepalli project and ten years in the SKG Sangha project) and they are sold after emissions reductions have occurred, rigorous monitoring systems are required. This is also likely to affect the build quality of the biogas digesters and the provision of maintenance. The same is reported to be true in other domestic bioenergy projects, such as clean cook stoves, which are frequently reported to suffer from a lack of uptake in more traditional projects (Barnes et al., 1994). Of course, such strict monitoring requirements can also pose difficulties for project implementers. For example, a similar CDM biogas programme in Nepal has had problems because the costs of its monitoring systems are inflated by difficulties in negotiating the mountainous terrain (Ram Esteves, pers. comm., 2009). This highlights the problems that highly dispersed projects and topography raise for project implementation.

Social impact assessment procedures are variable between projects and standards. The Gold Standard requires more rigorous impact assessment than standards such as the CDM. It requires that at least two stakeholder consultations are carried out and that data is provided on a number of social sustainability indicators (Peskest and Iwata, 2007). There are concerns relating to how well these processes represent community interests. This is particularly clear in the SKG Sangha project, where initial consultations appear to have been quite ad hoc, with some beneficiaries not having been at the initial stakeholder meetings.

Who carries out monitoring, data processing and storage also has implications for the sustainability of projects, as it affects the development of local skills and therefore the ability to scale up carbon market opportunities. The Bagepalli and SKG projects have very different approaches in this respect. Bagepalli has built advanced monitoring systems and has a team developing further carbon projects. SKG Sangha is much more reliant on the French project developer, which conducted the initial stakeholder consultations, carries out regular monitoring visits, and processes and stores data in France.

There are also some methodological barriers which prevent carbon offset investments in solid fuel efficient cook stoves. The clean development mechanism (CDM) has one methodology that supports clean cook stove dissemination

(AMS.II.G.) but this can be costly and complicated to implement, and returns are only expected around two years into the project (Blunck et al., 2010). This is primarily due to the difficulties in calculating the emissions reductions of the clean stove projects, given that every household is likely to have a different mix of sustainable and unsustainable sources of wood-fuels. Another obstacle is due to the difficulty in measurement of distributed GHG reductions where reductions are made in very numerous small sites.

6.2.4 National and local policy environment

Despite strong potential for investment in bioenergy, Indian national and state-level policies to encourage carbon market investment in this area are weak, and in many cases non-existent. Solar, wind and hydro power are much better subsidised, mainly due to the strength of lobbies on these technologies. The lack of availability of consistent biomass supplies and price fluctuations can also make it difficult to implement bioenergy projects.

There is also weak government capacity to implement biogas programmes. Carbon finance has helped to overcome some of the financial barriers, quality control and monitoring/maintenance barriers, providing opportunities for those participating in the projects, and probably enhancing their longer term sustainability. In the case of the Malavalli project, the involvement of local community governing bodies in the operation of the plant and regular meetings between the plant and surrounding villages may have had some impact on the quality of electricity supply compared to conventional supply systems.

Indian CDM requirements on small-scale methodologies and project boundaries also appear to have an impact on participation. In the Bagepalli project, there are limits on the numbers of biogas units that can be put in place by ADATS, the implementing organisation, which means that they now have to work through other NGOs to expand the scheme. Whilst this could prove beneficial in terms of human capital development within these NGOs, it could decrease efficiency.

One positive development has been India's interest in the 'Programme of Activities' (PoA) under the CDM. Since 2007, the CDM Executive Board has implemented a programmatic approach to the CDM. This reduces GHG emissions through a policy or measure that allows smaller, dispersed project activities to be bundled into one larger programmatic activity that reduces transaction costs associated with many single CDM project activities and also provides flexibility in terms of the number and timing of projects developed under the PoA (Hayashi et al., 2009). India has so far not begun implementing any PoAs dealing with bioenergy, but there is a lot of potential for household based projects, such as stoves and domestic biogas plants, to be promoted through the programmatic approach.

6.3 Summary

Carbon finance is offering opportunities to overcome existing barriers to project implementation. In both the household biogas projects and low density biomass power generation project, there are significant financial barriers which are preventing government, NGO and private sector investment in these technologies. Carbon finance covers a significant proportion of upfront and ongoing costs, especially for the biogas projects.

In general, monitoring systems seem to be improved over more traditional project implementation, at least over the crediting period of projects. However, the quality of monitoring systems differs significantly between projects.

The case studies illustrate how the institutional structure of projects can have major implications in terms of the opportunities offered and their sustainability. Direct payments for carbon appear to be less common in bioenergy projects, though there are large disparities between projects, even of the same type – the Bagepalli project will make large carbon payments directly to participants in the future, whereas in the SKG Sangha project this does not appear to be the case. There are also large differences in the way projects are managed and monitored, with the Bagepalli project centred around a well-established local NGO using advanced monitoring systems and closely connected to local community groups, whilst the SKG Sangha project does not work through groups at the community level and is also much more reliant on international project developers to run the project. In the Malavalli project, the transfer of benefits to communities is structured more like a traditional supply chain. The direct benefits for farmers in terms of payments and fertiliser appear to be relatively small, but the low opportunity costs imply that they are nevertheless additional to other income sources and available to most farmers owning land and growing the right kinds of crops. The institutional relationship between the company, employees, local communities and supply chain actors appears to have been important for the company in terms of ‘de-risking’ the investment and helping to ensure the sustainability of the supply chain. However, it is questionable how scalable this technology could be given the high biomass requirements, which require sourcing from a wide area and very functional supply chain management.

7 CONCLUSIONS

The introduction to this report set out three main questions that have been investigated during the research process:

1. *What are the different approaches to establishing carbon offset projects in the forestry and bioenergy sectors?*
2. *Does the carbon offset aspect of these projects introduce new opportunities or risks for the poor?*
3. *How does carbon finance influence the long-term sustainability of any new opportunities?*

This chapter draws conclusions in relation to these three questions. Comparisons are made between forestry and bioenergy projects, and different project approaches within these categories, where possible. The questions about opportunities use the framework presented in Box 1 for understanding opportunities in terms of: expanded access to financial and material assets; increased security and reduced vulnerability; and empowerment.

1. *What are the different approaches to establishing carbon offset projects in the forestry and bioenergy sectors?*

There is a great diversity of approaches to establishing carbon offset projects. Both forestry projects and bioenergy projects appear to vary between two extremes: small-scale community or individually implemented projects, often with local NGOs acting as the main intermediary, and having a poverty reduction objective; and large-scale, more commercially orientated projects driven by private enterprises. These generalisations mask details which need to be well understood in order to understand the opportunities and risks for communities. Key variables include:

- **The type of technology used to generate carbon offsets.** In the forestry sector the two main approaches are sequestration activities (through tree planting) and carbon stock preservation (through reducing emissions from deforestation), though new land use based offsets (such as soil sequestration in agricultural systems) are emerging. These have obvious implications for the types of land in which projects can be implemented, and hence their implications for the poor. There is great diversity of technology in bioenergy based offsets. Most biomass or biogas technologies are relevant for commercial activities (e.g. energy generation on large farms), with few direct benefits for the poor beyond the potential for employment. There are some exceptions, for example, in the case of the Malavalli power plant where local farmers are employed in the supply chain. The number of bioenergy offset projects available at the household scale currently appears to be limited mainly to biogas digesters and a few solid fuel efficient cook stove projects.
- **Nature of the markets used for trading carbon.** As outlined in chapter 3, there are two main carbon markets (regulated and voluntary) for trading credits from offset projects. The type of market influences the types of technologies that can be used, standards and methodologies applied, and the motivations of buyers vary between markets.
- **Institutions and actors.** There is a diversity of institutions and actors involved in projects, which means that even where projects use similar technologies and trade in the same markets, they can be set up in different ways. At the local level, for example, communities can be involved through group or individual activities, and if groups are involved, there are differences arising from whether these previously existed or have been established for the project. Important differences

also arise at the level of intermediaries. These can differ in type (e.g. whether local NGOs are involved, governments, or both) and number (e.g. buyers may transact with project developers based in developed countries that may partner with companies or NGOs in host countries, introducing many different levels into the system). The types of project developers involved and their motivations are also key variables. Project developers can be private companies, NGOs or developing country governments, and donors (e.g. multilateral banks) are commonly involved. Some projects are established for commercial purposes, and others are non-profit.

- **Local context.** There are differences in country policies relating to carbon trading and the implementation of different project technologies. Country sustainable development criteria vary considerably for the CDM, which affects issues such as the social impact requirements during project preparation. The degree to which the Designated National Authority (DNA) has oversight of project implementation also varies considerably between countries (Boyd, 2007) as do the financial and human resources (UNDP, 2006).

2. Does the carbon offset aspect of these projects introduce new opportunities or risks for the poor?

At a global scale, increasing volumes of carbon finance are being channelled to developing countries. However, there are still few carbon offset projects in the least developed countries meaning that new opportunities for the rural poor are limited. Opportunities are further limited by the fact that few of the projects that are implemented are operational in rural areas and/or implemented in a way in which poor people can participate directly. This is often because they are implemented on large land holdings or applied to large-scale technologies. Forestry projects and certain types of bioenergy projects are considered two of the main carbon offset project types in which the rural poor have the potential to participate directly, but current figures indicate that such projects represent a small proportion of the overall market. There is evidence that the market is growing, so this picture may change. Recent developments on REDD and a reformed CDM in the UNFCCC process may result in a much more rapid expansion of rural offset projects, but there is still much uncertainty about the future of the process following COP15 in Copenhagen. US domestic policy may also result in much greater investment in rural offset projects.

At the local level, among the forestry and bioenergy projects that do exist, the case studies in this report indicate that there are both new opportunities and risks for both participants and non-participants. These are summarised below grouped under the three elements of poverty reduction highlighted by the World Bank (2001).

Expanding financial and material opportunities

The use of carbon finance to support projects has some bearing on whether projects offer new opportunities, barriers and risks for the poor compared to more traditional financing approaches. Carbon finance can contribute to a number of expanded financial and material opportunities:

- **Employment:** All of the projects reviewed are providing employment to varying degrees for both participants and non-participants. These tend to be higher in the forestry projects, where more labour is required. Projects are likely to provide ongoing employment for smaller numbers of people. Offset standards, such as the Gold Standard and CarbonFix can help to ensure that project developers implement specific codes of conduct relating to the quality of employment.
- **Subsidy of technologies:** Carbon finance is helping to subsidise technologies (including tree planting) in all projects, but the extent of subsidy is very variable

between projects. In some projects it covers all upfront and ongoing maintenance costs, whereas in other projects it supports only a small fraction of investment costs for participants.

- **Income from sale of products related to projects:** This is more common in the forestry projects, where income from future timber sales by participants could be substantial. One concern is that in cases where alternative income generating activities are part of projects (e.g., vermicompost units linked to biogas digesters), there is little in the way of assessments as to demand and market access.
- **Income from carbon offset payments:** Carbon offset projects can be a source of direct carbon finance for participants, though this varies considerably between projects. Four out of the six projects reviewed here have arrangements with participants to channel some payments to them based on carbon contracts. Net income appears to be relatively low in most cases compared with annual household income, but further research would be needed to determine exact figures. There are income gains for the wider community (e.g., from community carbon funds) in some cases, but these funds are very low. These findings support earlier work on the value chain of different offset providers, which indicates large differences in the percentage of offset sales going towards project implementation (Kollmuss and Bowell, 2006).
- **Infrastructure improvements:** Carbon finance is contributing to investment in local infrastructure improvements in a limited number of cases. This includes, in one project, support to a local school and in another, improved management of local electricity distribution systems.

The standards and methodologies used for implementing projects can impose constraints on participation. This is because they result in high upfront costs for local project developers and participants; and fundamental principles such as additionality and permanence mean that they are restrictive in terms of the types of activities that can be carried out and the criteria for participation (e.g. uncertain land tenure increases risk of non-permanence in forestry projects).

Increased security and reduced vulnerability

Carbon offset projects can have both positive and negative effects on security and vulnerability. For participants, there are some clear gains in assets such as land, increased time. There is also some evidence in forestry projects that both the trees and the carbon payments can be used as security for loans. However, there is also potential for increased vulnerability, for example through the way that project contracts are established. A lack of flexibility in project contracts, combined with low understanding about the terms of contracts, could result in participants becoming involved in projects where they commit to changing activities but the expected returns never emerge. Given the complexities of carbon offset projects, intermediaries are extremely important in enabling participation and in helping to avoid some of these risks. There are not many such intermediaries about and participants may also be vulnerable to the collapse/bankruptcy/merger of 'their' intermediary. Intermediaries themselves may also become compromised in cases where they enter into delivery contracts for carbon investors – they are then under pressure to ensure that the participants that they manage, deliver emissions reductions or removals even if they have few mechanisms through which they can ensure delivery.

Non-participants may have some small gains in terms of increased security and reduced vulnerability through employment created by projects and potentially through benefits such as investments in community infrastructure and improved local

environment. However, the negative impacts in terms of reduced access to assets (e.g. grazing land) and elite capture may outweigh any benefits, but further cost-benefit analysis would be needed to quantify this. These disparities appear to be greater in forestry projects than in bioenergy projects.

Increased empowerment

Offset projects vary in how they empower the communities involved. There should be scope for increased empowerment related to the standards that are used for project development. These usually require consultations with communities, though their extent and depth varies between standards. In practice it appears that consultation processes are relatively ad hoc and in some cases tokenistic (e.g., in relation to the participation of women), even where projects are certified to additional standards that aim to enhance community benefits. Lack of knowledge among participants, and in some cases intermediaries, about what they are signing up to, appears to be a common issue which may also exacerbate the risks associated with participants investing resources in project participation. The carbon monitoring requirements for projects could act in a positive way to help ensure regular communication between project developers/intermediaries (who may have considerable technical expertise) and participants. However, this is likely to rely on building local capacities for such processes rather than relying on international consultants has been reported in other studies (Minang et al., 2007).

There is great variation between projects depending mainly on how they are structured. At one extreme, projects use elected local coordinators, run regular awareness workshops and integrate carbon offset activities with other development projects. At the other extreme, projects rely on external coordinators, have less regular opportunities for links between participants and intermediaries and operate more in a vacuum. There is clearly scope to improve the processes through which consultations are conducted before projects are implemented and how the quality of consultation is assessed. There is even greater scope for establishing project monitoring and coordination systems that follow best practice in their implementation. Projects could capitalise on their international links to draw on not just national, but international, best practice

In summary, there are new opportunities related to carbon offset projects, but these are relatively small in most cases, and are limited to individual or group participants. Risks to the wider community (particularly for large-scale forestry projects) may outweigh the benefits for participants, but more detailed cost benefit analysis would be needed to support this statement. Participation of poorer community members appears to be limited in most project approaches. This is because they do not have the financial resources to participate or they do not meet other eligibility criteria, such as owning land for tree planting, having secure title, or having livestock to run biogas systems.

Specific targeting of poorer households by projects could help (if they meet eligibility criteria for increasing emissions reductions or removals) and in some projects it could be possible to enhance participation by learning from best practice (e.g., in terms of collaborative forest management approaches that involve poorer community members). There are also promising innovations in carbon markets that could help to enhance participation, such as simplified methodologies, methods for bundling producers into larger projects and using carbon finance to invest in areas that are of benefit to the wider community rather than focussing only on participants. The extent

to which these innovations affect the opportunities for poorer members of communities is not known and would require further research.

3. How does carbon finance influence the long-term sustainability of any new opportunities?

Carbon finance appears to have some influence over the sustainability of new opportunities, enhancing sustainability at least beyond the three or five year timescale that is common for publicly funded projects. Project contracts for energy projects are typically a minimum of seven years and for forestry projects they can be much longer (in this study they range from 25 to 50 years), although agreements with communities may be shorter. New income opportunities for participants appear to be relatively secure over the length of these agreements once projects have been registered and start to trade. More regular and more detailed monitoring and evaluation procedures (particularly to evaluate emissions reductions, but in some cases to evaluate non-carbon benefits/risks) that are required throughout the lifetime of projects, may help to overcome some of the sustainability issues associated with more traditional projects (e.g. lack of maintenance).

As with any market-based system, the long term sustainability of carbon offset markets is not guaranteed. The markets have expanded rapidly over the last four years, but there have also been some large fluctuations in price. These have been due to regulatory problems, such as those surrounding the allocation of emissions allowances that caused the crash of the EU emissions trading scheme in 2006, and wider economic fluctuations, such as the current economic downturn. The failure of the UN climate talks in Copenhagen in December 2009 means that there is continuing uncertainty in the carbon markets, which is likely to affect investments over the next year at least (Reuters, 2009). The security of opportunities may also be affected by the evolution in standards used for carbon offset projects. For example, in the Plan Vivo project, whilst the opportunities appear to be greater than the other forestry projects reviewed, there are questions surrounding whether the approaches used to quantify carbon and reduce non-permanence risks would be sustainable in the long-term or stand up in comparison with other approaches. This could have knock-on effects for those involved.

While carbon finance has some influence over how projects are established and run it does not appear to result in much innovation. This is a concern, given that the ultimate aim of carbon offsetting is to help shift development patterns towards lower carbon pathways. The types of projects and approaches that are attracting finance have been implemented for many years. This may not be an issue where these are well tested. But often these have failed, not because of the technology, but because 'best practice' has not been taken into account. 'Best practice', for example in terms of establishing collaborative forest management approaches, has not been followed in a number of the projects reviewed here. The fact that projects are often driven by external actors may be a contributing factor to this tendency to adopt such a trial and error approach. Paying more attention to best practice would be a good first step in enhancing project opportunities.

A key concern is that many of the factors governing whether carbon offset projects can offer opportunities for poor rural communities are outside the realm of the projects themselves. Local and national policies and legislation may have impacts on the types of projects that can be implemented and the approaches used (e.g. specifying guidelines for collaborative forest management). This is particularly true for forestry projects, in which land tenure security is one of the biggest barriers for

project implementation. Solving such issues in a country such as Uganda could take a long time and ultimately has to be left to politics far removed from carbon offset projects.

Implementation capacity of local and national government departments is another key issue which affects both the oversight of projects and their integration into wider development plans. Lack of involvement of local government is a serious issue as it is the one body that could supposedly be held to account for the poverty-reducing impacts of activities within its jurisdiction. By coordinating carbon and non-carbon activities of a similar kind, negative impacts on non-participants might be avoided. Projects could do more to proactively engage with local government, but significant investment will be required through other channels in order to develop government capacity at different levels.

8 RECOMMENDATIONS

This section presents recommendations for project developers and those involved in market regulation, local intermediary NGOs, donors supporting carbon offset projects and researchers/research funders. These recommendations are based on the findings from the literature review, scoping study and case study experience that have been carried out in the course of the research.

8.1 For project developers and those involved in market regulation (e.g. design of standards)

1. Pay greater attention to existing best practice relating to project links with communities in their design and implementation. This includes, for example:
 - a. Drawing on experience in establishing collaborative forest management systems;
 - b. Working with local organisations to develop skills in running projects and establishing governance systems that ensure independence from project implementers;
 - c. Approaches for conducting rapid social impact assessment and ongoing project monitoring;
 - d. Ensuring transparency with project participants in terms of the potential returns related to carbon and their timescale;
 - e. Consultation processes, particularly with regard to ensuring that the views of women are meaningfully represented in consultation processes.
2. If poverty reduction is a core aim of projects, specific targeting of poorer community members may be required in order to provide opportunities. Alternatively, establishing mechanisms through which whole communities can benefit (e.g. community funds or infrastructure investments) may help to target a wider cross-section of the community.
3. Increased scrutiny by project certifiers as to the social impacts of projects. This may require certifiers to have additional skills in order to assess such impacts and for additional time inputs in the certification process in order to gain an independent understanding of project impacts.
4. Thorough analysis, prior to project implementation, of alternative livelihood approaches that are promoted as part of projects, particularly where these form an important aspect of the overall benefits and may carry risks if they are not successful.
5. Ensure high levels of transparency in the carbon 'value chain' to ensure that communities and intermediaries are clear about who gains how much from carbon and over what timescale.

8.2 For local intermediary NGOs

1. Seek clarity on the terms of contract with buyers and project developers, especially with regards to responsibilities and timescale of delivery of emissions reductions and removals from projects. This should also include clarity on the redress mechanisms if carbon emissions reductions or removals are not delivered.
2. Develop robust monitoring systems with locally stored data in order to track the progress of individual participants and increase local ownership.

3. Work with communities to establish internal benefit sharing arrangements relating to carbon benefits. For example, on the governance of carbon shareholding agreements so that investments and returns are well understood.
4. Use local labour for project implementation (monitoring; training; labour for planting/building) where possible to increase added value for local communities.
5. Be careful of over reliance on voluntary labour for project implementation, especially when projects are expanding and requiring increasing levels of rigour in monitoring, etc. Labour costs should ideally be estimated in negotiations with buyers and/or external project developers.

8.3 For donors supporting market development

1. Support central and local government in their technical capacity to oversee project implementation. This could also extend to developing better national databases on land use emissions and removals, monitoring systems and reporting processes. This would also help to promote participation in any future climate change mechanism such as REDD+.
2. Support a broader approach to projects that are better linked to land and policies outside the boundaries of projects, such as agricultural land outside designated forestry areas. This could be through active engagement with governments in pilot project development and/or by supporting work that helps to link projects to wider policies and measures.
3. Supporting pilot project implementation. There continues to be a distinct lack of experience in implementing offset projects especially in Africa, but this will be essential for gaining a better understanding of their implications. Piloting of approaches to carbon offset projects that target poorer communities and individuals would also be useful. This may include investment approaches for land that is under communal ownership or deemed as too insecure for many investors.
4. Ensure that lessons learned from previous donor programmes and research are incorporated into project design. Most of the issues surrounding why and how carbon offset projects offer opportunities or present risks to poor people have arisen in more traditional development projects in the same sectors.
5. Develop quality control systems that can be applied to any donor investments, such as guidelines on minimum processes for social impact assessment.
6. Support more rigorous global comparative studies on the social impacts of carbon offset projects, drawing from those that already exist.

8.4 For researchers and research funders

This study has highlighted a number of areas where further research is needed in understanding the opportunities and risks of carbon offset projects for the rural poor.

1. Understanding how new innovations in the carbon markets affect the potential of the poor to benefit from carbon offset projects. This includes:
 - a. Small-scale and simplified methodologies;
 - b. Bundling of projects and programmes of activities;
 - c. Balance of payments between participants and non-participants, including the types of benefits that are delivered;
 - d. New monitoring, reporting and verification approaches and/or technologies and the impacts on transaction costs (e.g., use of hand-held GPS systems for monitoring).
2. Understanding the carbon 'value chain' in different project approaches to identify essential functions, how these are taken on by different actors (including the whole range of government, NGO and commercial intermediaries) and the resulting impact on both the overall sustainability of the value chain and how value is distributed between chain participants.
3. Cost benefit analysis of how the benefits/risks for participants balance with the benefit/risks for non-participants in projects. This would be particularly useful, for example, for large scale projects where many of the benefits are through employment, but which are often claimed to have negative impacts on those not employed or participating in other ways (e.g., through collaborative forest management). This would also highlight some of the different perspectives that are being taken on the definition of 'sustainable development' in the carbon markets.
4. There continues to be a basic lack of evidence for the benefits and risks related to carbon offset project impacts on the poor. More detailed and comparable case studies are needed, particularly for the range of projects which are promoted as 'pro-poor'.
5. Rural-urban differences in the opportunities relating to carbon offsets. Some project types (e.g. clean cook stoves) may have much greater potential benefits in urban settings.

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A.1 APPENDIX 1: FORESTRY CARBON OFFSET PROJECTS IN UGANDA

A.1.1 Uganda country context

A.1.1.1 Climate change policies and institutions

There is currently no comprehensive climate change policy in Uganda. However, national strategies do exist in the form of the National Communication for the UNFCCC (2002), the National Adaptation Programme of Action (NAPA 2007) and the Renewable Energy Policy (2007). The Poverty Eradication Action Plan (PEAP 2003) does not include specific references to climate change related actions. The main focal point for climate change policies is the Department for Meteorology within the Ministry of Water and Environment, which has a mandate to coordinate all government activities on climate change. It contains the Focal Point to the UNFCCC process.

In the last two years there have been moves to develop more comprehensive climate change policies. The PEAP is due to be replaced by the five-year National Development Plan, for which climate change issues are being considered across a range of sectors. New institutions have also been established including the Climate Change Unit, which has been established to coordinate climate change related activities and the development of new climate change policies. It will also become the secretariat for the Designated National Authority (DNA) – the institution which approves CDM projects and manages CDM related policies. Connected to this is a climate change policy committee consisting of members from the public and private sectors which will help in approving CDM projects and providing technical advice to the unit.

Adaptation is the main area of concern for Uganda, but there is also interest in activities that are considered to link mitigation and adaptation, such as tree planting (a major activity stressed in the NAPA) and upland rice cultivation. 'Reduced Emissions from Deforestation and Degradation' is also a large area of interest and it is expected that a significant proportion of funding for new policies will be prioritised in this area.

A.1.1.2 Carbon markets

Uganda has been involved in carbon offset projects since the mid 1990s. CDM projects have been promoted and developed in Uganda since 2000. There have been numerous capacity building initiatives (see Olsen (2006) for a review of initiatives between 2000 and 2007) but despite significant investments there are still only two projects existing. These include the Nyagak Mini-hydro project of West Nile Electrification Company and the Nile Basin Reforestation project (A1 table 1). However, there are eight other projects in the CDM pipeline (CD4CDM August 2009) which include a landfill gas capture project, two cogeneration projects at sugar factories, a run-of-river hydro project and four reforestation projects on the same reserve as the Nile Basin Reforestation project.

The voluntary carbon markets are generally considered to have been more successful in Uganda than the CDM. This is because such projects involve less complex methodologies which reduces costs and the need for specific expertise and there is less role for government and international institutions to approve projects, which can slow down processes considerably (interview with Uganda Carbon Bureau, 2009; Kazoora, 2008). There are currently around five voluntary carbon

offset projects running in Uganda (A1 table 1). Four of these are forestry projects. There are around fourteen other forestry projects in development.

Forestry carbon offset projects have been initiated by NGOs, the government and the private sector:

- NGO led projects include the well established Trees for Global Benefit ('Plan Vivo') and TIST projects where local NGOs are supporting individual farmers to plant trees on their own land.
- Government projects include the Nile Basin CDM reforestation project, where planting is being carried out on a National Forest Reserve managed by the National Forestry Authority, and the FACE Foundation project which is being administered by the Uganda Wildlife Authority within the Mount Elgon Forest Reserve. This latter project is one of the earliest carbon offset projects and it has received much publicity since its inception because of a history of conflicts with local communities.
- Commercial projects include the Kikonda National Forest Reserve project being implemented by the German company Global Woods and a number of other commercial projects in development by Norwegian company Green Resources.

Limited capacity for extension, agricultural competition and land tenure issues are major barriers to the development of projects and particularly in developing projects that collaborate effectively with local communities.

According to the Uganda Investment Authority (UIA) there is considerable scope for further development of CDM and voluntary carbon offset projects in Uganda. They have identified thirty sites along the Nile that could be used for hydro projects and parcels of land between 500 and 16000 ha available for afforestation on 49-99 year leases (Kazoora, 2008). Some of these sites are unlikely to be viable in the short term because significant investments in infrastructure, such as grid extension to isolated locations, are required. Assistance programmes to enable such investments have so far fallen through (Hepworth and Goulden, 2008).

Project name	Description
Uganda Nile Basin Reforestation Projects 1-5	Five separate CDM projects being implemented in the Rwoho Central Forest Reserve by the NFA and funded by the World Bank. One project is registered.
West Nile Electrification Project	CDM run of river hydro-power project.
Kikonda Forest Reserve reforestation project	Reforestation of Central Forest Reserve. Voluntary project under the CarbonFix Standard and implemented by German company, Global Woods.
Uganda efficient stoves	Supply efficient wood burning stoves to families in Kampala. Voluntary Gold Standard project funded by Climate Care.
Plan Vivo 'Trees for Global Benefit' project	Planting of indigenous trees on farmers' private land. Voluntary project implemented by local NGO, ECOTRUST, with various private buyers.
Mt Elgon Reforestation	Enrichment planting of forest reserve in Mount Elgon National Park. Voluntary project supported by the Dutch FACE Foundation.
TIST Uganda	Planting of exotic and indigenous trees on farmers' private land. Voluntary project implemented by local NGO, TIST, with

A1 table 1: Existing CDM and voluntary carbon projects in Uganda

There is no specific policy framework for the implementation of carbon offset projects. However, a Designated National Authority (DNA) exists within the Ministry of Water and Environment for establishing guidelines on the sustainable development impacts of CDM projects and for approving projects in accordance with these guidelines. Applicants for CDM projects have to submit proof that the project meets sustainable development criteria, evidence of legal status and copies of the project design document. The Uganda DNA sits as a committee of members and considers applications which are then approved by the Minister. Whilst this is a relatively 'hands off' process, the Letter of Approval is crucial in order to register projects. There are some concerns that the lack of capacity (including a lack of funds to operate, competing existing commitments of officers and insufficient staff) within the DNA has caused delays in the progress of projects. The high levels of bureaucracy in the CDM, combined with slow procedures within DNAs and relevant UNFCCC bodies has been a major issue within the CDM globally and it can be restrictive for private sector investment (UNDP, 2006).

The National Environmental Management Authority (NEMA) is also involved in the approval process for CDM projects. It has a remit to establish guidelines for Environmental Impact Assessment by District Environment Officers and such an assessment will usually be required for a project to be approved. Better indicators and a procedure for more thoroughly checking projects are being developed by NEMA, which may increase the rigour of this process. However the capacity at local levels to carry out such assessments is generally extremely low, so it is unlikely that the process is particularly meaningful in practice. Once a project has been approved there is little government oversight. The fact that the Ministry of Water and Environment has little coordination with District Officers, who are recruited under NEMA means that there is little ongoing feedback on project performance to the DNA.

The Uganda Investment Authority promotes foreign (over \$100,000) and domestic investment (over \$50,000) in Uganda. They have been promoting commercial CDM projects, particularly for forestry and methane. They give licences to internationally financed projects to operate but do not carry out rigorous project appraisals themselves, which are conducted by DNA and NEMA. Domestic projects do not have to have a licence to operate. According to UIA the market has evolved in Uganda. Domestic project developers were initially very interested in the market because of a belief that they could get money from carbon upfront, but interest has now decreased because of the realisation that it is difficult to establish projects and that carbon finance is not available until the project is well established. Without upfront capital it is therefore difficult to establish projects. This problem is compounded by the fact that domestic banks are risk averse towards carbon offset projects partly because of their lack of knowledge about the sector. According to some project investors, a further barrier is that the government focuses most of its attention on promoting the CDM despite the difficulties in developing projects under this mechanism, rather than focussing on trying to promote voluntary markets (interview with Uganda Carbon Bureau, 2009).

The development of carbon markets in Uganda has also led to some concerns about the potential adverse effects on government institutions. There have been a number of different projects supported by donors, raising issues about donor versus government priorities. Many of these are relatively small scale investments that have been given as project support, which is at odds with the national policy to encourage

budget support (Olsen, 2006). This may have led to further lack of coordination between government institutions dealing with climate change.

Given the ongoing challenges in building carbon market investment in the country, a new initiative that has been developed is the Ecosystem Services 'Incubator' which is being implemented by Ugandan Carbon Bureau and the Katoomba Group. Its goals include (Hepworth and Goulden, 2008):

- Increase benefits to communities from ecosystem services markets by increasing the supply of good projects;
- Leverage new investment flows, demonstrating that community ecosystem services projects can provide attractive investment returns;
- Catalyse innovation and methodological development, including a focus on REDD, water markets, and bundled services;
- Strengthen regional institutional capacity to access markets and develop viable projects;
- Build an aggregation model to efficiently support a range of small-scale producers.

A.1.1.3 Forestry policies and institutions relevant to carbon offset projects

Following the 1995 Constitution of Uganda, a process of public sector reforms was initiated. In the forest sector this led to the development of a forest policy, a forest law and a national forest plan. The focus of the reforms laid out in the policy is on decentralisation, with increased responsibilities for District Local Governments, local communities and increased involvement of the private and NGO sectors. It supports decentralised decision making, regulation and arbitration. There is an emphasis on 'partnerships', particularly in the management of government land, in delivering education on forest management and in 'collaborative forest management' (Kamugisha-Ruhombe, 2007).

The National Forestry and Tree Planting Act, which turns the policy into legislation, came into force in 2003. It classifies forests into five main categories:

- Central Forest Reserves (CFRs). The National Forest Authority (NFA) was created to manage the CFRs. There are 506 CFRs totalling about 1.2 million ha. The NFA was funded initially by the government but is expected to become self-sufficient in fund-raising after the first 3-4 years of operation. There is therefore a large incentive for it to develop carbon offset projects on its land.
- Local Forest Reserves (LFRs). These are managed by the District Forest Service (DFS). There are 192 Local Forest Reserves totalling around 5,000 ha.
- Community Forests (forests on communal land that are gazetted as community forests). These have not been invoked but some NGOs are trying to work through the provision of "Communal Land Associations" (under the Land Act) to establish community forests (Kamugisha-Ruhombe, 2007).
- Private forests.
- Forest forming part of a wildlife conservation area declared under the Uganda Wildlife Act, Cap 200.

Sections of the Act prohibit certain activities in a Forest Reserve, except when they are permitted in the specific forest management plan. Section 32(1) prohibits "grazing and livestock farming, planting or cultivation of crops, camping, erecting a building or enclosure for commercial, recreational, residential, industrial or for hunting purposes, construction or re-opening a road, tracks, bridge, airstrip or landing sites." Section 14

(1) prohibits cutting, disturbing, damaging, burning or destroying any forest produce, or removing or receiving any forest produce without due permission.

According to the NFA:

“Agricultural encroachment and settlement (with permanent houses) in CFRs has been NFA's main challenge. Almost all reserves have some form of encroachment; the worst being in possession of lease titles in CFRs and eviction has proved tricky due to interference by local politics. NFA has however adopted the following procedure:

- Re-opening the boundaries so people can know where they are
- Registering all those that are found living in the reserves
- Sensitising local communities, encroachers, civic and political leaders to visualise the encroachment problem differently
- Replanting areas that have been vacated by encroachers.

In many places this has worked successfully, with encroachers abandoning their gardens and therefore voluntarily leaving. Some former encroachers have formed associations that are now contracted by the NFA to plant trees.”¹¹

However, this process has led to conflict. There are substantial numbers of people still living in many of the CFRs, despite past attempts by the government to evict them.

Another area of conflict relates to the existence of overlapping rights due to the co-existence of multiple tenure regimes. In 1900 large areas of land were awarded to absentee landlords under freehold ('Mailo') tenure by the British (Brett, 1973), which created scope for overlapping rights to the same plot of land. Further complexity arose from the nationalisation of land by Idi Amin in the 1970s. This ended with the 1995 Constitution, but consensus could not be reached, particularly on issues of tenants' rights. These were addressed to some degree in the Land Act of 1998, but the “ambitious institutional design along with a lack of funding implied that little if any of the infrastructure needed to implement this Act was established” (Government of Uganda 1999 and 2003, cited in Deininger and Castagnini, 2004). A new national land policy is being developed and it will eventually influence a new national land law with the aim of revising the National Land Act. It has so far been very politically contentious, particularly because of issues such as the status of 'Mailo land' and the process is stalling.

A major component of the Forest Policy and Tree Planting Act is the promotion of Collaborative Forest Management agreements (CFM) in order to help resolve some of these conflicts. Nine step guidelines have been developed for the establishment of CFM agreements (Box A1). The CFM arrangements described in the Forest Policy state that “Collaborative forest management will define the rights, roles and responsibilities of partners and the basis for sharing benefits from improved management. There will be a specific focus on wide stakeholder participation, collective responsibility and equity and on improving the livelihoods of forest dependent communities.” Currently CFM arrangements are most relevant for CFRs operated by the NFA because this is so far the only CFM 'implementing body'.

¹¹ See: http://www.nfa.org.ug/content.php?submenu_id=4

Box A1: Collaborative Forest Management Process

- Step 1: Initiating the process
- Step 2: Preparing an application for CFM
- Step 3: Meeting between applicant and responsible body
- Step 4: Participatory situation analysis
- Step 5: Initial Negotiation and drafting a CFM plan
- Step 6: Institutional formation and development
- Step 7: Continuation of Negotiations
- Step 8: Review of the Plan and Agreement by stakeholders
- Step 9: Implementation

A number of issues in implementation and gaps have been identified in the existing legal framework for CFM (EMPAFORM, 2006):

1. Although sharing the resources is provided for in the policy, there are no guidelines for forest-benefit sharing. Quite often communities are left with low value items (mushrooms, water ponds, medicinal species, etc).
2. There is limited institutional capacity to handle CFM. The National Forestry Authority has limited ability to take on CFM. Applications received are way above what can be handled by NFA.
3. Lack of guidelines for registration and declaration of Community and Private Forests
4. Transfer of property rights and control of resources to communities is provided for as a strategy and opportunity in the 2001 Forestry Policy but has never become a reality
5. There is a lack of information and lack of information dissemination to communities about the available opportunities in participatory forest management. CFM agreements (wherever they are signed) have been drafted in English with less than 10% of the community members being able to comprehend the contents of the agreement.
6. CFM Agreements have a life span of 10 years yet many forestry activities are of a longer gestation period. For example trees take 20 years and above to mature. Private tree farmers in Central Forest Reserves are given permits of up to 50 years. This is a disincentive for communities to undertake long term and lucrative investments under CFM restricting them to subsistence tendencies (collection of mushrooms, rattan and hunting).
7. Gender and equality is a mere formality under the CFM agreements
8. The 2001 Forestry Policy empowers civil society organizations to be at the forefront in the management of forest resources in the country. However, there are no networks of civil societies at grassroots level fighting for collaborative forest management issues.
9. Many of the communities are manipulated by elites. Someone becomes chairperson of a CFM group for as long as he lives; later becoming a proxy representative of the Responsible Body (in this case the National Forestry Authority) with whom the community signed an agreement.
10. Lack of coordination with the National Agricultural Advisory Services (NAADS) and failure of NAADS to recognise the value of forest resources in its policies has led to critical lack of extension and/or advisory service provision to communities.
11. Forest sector stakeholders have a concern that parties involved in CFM agreements always have a hidden agenda – forest resources managers opt for CFM to solve encroachment and not necessarily as a management tool and the communities take on CFM to legalise illegal activities in the forests.

These issues are particularly relevant for forestry carbon offset projects being established on CFRs. Many of the larger projects (including the Nile Basin Reforestation project and the Kikonda Forest Reserve project reviewed below) have been established on such plantations and utilise CFM arrangements in their management systems.

The number of projects on CFRs also appears to be increasing as attracting carbon offset finance is part of the NFA's strategy. The impetus for this is growing because of the large and growing demand for timber and it is expected that Uganda will run out of industrial timber plantations and industrial resources from natural forests on private land in the next 3-5 years. Another key incentive scheme is the EU-funded Sawlog Production Grant Scheme (SPGS – Box A2).

Box A2: Sawlog Production Grant Scheme (Source: SPGS website and interviews)

The Sawlog Production Grant Scheme (SPGS) is a European Union funded programme that aims to promote private investment in timber production in Uganda. The SPGS started in 2003 and has so far subsidised 10,000 hectares of commercial plantations throughout the country: this includes small community-based, tree planting associations up to large-scale commercial operations. Discussions are currently underway between the Government of Uganda and potential donors (notably, the European Union and the Norwegian Government) to expand the programme over the next 4 years (2009-2013).

SPGS covers up to 50% of establishment costs for plantations over a period of three years. The minimum land requirement is 25 ha (it was originally 100 ha), so it is targeted at larger land owners. However, SPGS community planting support is an initiative that started in late 2005 in which SPGS provides free quality planting material to target tree planting communities. Priority is given to communities planting near SPGS commercial planters for logistical reasons.

A.1.1.4 References

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A.1.2 Uganda Nile Basin reforestation Project

A.1.2.1 Overview

The Uganda Nile Basin Reforestation Project consists of five small-scale Clean Development Mechanism (CDM) projects being implemented in the Rwoho Forest Reserve in South Western Uganda (A1 figure 1). It spans three districts (Mbarara, Ntungamo and Isingiro) near to the Rwandan border. The project is being implemented by the National Forest Authority (NFA).

In its capacity as trustee of the Bio Carbon Fund, the International Bank for Reconstruction and Development (IBRD) made an agreement with the NFA to purchase Emission Reductions from the project. The upfront costs for planting are being provided by the NFA. This case study refers mainly to issues surrounding carbon project number three which involved a community group called RECPA. Some insights are drawn from one of the other projects which is at an earlier stage and involves a community group called the Kanywamaizi Development Association.

A.1.2.2 The Reserve

The reserve (9073 ha, of which over 50% is available for reforestation and the remainder for watershed and biodiversity conservation) is managed by the National Forestry Authority (NFA), on behalf of the Government of Uganda based on the National Forestry and Tree Planting Act 8/2003. The reserve was gazetted in 1939 under East Rwampara Reserves (LN No. 257 of 1939; LN No. 275 of 1940). Legal Notice No. 11 of 5th January 1963 left the Forest Department in control of Rwoho CFR. The present constitution of the Reserve is contained in Statutory Instruments of 1998 No. 63 supplement No. 23 (Forest Reserves – Declaration Order). The land tenure is with the Government of Uganda, administered through the Uganda Land Commission.

Plantation establishment started in 1964 in Rwoho with *Pinus radiata*. Later other species like *P. oocarpa*, *P. patula* and *P. caribaea* were introduced. Rwoho has a non-carbon immature crop estimated at 800 ha ranging from 5 to 12 years. The crop has been tended (thinning and pruning) since 2003. The species planted are mostly *P. oocarpa*, *P. caribaea* and small areas of *Eucalyptus grandis* and *Cupressus lusitanica*. The total target area for the carbon project is 2,014.6 ha of which existing planted areas in November 2009 covered 1354.4 ha (information provided by NFA and World Bank 2010). This is being managed in five separate carbon 'blocks' that act as 5 separate CDM projects bundled together.

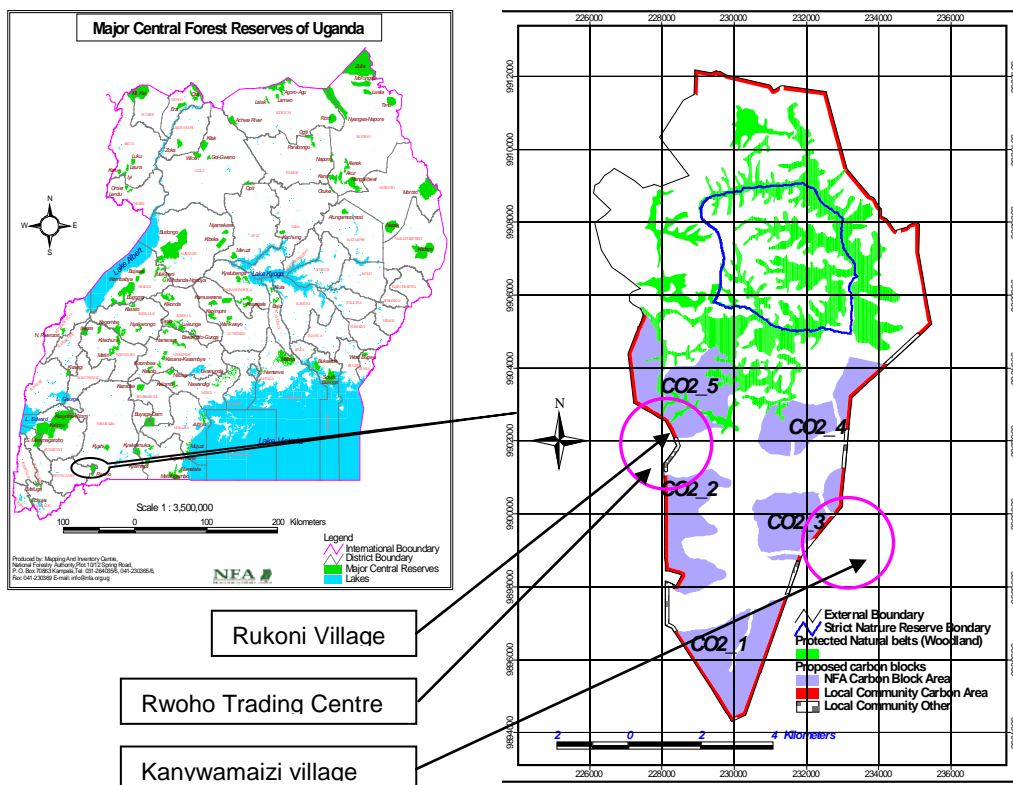
Collaborative Forest Management agreements are being created which enable communities to manage strips 100-200m wide along the boundaries of the plantation. The management of these areas is governed by a collaborative forest management (CFM) agreement with the NFA (Box A3). Each CFM agreement has an implementation plan which is an integral part of the general management plan for the reserve. The other carbon blocks have not yet been registered and the agreements are being negotiated with other community groups (although, on the basis of the interviews, there appear to be links between these groups and RECPA).

Box A3: Collaborative Forest Management Agreements and Tree Planting licences

Collaborative Forest Management (CFM) agreements are a key aspect of the Nile Basin project. They give surrounding communities certain usage rights to the Central

Forest Reserve, and cover both tree planting activities and usage of natural forest areas. One CFM agreement has been negotiated so far (in 2007) between the community association RECPA and the NFA, who are involved in (the yet to be registered) carbon project number 5. It covers 200 ha of which 74.6Ha have so far been allocated for carbon forest plantation. This is organised in a 200 metre wide strip along the boundary of the reserve, the rationale being that the area planted and managed by the community will act as a buffer for preventing calamities such as fires, given that it is in the community's interest to protect the strip. The CFM agreement is for 20 years but renewable including an initial 3 year period during which the parties will be tested for their compliance with their obligations under the agreement and revisions made where necessary (CFM Agreement between NFA and RECPA signed 09 February 2007). The licences for land allocation to communities are for 60 years (and then renewable) but it can be rescinded at any time if the community association breaks the terms.

Under the agreement, the community association is required to plant trees on the 74.6Ha area using the same management regime as the NFA. The CFM agreement also allows them to collect subsistence products from the remaining areas of forest but with certain restrictions (e.g. head loads of firewood can only be collected on Saturdays and Sundays). The CFM agreement also forms the basis of the agreement between the NFA and the community associations in terms of enabling a mechanism for linking carbon finance to communities. The CFM and tree planting licence transfer rights to plant on the NFA reserve, which in turn transfers certain rights to trees and associated carbon revenues to the community associations.



A1 figure 1: Map of the Rwoho forest reserve showing the five carbon blocks. The pink circles indicate the two carbon blocks visited and the arrows mark the villages visited.

The CFR lies on top of a large flat-topped ridge running from North to South. It has an altitudinal range of 1,360-1,800 m with 56% of the area exceeding a 15% slope (51 km²). The annual average rainfall is about 1,000 mm occurring mainly in two rainy seasons. The project sites are all degraded grasslands maintained through a human induced fire climax where fires occur more or less annually outside the valley areas of moist natural forest. Natural regeneration is not possible under these conditions (Project Design Document, 2009).

The region has a population density of around 160 people per km² based on the 2002 census. Approximately 80% of the population is involved in subsistence farming. The main crops grown are bananas (matooke), beans, sorghum, cassava, groundnuts, millet, Irish and sweet potatoes, and coffee is grown occasionally. In addition to agriculture, most farmers have some livestock (mainly chicken, goats or cows, in some cases sheep). Some farmers also have experience of growing trees (especially pine and eucalyptus). There are also a few larger herds (>25 animals) owned by nomadic pastoralists passing occasionally through the area. Some of the villages located near the boundary of the CFR have in the past used areas inside the reserve for subsistence agriculture and grazing.

The nearest large towns are Mbarara and Ntungamo (approximately 70-100 kilometres away). Both are connected to the CFR via earth and gravel roads, meaning that it is difficult for farmers to sell agricultural produce in urban centres at competitive prices. Besides subsistence agriculture, there are few income generating opportunities in the area since forestry operations collapsed in the late 1970s. However, there is a high demand for timber both locally and nationally. Value-added activities could also develop as planting progresses. There is currently 4000 ha of private plantation and 6000 ha of NFA planting elsewhere in the region, which could justify the development of a sawmill in the next 10-20 years (NFA interview March 2009).

A.1.2.3 **Carbon finance**

The project has been developed using a small-scale CDM reforestation methodology modality which is applicable to projects that generate less than 8000 tCO₂e (now up to 16000 tCO₂e since a change in rules by the UN) Small-scale CDM projects benefit from simplified procedures relative to those for standard CDM projects, with the aim of making greater contributions to sustainable development by allowing smaller producers to benefit from the market. The Biocarbon Fund, which is purchasing the CERs from the project, also has an objective of “poverty alleviation” through carbon market transactions (BioCF website 2009).

The project consists of five separate ‘carbon blocks’ in different areas of the reserve, each one of which represents a separate CDM project (see A1 Figure 1 above and A1 table 2 below). The main species being planted are *Pinus caribaea* (75%), *Maesopsis eminii* (20%) and *Prunus africana* (5%). *Pinus* and *Maesopsis* will be managed on a 22 years rotation cycle or until the target diameter is reached, i.e. 45 cm. *Prunus* will be managed for medicinal bark production in a 10 year rotation period. In practice the *Maesopsis* has not grown well so far and the bulk of it may be replaced with pine and *Prunus*. The total emissions reductions from all five projects are expected to be approximately 260,000 tCO₂e by 2017. Carbon block five is most advanced in terms of tree growth; the project design document has been re-submitted to the Executive Board of the CDM for approval following some corrective action requests. It is not known whether or when this will finally be approved. Carbon project number three has recently been registered as a CDM project.

Structure of carbon finance agreement between the World Bank and the NFA

An emissions reduction purchase agreement for Verified Emissions Reductions (VERs) has been signed between the National Forest Authority and the International Bank for Reconstruction and Development (IBRD - the Trustee of the Biocarbon Fund). The aim is to generate temporary Certified Emissions Reductions (tCERs) under the CDM once the project has been registered.

CDM project number (carbon block)	Total area (ha)	NFA area (%)	Community area (%)	tCO₂e/yr
1	468	86	14	7498
2	370	90	10	5928
3	342	93	7	5579
4	347	94	6	5561
5	488	85	15	7812

A1 table 2: The five CDM projects within the Rwoho Forest Reserve. Source: World Bank and NFA 2009

Payments for carbon will be made based on annual reports, but corrected after each verification carried out by a third party (likely to be at 5-yearly intervals). Whilst an Emissions Reduction Purchase Agreement (ERPA) has been signed, the agreed carbon price is confidential. A reasonable assumption is that the price is in the region of \$4.76/tCO₂ based on recent market data (Hamilton et al., 2009). Some revenues from the annual payments due to the NFA will be used to cover transaction costs such as project preparation costs and Kyoto Protocol costs (relating to the UN Adaptation Fund which is financed via a levy on CDM projects). The scale of these transaction costs is not known, but can be assumed to be in the region of \$100,000 – 200,000 (Neeff and Henders, 2007).

The NFA estimates that carbon revenues will meet one third to one half of plantation establishment costs. Upfront costs have so far been covered by the NFA which has used resources from timber revenues, income from leased land and the sale of seeds. No international revenues (e.g. Overseas Development Assistance) have been used. According to the NFA, carbon revenue improves the cash flow to the NFA and helps to leverage other expenses (NFA interview March 2009).

The conditions of contract between the Biocarbon Fund and the NFA have some influence over the forest management regime. Permanence is a particularly important factor, which is dealt with by requiring that the NFA is limited in the extent to which trees can be cut within the Project Boundary during the term of the contract (mainly thinning and selective harvesting during the contract period to 2037). The project will also generate temporary credits, which expire at the end of the Commitment Period following the one during which they were issued.

The additionality criterion of the CDM also requires an analysis of the financial viability for the project with and without carbon finance. Taking into account all funding sources, this indicates that without carbon finance the project would not have had a high enough internal rate of return to make it possible. By this analysis carbon finance is therefore indirectly responsible for all of the benefits (and risks) that have been created by plantation activities.

A key issue that may have impacts on the sustainability of the scheme (and of the broader development of forest carbon markets in Uganda) is the apparent lack of

knowledge about the carbon aspects of the project amongst the local NFA staff. This includes basic information about the approximate scale of financial benefits that may be expected from carbon sales, how the monitoring arrangements and how interactions with local communities are managed.

A.1.2.4 **Opportunities and risks for community association members**

Beyond the creation of employment opportunities, one of the main mechanisms through which the NFA is aiming to benefit local communities is through collaboration with local community associations. RECPA (Box A4) has been established for the longest and is particularly active in carbon project 5, but other associations (such as the Kanywamaizi Development Association and Kagoto Foundation for Rural Development (KFFRDA)) are becoming active in another carbon block. This section focuses mainly on RECPA unless otherwise stated.

Box A4: Rwoho Environmental Conservation and Protection Association (RECPA)

RECPA began with ten members who had been planting trees individually (none of which are yet mature). One reason they decided to plant trees is that the National Forest Authority (NFA) had harvested its plantation and left the slopes bare, leading to landslides and erosion. They decided to form a group to help each other overcome shared problems like fires and degradation by goats, etc. They developed a constitution and in 2003 registered their association as a Community Based Organisation with Ntungamo District.

A registration fee of 10,000UGX is charged for joining RECPA, plus an annual subscription of 5,000UGX. Members come from the districts of Mbarara, Isingiro and Kiruhura. There are 200 members of whom 73 are members of the carbon group. RECPA members are also involved in other schemes such as the EU-Funded Sawlog Production Grant Scheme (SPGS) which has financed 40 ha of planting on communal land by RECPA, and SCI-SLM (Stimulating Community Initiatives in Sustainable Land Management) working through the Ministry of Agriculture, Animal Industries and Fisheries (MAAIF)

To be a member of the carbon project, people have to be a member of RECPA and contribute 100,000UGX for a share (up to a maximum of 6 shares per person). These funds go towards the costs of preparing the land and planting and can be paid either in cash or through labour (though out of the 73 members, 65 were able to buy their share with cash payment). But theoretically, the landless could join if they paid their share with labour. Shares are inheritable.

Decisions within RECPA and within the carbon sub-group are made at general meetings and taken by majority voting.

There are a number of benefits stemming from RECPA membership. These include:

1. **Timber revenues:** The RECPA carbon group have been provided with free seedlings by the NFA for planting in the CFM area. Significant income can be expected when the trees are harvested (about 20 years after planting) and thinned (about 12 years after planting). This will be shared between the carbon group shareholders. Three harvests are expected of the sixty year lifespan of the project. Costs of replanting for the second and third rotation are expected to be covered from harvest income.

2. **Employment:** RECPA carbon members generally employ others to prepare, plant and maintain the plantation. They prioritise other RECPA members before employing people outside the association.
3. **Usage rights for the CFM areas:** The CFM agreement includes both the carbon forest plantation land and natural forest. It allows all community members to collect subsistence products from the forest, such as head loads of firewood for domestic use on Saturdays and Sundays. As there is no separate management plan for the CFM area, RECPA members do not have the ability to manage the indigenous forest part of their area independently of the CFR.
4. **Training:** This is provided in tree planting, fire fighting and maintenance (particularly from the Sawlog Production Grant Scheme – SPGS).
5. **Carbon revenues:** All community associations that enter into agreements with the NFA will benefit from direct carbon payments (see below) over the course of the project (at least until 2017).
6. **Visitor fees:** RECPA charges a flat fee of 50,000UGX to visitors, which is used to support the association's activities.
7. **Links to other initiatives:** There are different sub-groups for these different initiatives such as SPGS and SCI-SLM. Members are particularly appreciative of the opportunities to go on exchange visits and to attend workshops.

A number of the community association members interviewed (including RECPA members involved in carbon project 5 and Kanywamaizi Development Association members where stated) have experienced similar problems to community members outside of community associations (section A.1.2.5), in terms of lost land for grazing and stricter enforcement of rights to fuelwood etc. But they have also experienced a number of challenges in relation to the activities that they have to carry out as part of the CFM and carbon agreements. These include:

1. Problems in finding the money to manage young trees, which are quickly overtaken by weeds and need to be maintained.
 2. High maintenance costs.
 3. A lack of forest protection. They pay for one forest guard and have some collaboration with the CFR guards but this is deemed as insufficient.
 4. Loss of trees because of fire which affected 2 ha in 2008.
 5. Keeping to a rapid planting schedule. This has been compounded by the fact that the NFA did not provide them with enough seedlings for the first planting.
 6. Competition for labour with the NFA as RECPA pay lower rates to labourers.
 7. Trade-offs between whether to buy shares in the carbon scheme or to use money for other things (such as school fees).
 8. High staff turnover in the NFA, lack of communication and lack of understanding about procedures led the Kanywamaizi Development Association to plant trees (60% of which have been lost due to drought) in the belief that they are about to sign an agreement with the NFA. There is also a lack of understanding within the NFA about how the group works.
- This does not appear to have been an issue in the case of the RECPA group involved in project number 5.

No data were available to compare the well-being status of members of these groups with those outside the groups. However, in the two groups of associations interviewed it was apparent that a number of the members are professionals and officials, such as teachers, village officials, and in the case of RECPA, the President's wife. RECPA consulted with other members of the community whilst establishing the carbon scheme and invited people to join up. However, the membership fees and annual subscriptions have prevented people in Rukoni village from joining RECPA and/or maintaining membership, suggesting that this

arrangement is not suited to poorer community members. Beyond this there does not appear to be much interaction between the community associations and wider members of the community, or any provisions for distributing benefits beyond the association (e.g. through supporting local schools). Few of the members live adjacent to the reserve boundary (though in carbon block three, the community association has employed a guard living adjacent to the boundary), which could result in problems both for the NFA and for the community associations in terms of the security of their assets that is offered by this approach.

Opportunities and risks relating to carbon finance arrangements

Carbon finance for communities is generated by sale of credits from the trees planted on the CFM areas managed by the community associations. The tree planting licence agreement does not stipulate who is entitled to benefit from the carbon credits, because the Ministry of Lands Water and Environment has not yet developed appropriate regulations. However, the current understanding of the Ministry and the NFA is that, whilst the “NFA has all rights, title and interest to the emissions reductions generated, including those generated by any community or groups participating in implementing the Project Activity” (PDD, 2009), the community association is entitled to both the revenue from the trees and from the carbon. Community groups will be paid for the carbon sequestered by the NFA upon delivery, but the NFA will maintain overall responsibility for the project implementation and delivery of the emission reductions.

In carbon block five (the most advanced project site in terms of tree growth) the CFM agreement is between the NFA and RECPA. RECPA is required to plant in accordance with the wider management plan for the reserve and following third party monitoring they will receive an initial payment for carbon. Assuming that around 86,014tCO_{2e} are sequestered from CDM project five in the period to 2017 (the period for which a purchase has been agreed), and that \$4.76 is paid for each tonne¹², the NFA should receive around \$409,426 up to 2017. RECPA manages 15.3% of project 5, so would expect to receive around \$62,640 in the same period. If we assume that RECPA continues to have 73 members, each member’s annual average carbon payment is expected to be around \$86. When subtracting the one off joining fee (10,000UGX or \$5¹³), annual membership fee (5,000UGX per year, or \$2) and share cost (100,000UGX per share, or \$47), this works out at about \$78 per year over a ten year period, for people purchasing one share¹⁴. These figures exclude transaction costs which have to be covered from the carbon revenues and could be deducted from the income received by the NFA (and possibly passed on to communities as a reduction in payments). The annual average income for the Kanywamaizi Development Association members (there are 84 members) involved in project number three is \$20, excluding costs of membership of the carbon group, which are not known. This reflects the lower proportion of project land that they are managing and a large group.

The understanding within RECPA of the expected returns is that:

1. a payment will be made in 2009;
2. benefits will be ongoing for 15 years;
3. that the price that they will get will be around \$4 per tonne (the same as the price received by the NFA).

¹² Based on average price per tonne for temporary CDM forestry credits reported in Hamilton et al., 2009

¹³ Exchange rate at 1 April 2009: US\$1 = UGX2115

¹⁴ Note that given that the share cost and the joining fee are one off payments, the annual income should converge to around \$84 over much longer periods

However, there is no notion of how many credits will be created and hence the overall financial benefits that they may get from the project. This could have negative implications, especially for those considering joining the carbon scheme. In one case, for example, it was mentioned that it has been difficult to decide between buying shares in the carbon project or paying school fees.

Not all members of RECPA will benefit from carbon finance. Payments will be delivered to the RECPA bank account and will be redistributed between the members of the RECPA carbon group. Benefit sharing arrangements have yet to be decided, but it is likely that they will include the following criteria:

1. Individual returns in relation to the percentage of carbon shares that they hold;
2. A percentage allocated to cover the costs of planting the area that has not yet been planted;
3. A percentage for starting a savings and credit scheme for members of the carbon group and possibly for other members of RECPA.

Given that there is no limit on the number of people who can become members of the RECPA carbon group and that new members are still joining, there is a concern that the benefits could end up being spread very thinly. This problem is compounded by the fact that the knowledge within RECPA of the potential income from carbon is unknown – it is entirely possible that with a large number of members, the finance received from carbon will be very low and that input costs may outweigh benefits.

The scheduling of payments is also an issue. Whilst RECPA has benefitted from free seedlings and training and in the long-run most of the financial benefits will be from timber sales, high input costs have been a challenge in developing and maintaining the carbon block plantation. The group is finding it hard to find enough money to maintain the trees as well as they ought to, which could affect income from carbon in the future. Earlier delivery of carbon payments and/or the frontloading of payments, as is done in the Plan Vivo project in Bushenyi District could help to overcome this problem.

A related issue surrounds the permanence of carbon sequestered. If significant numbers of trees are lost (e.g. through fire or pests) it is the responsibility of the NFA to replace them. If this occurs on the carbon area managed by RECPA, it will be their responsibility to re-plant. Whilst they will likely be provided with seedlings by the NFA, significant labour costs are implied, and the carbon revenues will also be lower. Additionally, if RECPA breaches the agreement in any way (e.g. by intercropping between the trees in the carbon plantation), the NFA can rescind the agreement. The CFM agreement is also supported by a land licence which bestows rights to the holder beyond what is in the CFM. For example the tree and tree products (including carbon) belong to the licence holder. Breaches to the licence also have remedies and cancellation is usually the last resort.

The relationship between the CFM agreement and the carbon agreement is important in terms of benefit flows, as it has been a necessary pre-condition for linking the carbon revenues to communities managing the land and trees. Through the CFM agreement, carbon has to some extent forced people to work in groups, which may enhance social capital and provide a basis for collaboration in other areas. However, in practice, tree planting is the main activity which the groups are involved in and they do not appear to have initiated other activities. The nature of the CFM agreement (and therefore the carbon benefit sharing) also means that only group members will benefit, with many more community members unable to benefit from either the trees or carbon. Given the membership requirements of RECPA, it is

likely to be those who are relatively more well-off (in terms of land and income) who benefit from the carbon.

There was considerable interest amongst those interviewed for receiving carbon payments for trees planted on private land, though this falls outside the CFR area and would have to form part of a separate project. Some of the members of RECPA have heard of other projects (such as the TIST project in Bushenyi District) which provide quicker returns. There is therefore some danger of a perverse effect, whereby tree planting activities are not carried out without incentives from carbon being offered.

A.1.2.5 Implications of the project for local communities outside of community associations

The main opportunity associated with the development of the project has been employment creation. Actual figures are not known, but the employment plan for the project indicates a need for around 500 people in the establishment phase of the project (approximately seven years), dropping to 200 people for maintenance such as fire protection, thinning and pruning until year fourteen (PDD, 2009). Employment is set up through local contractors. The NFA does not specify rates (though contract labour prices given by contractors in interviews are summarised in A1 table 3) or where labour is sourced from, but they do encourage contracting of workers from the surrounding area. Most of the members interviewed in Rukoni village have been employed through NFA contractors. Work is available six days a week (though the women interviewed said they could only manage about three days) and throughout the year. Contractors pay 2000UGX¹⁵ per day per person to labourers (implying a large cut taken by contractors, based on the contract labour prices paid by NFA to the contractors). There have been some problems with late payments, which have in some cases been up to six months late. None of those interviewed had been employed by the RECPA community forestry association to work on their plantation area.

Activity	Contract labour prices per hectare (UGX/ha)
Bush clearing	70,000
Panting	40,000
Slashing	50,000
Spot weeding	30,000

A1 table 3: NFA contract labour prices on the reserve, based on information provided in interviews with contractors

One of the biggest impacts of the planting in the CFR has been the reduction in available land for growing crops and for grazing. Before the NFA started to manage the plantation (which began when the NFA was formed in 2003), villagers were allowed to cultivate areas of the CFR while planting and maintaining trees (though it appears that this may have been due to lack of enforcement rather than a specific policy, as such intercropping systems were not allowed under the former Forest Department). With the arrival of the NFA, enforcement has been tightened up, making it difficult to cultivate bananas, beans and millet or graze animals anywhere on the CFR. Women interviewed in Rukoni village reported that this has led to malnutrition and many people leaving the village. According to those interviewed, given the choice they would much prefer to have access to agricultural land than this employment as they need food rather than cash. Some villagers have also sold livestock because of a lack of grazing land. The village is still able to collect firewood

¹⁵ Exchange rate at 1 April 2009: US\$1 = UGX2115

from the remaining natural forest. To compensate for these impacts, proposals have been made for zero grazing cattle and apiary, but these have not progressed far.

In the communities bordering carbon block 3 on the East of the CFR, the loss of land for grazing cattle was linked by some of the community members interviewed, with price increases in beef and milk. Some people had specifically settled next to the reserve to have good access to the CFR to graze their cattle. They have now had to sell or remove their cattle elsewhere. Whilst these increases cannot definitively be linked to the CFR or the establishment of the carbon project, it is likely that they would have had an influence.

The preparation of the Project Design Document for the CDM requires a summary of the socio-economic impacts of the project to be included. There are no specific procedures for this in Uganda, but the project was assessed against the Ugandan Sustainable Development criteria for the CDM (essentially a checklist based on project documentation) and a socio-economic assessment was carried out by the NFA. This included two rounds of stakeholder consultations with village leaders, selected members and women's groups. RECPA also carried out awareness raising meetings to inform farmers and invite them to participate. Some results of these consultations are available but they do not appear to be very extensive and it is not clear that a specific methodology was used (e.g. that ensured impartiality of RECPA's involvement).

A.1.2.6 **Summary**

The project offers potential opportunities in terms of future timber revenues and carbon revenues for the members of community groups who are involved through the CFM agreement. These groups do not appear to include the poorest members of local communities, for whom there seem to have been mainly negative impacts, caused primarily by the associated tightening up of enforcement preventing grazing and cultivation in the reserve. This may have implications for the sustainability of the reserve, considering that the CFM arrangements have partly been set up to reduce risks such as encroachment and fire.

The carbon finance aspects of the project appear to have introduced some potential new risks for the community groups involved, which may affect the long term sustainability of the project. One of the main issues is the lack of understanding amongst the groups about the terms of contract for carbon payments – significant resources are being invested in the communally managed areas of the plantation, but returns are not known. The internal benefit sharing arrangements, organised through a share-holding system, mean that the carbon finance benefits may eventually be quite small. There is also a lack of understanding about how calamities such as fire will be handled and where the responsibility lies to re-plant.

The whole process, both from the NFA perspective and within RECPA seems to be remarkably ad hoc. This is perhaps inevitable with such a new approach, but it is also a concern that there is not more of a strategic vision at least in terms of the aspects where there has been considerable experience in the past (e.g. establishing CFM agreements). The project gives the impression that the involvement of communities is not really in order to benefit communities but more to meet requirements that a certain proportion of the reserve is managed by communities, as stipulated by NFA guidelines.

A key factor in enhancing the benefits for local communities may lie in developing a better approach towards CFM arrangements that are more inclusive of all community members and where rights, roles and responsibilities in relation to forest management and carbon are better defined. Better information provision about how the project has been established would also help in implementation, as understanding of existing conditions is clearly lacking both within community groups and the local NFA staff.

A.1.2.7 References

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- Uganda national census data 2002

A.1.3 Kikonda forest reserve project

The Kikonda forest reserve project is a commercial plantation in central Uganda being implemented by German-based company, global-woods international AG and certified by the CarbonFix standard (see Box 5). 2000¹⁶ ha of trees have so far been planted on a National Forest Authority owned Central Forest Reserve just South of Hoima on the Kampala-Hoima highway. 200,000 tCO₂ are estimated to have been sequestered within the first 1000 hectares that have been validated. The main opportunities for communities surrounding the plantation are employment, support for private tree planting activities, including through a community group called KiCoFa, and direct payments for carbon through newly formed collaborative forest management associations.

A.1.3.1 History of the project

The project is being implemented on a National Forest Authority Central Forest Reserve. The land was made a reserve in 1951 and demarcated in 1968 as an area of high potential for conifer timber production. 145 ha of mainly *Pinus caribaea* and *Pinus oocarpa* were planted in the 1970s but the plantation was poorly maintained throughout the late 1970s and 1980s following the 1979 war. By the late 1990s and early 2000s most of the existing trees had been harvested for saw logs or destroyed by yearly fires. Areas of natural forest in the reserve were also affected by grazing and charcoal production.

In the late 1990s global-woods started to search for sites for large scale afforestation activities in order to implement carbon sequestration projects. The government of Uganda offered the company a number of forest reserves in the country for afforestation activities. In 2001 the Government of Uganda issued a tree planting licence to global-woods to use a 12,186 ha area of the reserve. The agreement commits the company to plant trees on the site in accordance with a management plan for a 50 year period. Under this plan approximately 8000 ha will be planted, with the remaining area (approximately 30%) left for conservation (including areas of natural forest, wetlands and hilltops). Since 2002, 2000 ha have been planted and it is expected that it will take another 5-7 years until they finish planting at the site. Thinning will begin once the trees are around 3-4 years of age. For the tree planting activities and forest management on the ground global-woods has contracted the Ugandan company Sustainable Use of Biomass Ltd (SUB¹⁷).

The main aim of the plantation is to produce high quality saw log timber but additional funding for the plantation has been raised through the sale of carbon. The plantation was certified by the CarbonFix Standard in January 2009, which enables global-woods to sell certified carbon credits to interested buyers. CarbonFix is a proprietary standard which sets out a process for quantifying and monitoring CO₂ sequestered through tree planting activities over the lifetime of a project (Box A5). It also includes procedures for evaluating the environmental and social impacts of projects. The processes defined have similarities to those of other standards, such as the CDM and the Voluntary Carbon Standard (VCS).

More recently the project has been assessed by TUV SUD for compliance with the Climate, Community and Biodiversity Alliance (CCBA) standard. It was approved in July 2009 with a 'Silver' rating. The CCBA standard sets out guidelines for more rigorous assessment of the impacts of land use projects on the climate, community

¹⁶ Revision August 2010 from original figure of 1000ha

¹⁷ Revision August 2010: Following a re-structuring of the company, the subsidiary was closed down in early 2010. global-woods AG remains active through its branch office in Uganda and has contracted out most field work to a number of Ugandan forest service enterprises.

and biodiversity. It aims to create a demand for 'premium' carbon credits that have additional benefits. The project also receives some funding from the EU-supported Sawlog Production Grant Scheme (SPGS)¹⁸.

Box A5: CarbonFix Standard (source Carbon Positive Review 2009)

The CarbonFix Standard is administered by a non-profit association NGO based in Germany. It is supported by experts from the field of forestry, development aid and the environmental sector. CarbonFix has placed itself in between the Voluntary Carbon Standard (VCS, 2007) and the Climate, Community and Biodiversity Standard (CCBA, 2008), aiming for a 'best of both worlds' approach. The standard accounts for the wider social and environmental impacts of carbon projects (unlike VCS) and issues carbon credits (unlike CCB).

By offering both ex-ante and ex-post crediting, the standard lends itself to developers looking to secure upfront revenues to help finance projects. Ex-ante crediting brings forward revenues, in recognition of high costs in the early years to plant and maintain trees. Effectively, it means carbon credits can be generated in advance of the carbon sequestration actually being fully delivered, a practice that has drawn criticism from some environmentalists. Whether sold upfront or not, every CarbonFix certified carbon reduction will eventually be verified and delivered.

There is also an end-loaded cost structure designed to help remove initial financial obstacles: Upfront project validation and registration costs are generally lower than other standards but a high registry fee (around 50 euro cents per credit levied after the successful sale of credits) is charged for resulting carbon credits.

CarbonFix says this high cost is justified in the higher prices its credits will attract – from the added value of the associated social and environmental co-benefits and the ability to market them via the standard's web platform. This includes being able to "tell a story" about a project's wider benefits to a particular local community or ecosystem, for example.

The standard requires 30 per cent of credits to be retained in a buffer reserve and replanting to be undertaken within 12 months after harvest. This is more demanding than the VCS. CarbonFix says it leads to a better guarantee of long-term permanence of carbon sequestration.

The standard doesn't allow UN CDM or other methodologies, only its own based on IPCC good practice guidelines. The standard is currently working with the CDM afforestation and reforestation working group to dovetail its methodology and project design approach as far as possible. The aim is to make possible dual certification under both standards with minimum cost and effort. Dual certifications under CarbonFix and the CCB Standard or Forests Stewardship Council are already possible.

A.1.3.2 Local context

The reserve extends across Nsambya and Butemba sub-counties within Kiboga District. It has been estimated that about 12,540 people live in the 20 villages within

¹⁸ The SPGS has estimated that on average in Uganda it will cost around UGX1.2M per hectare (US\$700) to establish a plantation. This cost covers all expected costs up to canopy closure (i.e. when the canopies of trees in adjacent rows touch and shade out the ground vegetation) - which is around 3 years with *Pinus caribaea*, 1-2 years with *Eucalyptus grandis*.

5km of the KFR. It includes one area that is completely surrounded by the reserve (the 'enclave') which contains three villages (parish of Kyakabuga) and about 1500 people. The population density is particularly high on the western boundary of the KFR, resulting in greater pressures for encroachment in this area.

The land tenure is complicated outside the KFR area, as it consists of 'Mailo Land' common in Central Uganda. This is essentially comprised of land holdings owned by large (often absentee) landlords. People who come to the land can ask the Mailo landlord if they can settle and pay a fee. They get a written agreement but have to inform the Mailo if, for example, they want to grow trees (though the grower owns the trees themselves). Mailos have an informal relationship with the District Office.

Kiboga District is very productive. The eastern side (into which the east of the KFR extends) is flatter with lower rainfall. Here, cattle and goats are people's main sources of income. The western side is hillier, with higher fertility and more rainfall. Coffee, bananas, maize and beans are the main livelihood activities in this area. It has been reported that about 50% of farmers in villages surrounding the reserve keep livestock on a small scale (2-5 heads), with about 10% having larger herds (up to 30 heads). Nomadic cattle herders with much larger herds (up to 300 head) from Rwanda and South West Uganda also visit or pass through the area every one to two years. This causes some conflicts with local farmers and with managers of the reserve, as cattle can damage crops and young trees.

Charcoal production is another key activity in the District. It is one of the top production districts in the country, with much of it going for markets in Kampala. The NFA has historically tried to prevent charcoal production on the KFR but now that the reserve is being cleared for planting, large quantities of charcoal are being produced, especially in periods when clearing is taking place. Charcoal is also produced in large volumes from land outside the reserve.

These activities have caused some problems for global-woods. The company manages the reserve in accordance with NFA guidelines, which specify that no grazing, no cultivation and no Taungya agriculture (intercropping between trees) is allowed anywhere in the reserve. The main problems are:

1. Encroachment of farmers on to reserve land for agriculture (particularly in the western area);
2. Illegal charcoal production on reserve land;
3. Problems with damage to trees when herders use the watering holes in the reserve, or when people use the roads;
4. Problems with fire when local farmers are clearing land for cultivation;
5. Unlawful occupation especially in the eastern area where 'fake' land sellers have sold off parts of the reserve land.

These problems are compounded by the high migration rate into the area (particularly from the east of Uganda) which is increasing population pressure and weak enforcement of access to the reserve by the NFA.

The company has put in place a number of measures to overcome these problems, including:

1. Employing its own security force that includes fifteen ex-servicemen, who work with the local police to prosecute people who encroach on the area.
2. Developing a comprehensive fire management plan and response team.
3. Developing a series of community outreach activities including support for private tree planting, tree planting on the edge of the reserve and planting jatropha to supply biodiesel for plantation equipment (described below).

A.1.3.3 Impacts of Kikonda Forest Reserve on local communities

Given the complexities of the local situation, KFR has had a number of positive and negative impacts on local communities. These can be broadly broken down into impacts on three groups:

1. Impacts on community members in villages surrounding the KFR who are not participants in any company outreach activities;
2. Impacts on KiCoFa members;
3. Impacts on collaborative forest management association members.

Impacts on community members in surrounding villages

The KFR is the only large employer in the area and employs about 300-500¹⁹ people. 25 of these are contracted directly by SUB as sub-contractors who employ labourers to work on the plantation. Some of these are people from the enclave and many of them are ex-charcoal producers. Contractors are paid a few hundred thousand UGX per hectare but they also make money from a small fee (500-1000UGX) charged to charcoal burners for each bag of charcoal produced during clearance.

Labourers generally come from Kibale, Hoima and Arua, and are contracted by word of mouth. The contractors interviewed said that they do not usually employ people from the enclave because they are not committed enough and are often engaged in other activities at times when they are most needed (managing their cattle and farms). Labourers are usually contracted to carry out a range of activities and the amount they are paid depends on the activity, ranging from 13,000UGX per hectare for spraying to 250-300,000 for clearance. The non-participants interviewed reported that they have been discouraged from taking jobs at the plantation because they have heard that payments are irregular.

Employment on the plantation is higher during periods of clearing (generally twice per year before the rainy seasons). It is expected that employment will decrease to about 200 people by the time all of the reserve has been planted, although it is possible that re-planting and sawmill activities help to maintain it at a higher level.

SUB has a comprehensive code of conduct for employment of its staff, which extends to contractors but not to their employees (though they request that contractors have their own binding agreements with their employees²⁰). This helps to ensure that workers' conditions are kept to high standards. Workers also receive other benefits from the plantation, such as access to the forest station water pump and support to cover funeral expenses.

With increased employment at the plantation some interviewees reported that there has been increased spending in local shops and bars by people from outside the area. However, this in-migration has also caused some conflicts with local people in cases where labourers do not get paid and create competition for other local jobs, especially in the enclave. The plantation has also attracted more international visitors to the area (such as researchers) who spend locally. A visit by one of the global-woods staff to the local school also reportedly resulted in support being given by the company to the local school where the salary of one teacher has been covered since 2006.

¹⁹ Revision, August 2010: employment estimates vary depending on the source

²⁰ Revision, August 2010: That is being changed now and formalized in a way that will meet FSC standards.

One of the newest schemes that is being piloted by global-woods is to support farmers in growing jatropha²¹. This is still at a pilot phase, with some experimental plots at the plantation headquarters and a few trial farms. SUB will have an agreement with the community group, KiCoFa, to buy the seeds at 300UGX per kilogram. The price was set to be slightly higher than other common food crops to incentivise farmers but no cost benefit analysis has yet been done and it is not clear how price variations will be handled. SUB intends to process the seeds to produce fuel for their own machines, though no processing has yet been done. The communities are a bit concerned because there is a history of special crops (e.g. vanilla) being promoted only to find that there is no market. There is as yet no national policy on jatropha but various experiments exist, including some processing in Soroti. In the starting phase of the project the jatropha seedlings and plants handed out to local farmers were severely damaged by the Golden Flea Beetle (*Apthona* spp.). Efforts to find an ecologically sound method feasible for small scale farming to control the pest failed. According to the company, as a consequence the interest from the farmer's side to cultivate jatropha diminished and the project was halted.

One of the most negative impacts (and an ongoing problem) has been the loss of (illegal) access to reserve land. This has had an impact on grazers who have lost grazing land and access to watering holes; on access to firewood; and on farmers encroaching on reserve land for cultivation. These problems are compounded by strict support of law enforcement by SUB security which takes offenders to the local police station for prosecution (usually involving large fines).

Charcoal producers have also been affected. However, this is partly due to a decrease in the number of large trees at the site (which would have occurred anyway) and has been partially compensated by the company allowing charcoal burners to produce charcoal from trees cut during the clearing process (something that should continue for a few more years at least).

An underlying problem appears to be a lack of communication between the company and community members outside the formal community NGO, KiCoFa. There are some forums in which communications can occur (KiCoFa village meetings are open to all and there is a complaints box at the forest station) though a number of non-participants interviewed complained that they are unaware of company policies and that the company is heavy-handed in the way it deals with people who break the rules, even if no damage occurs to the plantation. They lack bargaining power and do not have any chance to appeal against decisions made.

A more fundamental issue is that non-participants would prefer a change in the rules so that they have more flexibility to use the reserve for collecting water, to take shorter routes between villages and to use the areas that have not yet been planted for activities such as agriculture. Such activities are not allowed under Ugandan laws regulating National Forest Reserves. The company claims that it would be open to such a change in the rules if there is a clear law enforcement system in place that makes sure that these rights are not abused for illegal cattle grazing damaging the plantation and protected areas. Global-woods would also support the idea of agricultural use in unplanted areas, but are wary that this would raise a difficult situation at the moment they want to plant land. In any case, at present any such

²¹ Revision, August 2010: The Jatropha program has recently ceased after a beetle caused severe damage and consequently the interest of farmers in planting jatropha decreased. The NGO "SCC-Vi agroforestry" has been brought in to help facilitate a variety of rural development measures.

activities would require that the company contradicts NFA policies on the use of the reserve land, so it could be argued that these problems are more an issue for the NFA rather than the fault of the company. However, given that the company has already experimented with a permit system for allowing local cattle keepers to use the reserve (which was abused and eventually stopped), it seems that the NFA restrictions may not be so set in stone.

Impacts on KiCoFa members

One of the main mechanisms for enhancing collaboration with local communities has been the creation of the Kikonda Community Forestry Association (KiCoFA), which aims to encourage tree planting by neighbouring farmers and provide a new income stream from both timber and carbon finance (see box A6).

Around 250 ha of trees have been planted by around 300 KiCoFa members on their own land. They have benefitted from provision of free seedlings and frequent training sessions conducted by SUB. The expected benefits of the trees include:

- income from timber harvest (both women interviewed mentioned wanting to use this money for school fees);
- environmental benefits such as rain and wind protection;
- trees can act as security for loans (though nobody interviewed had done this yet);
- hope that if they plant well and look after the trees well, the company will provide them some help while trees are maturing;

It will be a few years until these benefits are realised by the KiCoFa members. Without KiCoFa it is unlikely that trees would have been planted because of the long timescale for achieving returns, high input costs (in terms of labour) and the limited size of land holdings.

There are a number of features of KiCoFa that raise questions about its sustainability as an institution and its effectiveness in creating a bridge between the company and the local community:

1. KiCoFa was effectively formed by SUB and did not arise out of any existing community institutions;
2. The focus purely on tree planting activities with few linkages to other activities means that it may not fit with the interests of some people in the local community. According to the company, there are plans to establish health care, agriculture and water supply projects which are in the pipeline;
3. Membership was limited to people who have the capacity to grow trees. Everybody who can plant trees and lives in a 5 km radius around the reserve can join. The group has never been closed for new members but global-woods stopped issuing tree seedlings in an attempt to promote a more sustainable initiative with global-woods selling seeds and providing technical support for a KiCoFA tree nursery. This nursery failed due to lack of support by KiCoFA and KiCoFA members did neither take the initiative nor buy seedlings. In consequence global-woods plans to provide a limited number of seedlings again from second half of 2010 in order to further promote tree planting but hopes that some farmers will still do tree planting without free support²². The fact that membership has been limited means that most of the local community receives no benefits from SUB other than potential employment, contributions to the local school and tree planting support for the school and church.

²² Revision, August 2010

4. The prominent role of a SUB employee in the governance of KiCoFa, which may affect its independence from the company, its ability to fit with the interests of the local community and who became members in the first place.

It was not possible to determine how the profile of members of KiCoFa compares with those of non-members in the local community. As the only requirement for becoming a member was owning land, then it is likely that larger landholders have been attracted to the scheme, though size of land holding is not a good poverty indicator in Uganda. However, comparing the non-participant and participant groups interviewed revealed some difference in terms of occupations with more of the non-participants being cattle farmers.

Box A6: Kikonda Community Forestry Association (KiCoFA)

global-woods and SUB initiated the Public Private Partnership Program “Sustainable development of forestry in Uganda” in 2005, with the aim of educating young forestry students and ‘sensitising’ the local population in tree planting. This occurred partly in response to the problems that the company experienced in the first period of planting, particularly with local cattle keepers and charcoal burners who were illegally encroaching on the land (Steiss, 2007). Within the PPP and driven by the company, the NGO Kikonda Community Forestry Association (KiCoFA) was founded in July 2005, with the aims of “encouraging and supporting communities neighbouring KFR to plant more trees from which they can derive income.... and contribute to sustainable development”, “facilitating training” and “accessing appropriate, relevant and good quality information regarding forest conservation” (KiCoFa Constitution, cited in Steiss, 2007). It has grown to include about 300 members (including new members who have started to plant *Jatropha*). Anybody who conducts tree planting in the vicinity of the reserve can become a member of KiCoFa, although initial support from the company has ended²³.

The main activities carried out by KiCoFa have included:

- Training in tree planting, including: clearance, lining out, pitting, planting, manual weeding and spraying
- Free provision of seedlings to afforest 200 ha of private land
- Intercropping for first 1-2 years

The only requirement for membership was that farmers owned land for planting and show a capability and interest in managing trees in the long-term. KiCoFa farmers own the trees that they planted on their land and are free to sell or use the trees as they wish, as long as they replant after harvesting.

KiCoFa is governed by an elected nine-member executive including SUB’s Public Relations Manager – one of the founding members of KiCoFa and also one of the principal signatories on the association’s bank account. They have an annual general assembly and can call additional meetings as necessary. Institutional members (like the school and church) have the same rights as individuals. Each of the seventeen villages that has KiCoFa members has a ‘village speaker’ who acts as a link between the board and the members living in the village.

²³ In effect this appears to mean that membership of KiCoFa has now closed, as it was driven mainly by the company

Impacts on collaborative forest management association members²⁴

SUB has more recently begun a separate collaborative forest management initiative focusing on a 100m wide strip of land along the boundary of the plantation but within the plantation area, thus creating a 'buffer' zone. The land is owned by the NFA and managed by SUB, but community members taking part in the scheme will be entitled to benefits from the tree planting activities and carbon finance. This system is currently being piloted by SUB with individuals from two communities (theoretically defined as those households under one Local Village Chairman) who have cleared the land and have recently planted seedlings provided by SUB. In one of these sites most of the seedlings have been lost because they were planted out too late in the season.

Draft contracts between SUB, the community and individuals managing the land (and co-signed by the NFA as owner of the land) are being developed. Some sensitisation has been carried out by KiCoFa and the people planting are often members of KiCoFa, but it is not officially involved in the scheme. In the two pilot sites (which consist of one group of five members and one group of seven members) the groups have been convened by the SUB Public Relations Manager. Each group has a representative who will sign the contract with SUB but this will specify the individual members, their land area on the strip and the number of seedlings they are entitled to. 90% of the financial benefits will go to individuals and 10% to the community.

It is too early to say whether this system will provide sustainable opportunities for local communities. Some of the potential benefits that may be expected are:

1. Benefits from trees: training; timber revenues; and carbon revenues
2. Benefits from group membership: The group could provide opportunities to "discuss developmental issues, resolve conflicts and bring unification" in the community (Gilbert Byoruganda, Kakindu village collaborative forest management association).

However, the piloting of this system seems to have been developed with little reference to other systems, which emphasise participatory situation analysis and institutional formation and development. It raises a number of outstanding concerns about its sustainability and the robustness of benefit flows:

1. The groups have been newly formed from individuals who did not already know each other and have been convened by SUB.
2. Some of the people living directly adjacent to the reserve have not been interested in planting but others living further away wanted to take advantage of the opportunity to plant on KFR land. This could result in conflicts with those living adjacent to the reserve area and/or not have the desired 'buffering' effect that the company has set out to achieve.
3. Membership will probably be limited, given the area of land available. This may mean that there are still many community members that see few benefits from the plantation.
4. They are unlikely to have rights to the natural forest in the strip, which makes the collaborative forest management arrangement essentially an outgrower scheme where the only major benefits are in selling timber to the company.

²⁴ Revision, August 2010: As noted at the end of this section, the CFM arrangements have stalled and are unlikely to emerge in the near future. NFA has not provided global-woods with the legal basis for land allocation under CFM in the Forest Reserve Land nor has it shown any tangible efforts to moderate a CFM process on the ground. Further NFA ordered global-woods not to take any leading steps in terms of CFM and stressed its own leading role.

A major barrier which has resulted in this scheme being stopped since the fieldwork was conducted is that the distribution of land to individuals in this 100 meter strip is not allowed by the Tree Farming Licence as it is now. According to the company the NFA is not willing to have the land “sub-licensed” to farmers selected by SUB and monitored by SUB. There is a concern then that if the NFA does not have the capacity to manage land distribution in such a strip in an efficient manner, there would be limited collaboration between land users and the company and it could result in uncontrolled land use that would threaten the plantation.

A.1.3.4 Carbon finance

Structure of carbon finance agreement between buyers and SUB

Global-woods has been responsible for originating carbon credits in accordance with the rules established by the CarbonFix standard. This process began in 2007 and the relevant documentation was verified by CarbonFix in mid 2008. The first 921 ha were independently verified (involving both desk review and ground-truthing) by TUV SUD in early 2009, making the project eligible to sell credits originating from this area of the KFR to buyers. Approximately one fifth (40,000 tCO₂) have been sold so far. Verification will be repeated every 5 years. The company originally started to work towards CDM registration, but switched to CarbonFix because of the complexities involved in the CDM. The low prices and lack of appreciation of the additional social and environmental benefits of forestry projects have also been cited as a reason for abandoning the CDM (Baldus, 2008).

CarbonFix facilitates the sale of credits through its website, charging a one-off certification fee of €1500 and a fee of €50 cents per credit sold, but it does not transact directly with buyers. Agreements are instead made directly between project developers (in this case global-woods) and buyers. Project developers establish their own prices, but have been advised by CarbonFix to follow a sliding scale of higher prices for small quantities and lower prices for larger quantities of credits (A1 Table 4). Individuals, companies (e.g. transport companies; festivals) and brokers are all able to buy credits.

Quantity (tCO ₂)	Price (€)
0-9	24
10	23
25	22
50	21
100	20
Bulk sale price (>100 tonnes) once other CarbonFix projects are certified	9-15

A1 table 4: CarbonFix recommended carbon prices for online sales

One of the key differences between CarbonFix and other carbon standards is that credits can be sold ex-ante rather than ex-post. The precondition is that trees must already have been planted prior to certification but the amount of carbon sold is equivalent to that which is projected to be sequestered over the complete rotation period. Global-woods are selling to buyers on the basis that the carbon sequestered will be removed from the atmosphere for at least 50 years (the length of two rotation cycles). Upfront selling of credits is much more risky, and therefore requires that stringent and robust procedures are in place in case the credits are not realised (e.g. if trees die or are lost to fire). This has a significant influence over the management

plan of KFR and on the transaction of credits. Some of the management tools that have been put in place to reduce risks include requirements to:

1. Maintain trees on the site for the duration of the contract (50 years);
2. Re-plant within 12 months of harvesting;
3. Replace trees if they are lost due to fire, pests etc;
4. Create a 30% buffer of credits that are withheld from sale by CarbonFix in order to act as insurance for any credits that are not realised. This buffer is drawn from all CarbonFix projects, which helps to spread the risk.

Global-woods claims that the introduction of carbon finance to the plantation has had some positive effects on the way it is managed. Better baseline assessments have been conducted and monitoring systems have been put in place. Achievement of 'silver' status under the Climate, Community and Biodiversity standard and the likely application for FSC certification next year also mean that there has been much consideration of the impacts on local communities and systems to reduce negative impacts and increase benefits.

The additionality criterion of the CarbonFix standard also requires an analysis of the financial viability of the project with and without carbon finance. Taking into account all funding sources, this indicates that without carbon finance the project would not have had a high enough internal rate of return to make it possible. By this analysis carbon finance is therefore indirectly responsible for all of the benefits (and risks) that have been created by plantation activities.

Structure of carbon finance agreements with communities

The project includes provisions for channelling carbon finance to communities via SUB. There are two main routes through which this is meant to occur, though no carbon payments have yet been made through either route:

1. Contracts between SUB and individual or institutional (e.g. schools and churches) members of KiCoFa who are planting trees on their own land;
2. Contracts between SUB and community groups who are planting trees on a 100 m wide strip of reserve land along the edge of the reserve.

Route one was the first to be established in 2004 and was based on the idea that trees on private land could be included within the company's carbon scheme (and that they could therefore benefit from carbon payments). Each individual (or institutional member) received a contract between them and SUB in which they were promised carbon payments. Members of KiCoFa were of the understanding that the carbon revenues that the company receives would be divided as follows:

- 25% to the farmers
- 25% for community schemes
- 50% to global-woods

The contract specifies that carbon payments will be made only if the company manages to obtain carbon finance, but goes into very little detail on other terms because SUB were not sure about getting paid. KiCoFa planting areas have not yet been certified, so carbon payments have not yet been received. However, there appears to be little understanding within KiCoFa about the kind of payment schedule that has been planned, for how many years they have to keep the trees (except that trees are mature for harvesting at 20 years) or mechanisms for sanctions or insurance. The members interviewed were aware that they would not receive any

more payments after they harvest trees. The contract also includes some clauses relating to inheritance and eligible beneficiaries.

A fundamental barrier to progress on this route has been the uncertain land tenure of private land in areas around the plantation. Most land is 'mailo' land owned by a small number of absentee landlords. Although many people have resided there for many years (and according to the District authorities will probably continue with relatively secure land holdings), they are effectively renting the land from Mailos. This lack of security, at least on paper, poses problems in terms of carbon sequestration as it is difficult to ensure permanence. It is unclear whether and how the carbon contracts that exist with KiCoFa members will be honoured in this situation. There has been some discussion of talking to organisations like Plan Vivo to see if there are options for establishing an alternative system that is not under the CarbonFix standard.

The second route through which communities may benefit from carbon payments is through the collaborative forest management activities on the buffer strip surrounding the plantation. Areas of this strip that are eligible (i.e. those that are not already forested in accordance with the Ugandan forest definition – at least 1 ha, 30% crown cover and minimum tree height of 5m), can be used for generating carbon credits if it is planted in exactly the same way as the rest of the plantation (this includes most of the boundary). As discussed in the previous section the beneficiaries are likely to include both individuals (90% of carbon finance) and the community (10% of carbon finance). Given that the selection of participants appears to occur in a haphazard way at present, it is not possible to tell which community members may benefit from this scheme. However, as previously discussed, overall membership is likely to be limited. In terms of targeting the poor the draft contract includes the possibility of providing an advance to cover labour costs which would be repaid from the carbon credits or timber sales. The company has also thought about options for generating carbon finance from the natural forest areas in the plantation from payments for 'reduced emissions from deforestation'.

A.1.3.5 **Summary**

The company has made a number of well-intentioned efforts to create linkages to local communities, through KiCoFa and more recently through pilot communal boundary planting activities and a jatropha production scheme. There are some clear benefits for the approximately 300 members of these initiatives, including training in tree planting, potential timber revenues and potential carbon revenues. There have also been costs involved, particularly in terms of labour and land inputs which are a concern to some participants, especially as returns may not be guaranteed.

There are also some benefits for community members who are not participating in these initiatives. Employment is the main benefit – the plantation is the only employer in the area and provides jobs for around 300-500 people – though, whilst anybody can work on the reserve, it appears that many of the labourers are not from the surrounding area. Company support for a teacher at one of the local schools and increased trade in local businesses due to migrant workers are also benefits. These benefits are likely to be sustained over the duration of the plantation (50 years). However, they need to be balanced against a range of negative impacts that have affected the local community. These are mainly associated with local people having to cease illegal activities, such as grazing cattle and carrying out agriculture on the reserve land. Clearly the balance between the broader long term economic benefits associated with the plantation and the more localised negative social impacts is not

well understood in this, or many, schemes but would be useful in order to better understand the costs and benefits of carbon forestry projects.

Aside from the benefits that are accruing from the plantation itself and the higher management standards that are required to gain carbon certification, it is not yet clear what the direct benefits of carbon finance are. However, it seems unlikely that members of KiCoFa will benefit directly from carbon finance because their land tenure does not make them eligible for certification to the CarbonFix standard, although they may have some indirect benefits (e.g., timber from the trees they have planted). Benefits from carbon from the communal boundary planting may be more likely once contracts have been finalised, because this falls within the company's carbon area. This system may have a greater chance of being sustained in the long run as it directly affects the company's planting activities. However, in both the planting on private lands by KiCoFa members and the boundary planting system there would appear to be more scope to draw on best practice (e.g. in the governance of community groups, how to deal with membership, transparency about benefit-sharing, etc.) and to link up with relevant authorities beyond the NFA. Lessons from international community forestry experience (c.f. Schreckenber and McDermott 2009) indicate that this may affect the long-term sustainability of these initiatives. There are clearly wider policy issues that need to be addressed, such as the capacity and policies of the NFA to support CFM. These are outside the remit of the company but they could help in the implementation of better systems.

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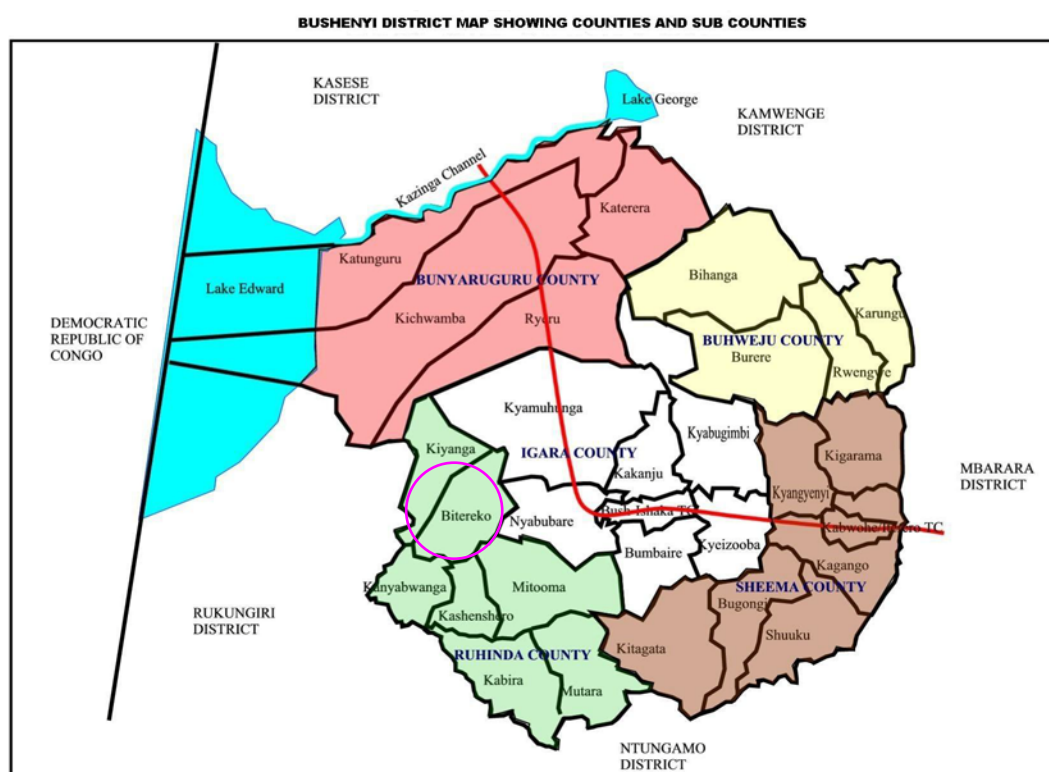
A.1.4 Plan vivo project

A.1.4.1 Overview and history of the project

The Plan Vivo carbon offset project uses carbon finance to fund the planting of indigenous trees by producers on their own land with explicit objectives of poverty reduction and environmental protection:

“The Plan Vivo System ensures that payments go directly to communities. It empowers communities to take control of their own resources and work to break negative cycles of poverty and degradation of natural resources.” (Plan Vivo Standards 2008).

The project spans three districts in Western Uganda: Bushenyi, Hoima and Masindi. It is managed by ECOTRUST, an environmental NGO based in Kampala. This case study focuses on project activities in Bushenyi District where the project has been established for the longest period (since 2003) (A1 figure 2).



A1 figure 2: Map of Bushenyi District. Pink circle shows Bitereko sub-county where the project was first implemented. Field visits were made in Bitereko and in Bunyaruguru County.

The Plan Vivo project grew out of an existing relationship between a national environmental NGO called ECOTRUST and the Bitereko Women in Development Association (BWIDA) based in Bitereko Trading Centre in Bushenyi District (A1 figure 2). The group was originally started in order to create a savings and credit scheme for women. Following a workshop run by ECOTRUST (then called the ‘grants management unit’) which sought opinions from local people about strategies for conservation, BWIDA applied for a grant to purchase 150 clean cook stoves and plant Eucalyptus trees to provide fuelwood (each woman was required to plant 100 trees under this agreement). This initiative finished in 2000, but BWIDA applied for a

second grant from ECOTRUST to get support for breeding exotic goats – a scheme which has also come to an end.

The carbon project began in 2002 with financial support supplied by CARE and DFID and technical assistance from Bio Climate Research and Development (which developed the Plan Vivo system), the Edinburgh Centre for Carbon Management (ECCM), the World Agroforestry Centre (ICRAF) and various Ugandan government research departments. The inception of the scheme was also associated with the forestry reform process – as a pilot project for innovative financing in forestry. It started as a pilot project working with five members of BWIDA from five different parishes. Another part of the rationale for establishing the Plan Vivo project in the area was to reduce pressure on the nearby natural forests. The local topography is undulating with broad ridge tops and shallow valleys, though the extreme North and West of the project borders the Rift Valley where slopes are extremely steep (over 45 degrees in some cases) and susceptible to erosion. The area near the Bushenyi carbon farmers borders the Kasyoha Kitomi forest reserve and Queen Elizabeth National Park. The fact that the project specifies that only indigenous hardwood trees and fruit trees are eligible for planting also demonstrates ECOTRUST's environmental objectives.

Each member has to implement the 'Plan Vivo' system for tree planting, originally developed in Mexico but now operational in four projects worldwide. It consists of a seven step cycle for generating Verified Emissions Reduction (VER) carbon credits (Box A7). Following introduction to the project by local ECOTRUST volunteers, producers develop simple plans of their land holdings detailing current uses and plans for future management schemes defined in the plan vivo system. These plans are evaluated and if they meet certain criteria, farmers are registered with ECOTRUST and become eligible for carbon payments based on the numbers and types of trees that they are planning to grow. By allowing producers to develop the initial plans themselves the project aims to create a 'bottom up' approach that is owned by the producers.

Box A7: Plan vivo project cycle (adapted from Plan Vivo website: www.planvivo.org)

1. Introduction to the project by ECOTRUST local coordinators (in Bitereko there is one sub-county coordinator and four parish coordinators)
2. Creation of a 'Plan Vivo': This consists of a hand drawn map of the producer's land holding which includes the following details:
 - a. the current land use – to assess the baseline
 - b. all the land under the producer's control – to assess the risk of leakage
 - c. the work plan (tree species, planting density, time allocated for planting, weeding, etc.) – to assess whether management requirements will be met
3. The Plan Vivos are then assessed by ECOTRUST in accordance with technical specifications. Producers who do not meet the requirements are informed and asked to re-submit on the basis of corrections. Producers with approved plan vivos sign a contract with ECOTRUST, which includes details of:
 - a. the offset potential of the activity
 - b. the time over which the activity must be maintained
 - c. the required risk buffer
 - d. terms and conditions for selling carbon credits via the Carbon Fund
4. Carbon purchase: Buyers may purchase carbon from farmers with registered

plan vivos. The payments are held in trust by ECOTRUST until they are made to the producers.

5. Sale agreements: When a purchaser places an order for carbon credits with ECOTRUST they allocate this sale to producers with registered plan vivos. ECOTRUST makes sale agreements with individual producers on behalf of the purchaser. They have to ensure that sufficient agreements are made to supply the required quantity of carbon.
6. Monitoring: Monitoring of trees is carried out by local coordinators every three months. Once the trees reach five years of age, growth rates are monitored by taking 'diameter at breast height (dbh)' measurements. Third party verification has also been carried out by the Rainforest Alliance.
7. Payments: Payments to producers are made following monitoring visits and in accordance with an agreed schedule, with payments in years 0, 1, 3, 5, and 10.

A total of 345 producers have registered sale agreements since project inception and the project is expanding rapidly – 207 producers were allocated sale agreements in 2008 (ECOTRUST Annual Report, 2008), though less than 160 of these are in the Bushenyi area. The rest are in Hoima and Masindi districts – the project expanded to these areas in 2007, and is now planning to extend to other areas of Uganda.

There is massive demand for timber in the area. Much of this is for construction but there are also three local tea processing plants and a tobacco industry, both of which have high demand for firewood. Demand for timber in the area is expected to increase significantly over the next decade.

According to the 2002 census, 77% of the population in Bushenyi is engaged in subsistence agriculture and around 30% live below the poverty line. The main crops include maize, bananas, millet, rice, simsim (white sesame), cowpeas, sorghum, sweet potatoes, cassava, bananas, soya beans and beans. Cash crops include ginger, cotton, sunflower, coffee and tea). The average household income is estimated to be around \$100 per month (Interview with District Forest Officer March 2009).

A.1.4.2 **Implications of the project for local communities**

Opportunities and challenges for Plan Vivo participants

The main beneficiaries of the project in Bitereko sub-county are those members of BWIDA, who are also part of the Plan Vivo carbon scheme. Farmers have joined the scheme for different reasons, but many of those interviewed were already members of BWIDA and had been involved in previous ECOTRUST activities (particularly clean cook stoves and eucalyptus planting). Others have heard of the project through radio broadcasts and local 'sensitisation' meetings. Certain conditions have to be met in order to join the carbon scheme. These include:

1. Assurance of customary land title by the local village chairperson
2. Payment of a 5000UGX fee to join, though this can be paid after receipt of the first carbon payment
3. Sufficient land. There does not appear to be an official policy on land holding size, but each case is evaluated individually to ensure that there is sufficient land for farmers to meet their needs. A minimum land holding size of 3ha was quoted in one of the interviews and 4ha appears in some of the project documentation (Fisher, pers comm., 2009).

4. A bank account (for BWIDA this is the Bitereko village savings bank; in the other area visited during this study a local cooperative bank was used where a deposit of 29,000UGX per farmer was required)

These details are included in application forms filled in by farmers prior to visits by local coordinators to assess land eligibility. If eligibility is confirmed, a 'Plan Vivo' can then be drawn up and planting can begin. These eligibility conditions may make it difficult for poorer community members to take part in Plan Vivo. Whilst the size of land holdings in Uganda is not a good poverty indicator at national level (Ministry of Finance, Planning and Economic Development 2001), the fact that the land holdings of participants interviewed in Bitereko appeared to be substantially larger than the six acre requirement and that a number of farmers had purchased new land in order to implement the project, suggests that those group members interviewed are unlikely to have been the poorer members of the community. A study by Carter (2009) confirms that participants differ from non-participants in terms of their mean farm area and in terms of other indicators such as levels of tertiary education (higher amongst participants) and the mean amount paid for farm inputs (significantly higher for participants), though it is not clear whether this is actually spent on the trees in the Plan Vivo system.

There are a number of benefits that participants expect from the project. These include:

1. **Timber:** A number of the species being planted are valuable timber species, which are likely to generate large returns in the future (20-50 year period depending on the species) and act as a 'pension' for some participants, or as an investment for children. In the shorter term, branches from these trees will provide firewood for farmers. Land with trees can also be sold at a higher price.
2. **NTFPs including fruit, medicine, beekeeping and fertiliser:** Some farmers are planting fruit trees such as local varieties of avocado and jackfruit, for which there are local markets. The bark of *Prunus africana* has become a valuable commodity for medicinal use, with a growing international market. This has not yet been formally exploited by the project, but there appears to have been at least one visit from a buyer to purchase bark. There have also been bark thefts on some Plan Vivo farms. Bee keeping was also mentioned as a promising activity given the shade that the trees offer, but bee keeping has not started yet.
3. **Environmental protection:** Many of the planting areas are on steep slopes (where it is difficult to grow other crops) where trees can help reduce soil erosion. They are also associated with local climatic improvements such as increased rainfall, though it is not clear whether there is empirical evidence to substantiate this relationship.
4. **Carbon revenues:** The scale of carbon revenues varies with the price that is paid, the size of farmers' Plan Vivos and the types of trees grown. The carbon finance contract also offers additional financial security for farmers, and in theory would allow them to take out loans from their local cooperative banks, though none of the farmers who were interviewed had done this yet. The expected direct financial benefits from carbon and these additional indirect benefits are outlined in the next section.
5. **Social capital development:** Shared learning through regular group meetings, farmer tours and external seminars.

These benefits appear to be fairly robust once farmers have joined the project and have buyers for the carbon sequestered. However, there are significant upfront costs

involved in establishing a Plan Vivo plantation and also opportunity costs from taking part in the scheme. Farmers cover the input costs themselves (which includes buying seedlings, own or hired labour for digging and weeding at least twice a year). Most of these occur upfront within the first five years of establishing their plan vivos. The participants interviewed estimated that about 30% of the money that is received through carbon payments goes towards covering these costs. The fact that carbon payments are made upfront (once a buyer has been allocated to a farmer with an agreement) is an advantage in this respect, because it gives farmers capital to cover these costs. However, this system only works when payments are made promptly to farmers. In the second area visited, both participants interviewed had hired labourers to help plant their Plan Vivo areas, but delayed payments from ECOTRUST meant that these payments were still outstanding, creating problems for the farmers and presumably the labourers they had employed.

Upfront costs have also increased significantly in some cases because of the challenges involved in growing indigenous trees, which include:

1. High water demand;
2. Susceptibility to drought, fire and disease (in the case of *Prunus africana* bark theft has raised concerns about increased susceptibility to disease);
3. Difficulties in getting seeds for trees other than *Maesopsis* (others have to be sourced from local towns). There are few nurseries with indigenous trees;
4. Difficulties in getting good quality seeds (and in knowing how to select these).

ECOTRUST does offer support for overcoming some of these problems, for example through commissioning analyses to identify certain diseases, though the one farmer who mentioned requesting support had had no response for a year. Ecotrust has also been supporting nursery operators who have high costs because of the long time it takes for trees to develop. They have been able to receive 60% advance payment before supplying the seedlings and the other 40% upon delivery of the correct quantities to the producers, as well as training from USAID/PRIME-West in Hoima and Masindi.

Opportunity costs related to the land used for planting are to some extent minimised because farmers are allowed to intercrop, there are eligibility requirements for land holding size and land where it is difficult to grow crops is prioritised for planting trees. However, some interviewees highlighted opportunity costs in terms of time requirements, for example to collect water for young trees.

The slow rate of returns expected from most of the varieties planted were a concern to some farmers. The fruit tree systems are expected to give quickest returns for farmers and are therefore recommended for farmers with smaller land holdings. ECOTRUST stipulates that traditional varieties (e.g. of avocado and mango) must be planted in order to preserve such varieties and because, they argue, local varieties are likely to be more resilient (e.g. to drought) than improved varieties. However, local varieties take seven years rather than three years to reach maturity, and may produce less easily marketed fruit, which could be problematic if farmers are implementing their projects on small areas of land or have no other income sources. Farmers were also concerned that the long term benefits of trees may not be realised, given that the government may in the future claim that they have been illegally harvested (i.e. it will be hard to prove origin from the project rather than natural forests) or that the people funding the trees may take the land away. Contractually, Plan Vivo trees and the land they are on remain the property of the farmers, so this should not be a problem, though it will be important in the future that ECOTRUST is able to support farmers in proving the origin of trees that are harvested. The District Forest Officer will need to be informed when they harvest and a licence fee will have to be paid.

Opportunities and challenges for non-participants

Given that Plan Vivo farmers are planting on their own lands, there appear to be few direct implications for non-participants. The benefits mentioned included the fact that members hire labour (which may contribute to local employment) and that they can provide seeds to their neighbours for planting.

The fact that Plan Vivo members are purchasing more land in order to plant trees for the project may constitute a risk in the long term if it leads to the concentration of land. Whilst this does not seem to be a problem at present, there have been some concerns raised about other incentive schemes for tree planting such as SPGS leading to land concentration among elites, although these operate at a much larger scale both geographically and financially. There do not appear to be any limits on the size of plan vivo that farmers can have, which would be one way of preventing this problem.

The tree planting activities are associated with some negative environmental impacts, such as boundary plantings causing shade on neighbouring land, high water demand and harvesting activities destroying neighbouring crops. There is also a concern (amongst participants and non-participants) that increasing numbers of indigenous trees could result in a rise in wild animal pests such as monkeys and snakes, though these changes do not appear to have been observed so far.

Finally, there is potential for tree planting to cause conflicts with non-participants in cases where trees are damaged (e.g. through fire or grazing). In cases where this has occurred, settlements have been made between the owner of the trees and the person who has caused the damage. It is possible that given the greater onus on participants to preserve trees in the Plan Vivo system, and their increased value, such cases could have more severe implications for those who have caused damage.

A.1.4.3 Carbon finance

The delivery of carbon finance to the project is based on methodologies developed by Plan Vivo to calculate the amount of CO₂ sequestered by trees grown under the Plan Vivo system. These use existing data on tree growth rates for the region to derive correlations between stem volume and age, total tree volume (including branches and roots) and biomass. Such growth curves can then be converted into curves for accumulation of carbon over time and CO₂ sequestered. Technical specifications have been developed for different management systems, including sole species woodlots and mixed stands, which can be applied according to the choice of systems implemented by producers. As the project expands into new regions, growth rate estimates will need adjusting (Ecotrust Annual Report, 2008). They also include specifications for ensuring additionality, reducing leakage, ensuring permanence and monitoring processes.

The amount of CO₂ that was sold between 2003 and 2007 was approximately 58000 tonnes. Of this, about 56% of sales value has gone to producers, 28% to ECOTRUST and 15% to Biocarbon Research and Development (A1 table 5) (Ecotrust Annual Report, 2007).

tCO₂	Price	Total cost (\$)	EC/T share (\$)	Producer share (\$)	BR&D share (\$)
57930	N/A	258963	73773	145855	39317

			EC/T share of sales (%)	Producer share of sales (%)	BR&D share of sales (%)
			28	56	15

A1 table 5: Breakdown of carbon income among different actors in Plan Vivo project

Contracts between ECOTRUST and buyers

ECOTRUST acts as an intermediary between carbon buyers and producers, managing the 'Carbon Fund' that receives payments from buyers and paying producers that have registered plan vivos. There are five main steps to this process (Plan Vivo website, 2009):

1. The purchaser must first define the volume of carbon required, the types of activity that may be used to supply the credits and the crediting period.
2. ECOTRUST will inform the purchaser if the project can supply the required carbon credits and agree on a price per tonne. It then issues a purchase note to the purchaser.
3. A unique serial code is generated specific to this purchase of carbon. It will be used in all documents concerning this purchase and allows carbon allocated to the purchase to be traced back to individual producers.
4. When the payment for the credits is received by the Carbon Fund ECOTRUST will issue a certificate of emission reduction to the purchaser.
5. This money is held in trust for the purchaser in the Carbon Fund until payments are made to producers

Carbon contracts between ECOTRUST and producers

Once a plan vivo has been approved by ECOTRUST it acts as intent to purchase and with this, farmers may start planting. Agreements are usually signed later after the buyer and price have been confirmed. The sale agreement stipulates the main aspects of the management system being used by the producer and the area of land being planted. It also details the terms of contract, including the length of time that the trees must be maintained on the land (this appears to have been revised from 50 to 25 years, or around the length of one rotation for most of the species that are planted (Fisher pers comm., 2009)) and the price of carbon. Producers are paid, on average, around \$1000 during the course of the project (average calculated from 117 members listed in the 2007 Annual Report). ECOTRUST negotiates the price on behalf of the producers, and there is no opportunity for the farmer to negotiate the price. Given the different prices offered by buyers (typically between 4 and 10 dollars per tonne) it is possible that there will be large differences between producers in terms of returns for carbon. The rationale for having such a pricing system (rather than one set price established by ECOTRUST) is that buyers are keen to have a direct agreement with individuals. Concerns have been raised by some producers about the differences in price (Annual Report, 2008), though according to ECOTRUST it is a not a common problem and one that they try to deal with by striving to allocate a single buyer to members of the same group. Priority of allocation of buyers is given to those who have demonstrated commitment by planting after their plan vivo has been approved. In practice this appears to be quite an ad-hoc system, with some farmers that were interviewed confused as to why they did not yet have buyers. It would also tend to favour wealthier farmers who are able to cover upfront costs associated with the scheme.

A standard payment schedule is used for all producers (A1 Table 6). This is weighted towards the early years of contracts in order to incentivise farmers to join the scheme and to cover the upfront costs associated with planting. Given that these costs can represent a significant outlay (producers are only likely to start making any income

from the second payment, though part of this will also be spent) this weighting is likely to be important for the effectiveness of the scheme. Payment for year zero is made as soon as the agreement with ECOTRUST is signed and a buyer has been identified. The subsequent payments are made following monitoring visits by ECOTRUST and the fulfilment of any corrective actions (e.g. replanting trees that have been lost). However, as discussed above, there are sometimes delays in the year zero payment, which can make it difficult for producers to cover costs that they have already incurred. This has led to calls for ECOTRUST to establish a loan facility for producers to cover labour costs and costs related to the purchase of seedlings.

Year	Payment (% of total)
0	30
1	20
3	20
5	10
10	20

A1 table 6: Standard payment schedule for Plan Vivo producers

ECOTRUST send a payment schedule (listing all producers and payments due) and channel money to a local branch of Stanbic Bank. The manager of the Bitereko village savings bank then goes to Stanbic and brings back money for distribution to producers. In order to access their payments, producers have to open a savings account at Bitereko village savings bank. All farmers in the participants group knew the payment schedule and the approximate size of the payments expected, though it was much less well known to the new participants interviewed or those wanting to become participants. 39% of farmers surveyed in Carter (2009) did not understand the payment schedule – this could affect decision making and the long term efficacy of the project. None of the farmers visited for the present study had copies of their Plan Vivos, the original of which is held by ECOTRUST, because the distance and cost of obtaining a copy (nearest copy facilities are a day's travel away) are prohibitive.

The agreement with ECOTRUST is usually between the male head of the house because he is the landowner. However, all members of the household are supposed to be consulted during the drawing up of the plan vivo and negotiation of the agreement. Both husband and wife have to sign the agreement, regardless of whose name it is technically in. There do not, however, appear to be provisions for inheritance that take account of the issue that Plan Vivo land may be more valuable. Whilst contracts are with individuals, for ease of mobilisation, cross learning, peer monitoring, communication, training and the ability to open an account with the village bank, etc., ECOTRUST have found that it is easier for people to be in groups (these appear only to be active when ECOTRUST are conducting sensitization and monitoring, although they often overlap with other groups (Fisher pers comm., 2009). This reduces time inputs and costs. One of the potential benefits of carbon finance in the project is that contracts between producers and ECOTRUST could act as security for loans (Carter, 2009). This could enable increased investment in farming activities or other business ventures, although it had not been implemented by any of the farmers interviewed in this study.

In addition to the individual payments a 'community carbon fund' has recently been established. This has not been discussed with producers yet but new Plan Vivo contracts include a clause stating that 10% of the payments will be deducted and pooled into a community fund. The fund would be administered by ECOTRUST and would consist of 10% of the total producer share of revenues from the project. The

aim of the fund would be to support capacity building, community development projects and any farmers that face natural disasters or other calamities related to planting (based on procedures yet to be agreed) (ECOTRUST, 2008).

One of the features of the Plan Vivo system is that carbon is sold upfront by ECOTRUST, meaning that all carbon sequestered over the course of the contract (25 years) is sold to buyers. This means that ECOTRUST is then bound to deliver the reductions that have been promised and must ensure that producers maintain their trees. A number of mechanisms have been introduced to reduce risks associated with carbon not being delivered in accordance with projections:

1. A 'buffer' of 10% of credits is withheld from sale;
2. ECOTRUST monitor the growth of trees. If the survival rate is below 85% then producers are requested to replant;
3. Spreading payments out over the first ten years to incentivise good management at critical stages in tree growth;
4. Stipulating that producers are not allowed to sell carbon to other buyers (which ensures that they honour their contract and that no double-counting occurs);
5. Conservative estimates of carbon sequestered.

This system helps to reduce the risks that could be faced by ECOTRUST, but it is also likely to have an impact on the benefits received by producers. Firstly, the buffer is stocked by deducting 10% from payments made to producers, which reduces their overall benefits. Secondly, the requirement to maintain a high survival rate has increased the expenditure of farmers, some of whom have reported losses of up to 50% of their seedlings (e.g. due to drought) in the early stages of implementing their plan vivos (requiring them to use all of their second payment to cover costs). Losses could increase significantly if farmers lose a large number of trees further down the line (e.g. through fire), as there are no arrangements for compensation. Finally, having made all payments by year ten, ECOTRUST has very limited control over producers' actions between years ten and harvesting (5-15 years later). This is based on the assumption that it should be more profitable for farmers to retain their trees for the 5-10 years before they can begin to be harvested than to cut them down. The expectation (in the contract) is that they will harvest the short-rotation trees (mostly *Maesopsis*) by Year 25 and then replant these while the longer rotation trees mature, keeping the whole Plan Vivo area under trees for 50 years. They do not expect more incentive payments for replanting *Maesopsis* in Year 25 as this should be covered from the proceeds of the timber sales.

One of the main concerns about the Plan Vivo project is the sustainability of such an approach given the evolution of carbon forestry markets. Standards for carbon forestry projects have become more rigorous over the last few years and there are elements of the Plan Vivo system that differ from some of the standard requirements and processes in the CDM and Voluntary Carbon Standard (VCS), including for example:

1. The size of the buffer is much smaller than the 30% buffer used in most CDM and VCS projects;
2. There appears to be little locally specific experience with quantifying carbon accumulation in some of the indigenous species in Uganda (which is one reason why few indigenous species are planted in carbon offset projects in the country).

A related concern is how transaction costs will work out as the ECOTRUST scheme is scaled up. The monitoring system is very time intensive, and relies on both Kampala-based salaried staff and local volunteer staff (and an increasing number of

interns – Annual Report, 2008). This may not be sustainable in the long run or across all areas that the project is planning to expand to. Monitoring is carried out by volunteer coordinators in each Parish, who count the trees, note species and spacing every three months. In the Bitereko area there are about thirty participants to each coordinator. Given that it is possible to visit about four plots in one day, this would require approximately eight days of work in each three month period. The use of external verifiers (such as the Rainforest Alliance, who have recently verified the project) will also push up costs (the 2008 Annual Report notes that prices being charged per tonne of CO₂ have been increased to cover verification costs and the establishment of the Community Fund). Such transaction costs have been a major reason why small-scale projects involving many individual farmers have been less attractive to the carbon offset industry.

There are some indications that Plan Vivo and another carbon project in the District (The International Small Group Tree Planting Programme – TIST) have had an influence over local development plans. The new five year development plan contains a number of clauses on carbon offsets, which are seen as a key pillar in the local forest policy.

A.1.4.4 **Summary**

The Trees for Global Benefit project is evidently providing benefits to participant farmers in terms of direct income from carbon sales and potential future income from the sale of timber. Some of the additional benefits, such as the use of carbon income and trees as collateral for loans and generating additional income through beekeeping, do not yet appear to have been taken up. There are also environmental benefits such as the reduction of erosion on steep slopes, the use of leaves for mulch and the opportunities to intercrop within the plantations. The early project site in Bushenyi has been centred on a strong existing group with active volunteers who have developed some technical skills in monitoring and also leadership skills.

Whilst the project aims to target poorer members of the community, in practice it appears the main people to benefit are those who are relatively better off and have land.

Many of the challenges with the project are in the institutional structuring above the community level. ECOTRUST plays a major role in facilitating the carbon finance aspects of the project, and appear to have a good relationship with local coordinators and farmers. However, they are also exposed to risks such as the limited control that they may have over farmers' activities in the 10-25 year period after they have received all of the carbon payments. The project is growing fast, but there are some evident delays in processing carbon agreements and in providing support to some of the farmers in newer areas, and it is still heavily reliant on volunteers. There are also some infrastructure problems in terms of the availability of good quality seedlings of the types allowed in the project, and in terms of training in collecting and preparing seeds. These could have implications for sustainability as the project expands. The fact that ECOTRUST also negotiates carbon prices on behalf of the producers and that different farmers can receive different prices for carbon, may also affect the sustainability of the project.

The front-loading of carbon payments is useful in that it helps to cover some of the upfront costs associated with the project. But some farmers are suffering high loss rates of trees and spending a significant proportion of their income on re-planting, so the direct financial benefits from carbon are limited. Some farmers would prefer

quicker returns but these are not possible with most of the indigenous timber trees and fruit trees, specified in the project.

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A.2 APPENDIX 2: BIOENERGY PROJECTS IN KARNATAKA, INDIA

A.2.1 India national and local context

In India, 70% of the total population lives in rural areas, and 85-90% of overall energy consumption is met by bioresources (Ramachandra, 2008). In this context, India serves as a model country to explore the potential of bioenergy carbon offset projects. Since the creation of the Department of Non-conventional Energy Sources in 1982 and its upgrading to an independent ministry of the GOI, there has been a strong focus on renewable energy sources, such as wind, solar and biomass (from natural waste such as crop residues, sugarcane bagasse, banana stems, cattle dung, fuelwood, etc).

Rural areas in India are commonly characterised by very unstable and infrequent access to electricity. The Indian government has a poor history of working to expand its power grid to rural areas. While over 80% of the 600,000 villages in India have at least an electricity line (Central Electricity Authority, 2003), only 44% of rural households have access to electricity (Bhatia & Gulati, 2004). For those that do have access, electricity losses during transmission and distribution are very high, and power cuts have negatively impacted the country's economic growth. Weak enforcement and high levels of electricity theft, for example, from irrigation pump heads is also a major contributor to instability of supply.

For over two decades, India has encouraged and implemented bioenergy programmes through the Ministry of Non-conventional Energy Sources (MNES). Through the MNES 11th plan and the government's Renewable Energy Policy, India has developed a policy for all-round development in the sector, with objectives to meet the minimum energy needs through renewable energy, to provide decentralised energy supply in agriculture, industry, commercial and household sectors in rural and urban areas. The policy hopes to achieve a target of 10% of additional grid power to come from renewable energy by 2012²⁵. In order to achieve this target, MNES has provided incentives for investing in renewable energy technologies through interest and capital subsidies, soft loans, government backed fiscal incentives for the renewable energy sector (such as tax and duty exemptions or reductions), etc. Specific incentives often differ by state.

A.2.1.1 Biomass power generation

Subsidies and other financial incentives are available for biomass and biogas²⁶ power plants for distributed power generation, but there are often some difficulties in companies accessing these subsidies, and incentives provided for other energy sources tend to prevail. Specifically:

- High subsidies provided to fossil fuels create an uncompetitive playing field for biomass technologies. The unfavourable electricity pricing with comparatively low government tariffs provided for bioenergy-based power means that investment in bioenergy is not an attractive option.
- In the renewable energy sector, wind and solar technologies are often favoured. This is largely due to the strong lobby in the solar and wind sectors, backed by money and political pressure from overseas investors who favour these technologies. While important from the standpoint of reducing greenhouse gases and the stability of electricity supply standpoints, these technologies are unlikely to offer the same direct opportunities for the rural poor as bioenergy projects.

²⁵ http://www.nri.org/projects/biomass/conference_papers/policy_material_section_3.pdf

²⁶ See section 4.4., table 3 for definitions used in this report.

- The government gives a certain amount of electricity for free to certain users. Electricity is given for free to all agricultural pumpsets (although with severe power cuts). This has resulted in black markets developing, where kerosene and other fuels supplied to rural areas are sold at profit within urban areas.

Investment from the carbon market through CDM or voluntary carbon offsets could help to fill the investment gap and may provide the financial incentives which can overshadow the unfavourable conventional energy pricing policies and incentives provided to wind and solar energy sources.

There are also non-policy related barriers to uptake of bioenergy technologies:

- A lack of availability of consistent biomass supplies in rural settings serves as an important constraining factor, given that biomass power projects depend on acquiring biomass from external sources. Unless the biomass supply is provided from a large scale sugarcane plantation or the like, developing a market around the biomass supply chain can be challenging. For bio-residues, collection needs to be done by each individual landholder, thus requiring high degrees of coordination.
- Price fluctuations can act as a significant barrier. The costs of setting up and running a biomass plant are high (particularly once transport costs are factored in), and the available government tariffs are not sufficient. In general, private banks still consider biomass projects risky from an investment perspective. In order to make grid-connected biomass plants competitive, this would require a reform of the tariff support. If the tariff support for biomass was equal to that going towards solar (i.e., 12 rupees/kWh), this would automatically spur investment into the field of biomass energy generation.

A.2.1.2 Domestic biogas

The potential of biogas for household use from agricultural residues and dung (from India's 300 million cattle) is estimated at approximately 17,000 MW (Ramachandra, 2008). Indeed biogas as a viable energy source to meet rural energy needs is not a new concept. India has in many ways been a pioneer in the field of developing technology for biogas production from animal residues (dung) since the mid-90s. India has made several attempts to disseminate biogas to rural areas. For example, initiatives such as the National Programme on Biogas Dissemination and the Biomass Gasification Programme are supported by the national government. However, there are a number of barriers to the uptake of the technology. These include:

- High up-front investment costs of biogas plants have tended to inhibit uptake of the technology. While the government initially provided a subsidy to encourage this biogas technology, the availability of government subsidies has reduced dramatically in recent years.
- Technological barriers, including knowledge of how to build and maintain the systems.
- Fuel supply issues. Most domestic biogas units require at least one (but normally two) cows in order to produce enough methane. This can limit the options for the technology for those who do not have cattle. Moreover, the cattle-human ratio in many parts of India does not lead to sufficient biogas to meet the energy (cooking needs of all households in any particular village (Reddy, 2004).
- Institutional issues: The requirements for maintenance and fuel can mean that strong local institutions are needed in order to implement the technology or to make it accessible to the poor. Some communal biogas projects have been established to try to overcome these problems, but they have faced significant challenges. For example, experience from the Pura community biogas project

suggests that local institutions and self-reliance are necessary to achieve sustainable projects and technologies (Reddy, 2004).

- Competing fuels such as kerosene have been increasing in usage over the last few years, in part due to government subsidies.

While there was a big push to disseminate biogas cook stoves in rural areas of India in the 80s and 90s through the National Project on Biogas Development, the project faced many barriers including its own lack of coordination, maintenance and financial support. The government programme for providing these biogas stoves has been significantly scaled down; the Central and State government only supported the dissemination of 500 biogas plants in the Hassan District in 2005 (while the demand may even exceed 50,000 plants) (Hassan Gold Standard PDD, 2008). Overall, the national government programme is no longer reliable as a funding source to support the dissemination of biogas units.

Today, the prevailing practice by the public sector is to make kerosene as cooking fuel available to families below the poverty line at a subsidised price (available at a cost of 10 INR per litre, where market price is 30 INR per litre. However, for many households the price of kerosene is still too expensive and, since only three litres per month are available through the public distribution system, not enough fuel is made available. Therefore rural households still depend heavily on firewood for cooking.

A.2.1.3 **Efficient cook stoves**

In an effort to conserve the use of fuelwood and reduce smoke in kitchens during cooking, the GOI began a National Programme on Improved Cook stoves²⁷ (NPIC) by the MNES in the mid-80s. Since then, NPIC has overseen the installation of 28 million improved cook stoves. Each stove received a minimum 50% government subsidy of about 70 rupees (\$4.30) per stove (as reported in 1994). While the dissemination rates are impressive, follow-up surveys suggest that only about half of the improved stoves were still in use in 1994 (Barnes et al., 1994). Some participants reported that the stoves promoted by the government programme did not save much energy, did not eliminate smoke, and were incompatible with cooking habits. However, other surveys found that recipients did find the stoves were consuming less energy and producing less smoke. Some reported that reasons behind the poor success of the Programme include inadequate quality control and weak monitoring systems, burdensome programme administration, too broad a scope where financial resources were diluted and efforts were uncoordinated (Barnes et al., 1994).

A.2.1.4 **Carbon markets**

Despite the strong potential for investment in bioenergy, the Indian national and state-level policies to encourage carbon market investment in this area are weak, and in many cases non-existent. There is very little being done to create strong investment opportunities for carbon offsets.

One positive development has been India's interest in the 'Programme of Activities' (PoA) under the CDM. Since 2007, the CDM Executive Board has implemented a programmatic approach to the CDM which reduces greenhouse gas emissions through a policy or measure that allows smaller, dispersed project activities to be bundled into one larger programmatic activity that reduces transaction costs associated with many single CDM project activities and also provides flexibility in terms of the number and timing of projects developed under the PoA (Hayashi et. al., 2009). At the policy level, India's Bureau of Energy Efficiency, supported by the GTZ,

²⁷ Often referred to as the National Programme for Improved Chulhas.

is implementing a programme of household level energy-saving light bulbs, which will be bundled under the PoA. The target is to replace 80% of incandescent light bulbs currently used by Indian households. Up to 80 individual projects will be implemented by regional power distribution companies, which will distribute the energy-saving bulbs at the price of the incandescent bulbs. Also through the Indian Bureau of Energy Efficiency, the GTZ is supporting an Indian wide PoA targeting energy efficiency measures in commercial buildings. Other Indian governmental agencies are also looking into doing this type of project bundling. India has so far not begun implementing any PoAs dealing with bioenergy, but there is a lot of potential for household based projects through the programmatic approach, such as household stoves and domestic biogas plants.

There are also some methodological barriers which currently prevent carbon offset investments in efficient cook stoves. The clean development mechanism (CDM) does not currently support cook stove projects unless they replace fossil fuel, which means the wood-fuel stoves predominately used in India are not eligible. This is primarily due to the difficulties in calculating the emissions reductions of the clean stove projects, given that every household is likely to have a different mix of 'renewable' and 'non-renewable' (i.e. unsustainably harvested) sources of wood-fuels. Another obstacle is due to the difficulty in measurement of distributed GHG reductions where reductions are made in very numerous small sites.

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A.2.2 Bagepalli CDM Biogas Programme

A.2.2.1 Summary

The Bagepalli CDM Biogas project is a Gold Standard project that has constructed 5,500 household biogas 2 m³ digester units in the Chickballapur District of Karnataka State, India (A2 figure 1). The project is working in five Taluks within the District: Bagepalli, Chickballapur, Chintamani, Siddalaghatta, and Gudibanda. Each household uses the dung of its cattle to feed the digester to produce biogas for cooking with the aim of replacing inefficient wood fired stoves with renewable and efficient biogas stoves. Greenhouse gas emissions are reduced through reductions in the use of non-renewable biomass for cooking and reductions in fugitive emissions from cow manure. 19,800 tCO₂e per annum are reduced through the project every year.



A2 figure 1: Location of Bagepalli project in India

The project is managed and implemented by the Agricultural Development and Training Society (ADATS), a grassroots NGO. ADATS provides support in the villages through village units of the Bagepalli Coolie Sangha, a 25 year-old membership-based people's organisation formed by small and poor peasant families (landed and landless agricultural labourers) in their respective villages. The project is financed and monitored by Velcan Energy Pvt. Ltd, (VEI) a subsidiary of French-owned Velcan Energy. Velcan provided forward CER finance of €1.1 million for the first seven year crediting period (at € 8.60/CER); this money was used to construct the biogas units and provide support activities. The project was registered under the CDM on 10 December 2005, and began operation in January 2006. The project is now in its 4th year of operation, halfway through the initial crediting period. All 5,500 units have been implemented. The project is meant to save greenhouse gas emissions by avoiding the burning of unsustainably harvested fuelwood (non-renewable biomass) by switching to biogas. Through this, the Bagepalli biogas units are generating 3.6 CERs per annum per biogas unit. The project also aims to increase women and children's health by reducing indoor air pollution, protect the local environment by reducing deforestation, and create employment opportunities in the local communities.

A.2.2.2 Background

Bagepalli is in the semi arid zone of Karnataka, with large variations in the annual rainfall of 560 mm (Ramachandra, 2008). The area is predominately agricultural, with

groundnuts grown on the dry lands, intercropped with gram, maize, mulberry, onions and sunflower. Ragi (finger millet) and a rain-fed variety of paddy is also cultivated. Every fifth or sixth year there is a drought. The average population density of Bagepalli is 1.44 persons per hectare, livestock density is 0.68 cattle per hectare, and total forest cover is >20% (Ramachandra, 2008²⁸). The biogas potential (i.e. the ratio of resources available compared to demand) in Kolar District is good (Ramachandra, 2008). In the Bagepalli Taluk, the literacy rate is 47% in the rural areas, with men at 60% and women at 35% (2001 Census data).

The region is prone to droughts and the more fertile lower areas are owned by landlords, whereas upland areas are owned by 'Coolies' – small and poor peasants. Traditionally, there exists a feudal relationship between middle peasants (many of them former tenant peasants who became landholders after the post-war land reform) and coolies. Coolies have a low and irregular income and rely mainly on wage labour and seasonal migration, and they are further marginalised by the prevailing caste system.

In the five Taluks where the Bagepalli project operates, a few biogas units had originally been built by the government through a programme for providing biogas plants for the poor, called the National Project on Biogas Development (under the National Biogas and Manure Management Programme), but none of these plants are in operation. Implementation was not followed up and no ongoing monitoring or maintenance was provided. The government programme, which provided biogas plants, had been severely reduced with a significant capital shortfall, which prevented the expansion of the biogas programme in India. While the government had provided a subsidy for biogas plants, the subsidy amount was low and the programme was severely limited in the number of units it could provide to each District through the Ministry of Non-Conventional Energy Sources. The programme supported a mere 500 biogas plants in Kolar District in 2005 (Bagepalli Gold Standard CDM PDD, 2006).

While it is unclear how the initial conception of the project idea came about, it is clear that the project was responding to a high demand for such biogas plants in the area, a demand which would not have been met otherwise. Representatives from the Ministry of Non-Conventional Energy helped provide the host country approval for the CDM process. The CDM project helped reduce dependence on government for biogas plant uptake and instead worked through a commercial agreement with Velcan Energy for project financing. In this way the CERs provided a new and innovative approach to project financing. In June 2007, the Bagepalli CDM Biogas Project received the Jury Special Award 2007 from the World Clean Energy Award for its innovative financing solutions using CDM (<http://www.cleanenergyawards.com/top-navigation/nominees-projects/nominee-detail/project/55>).

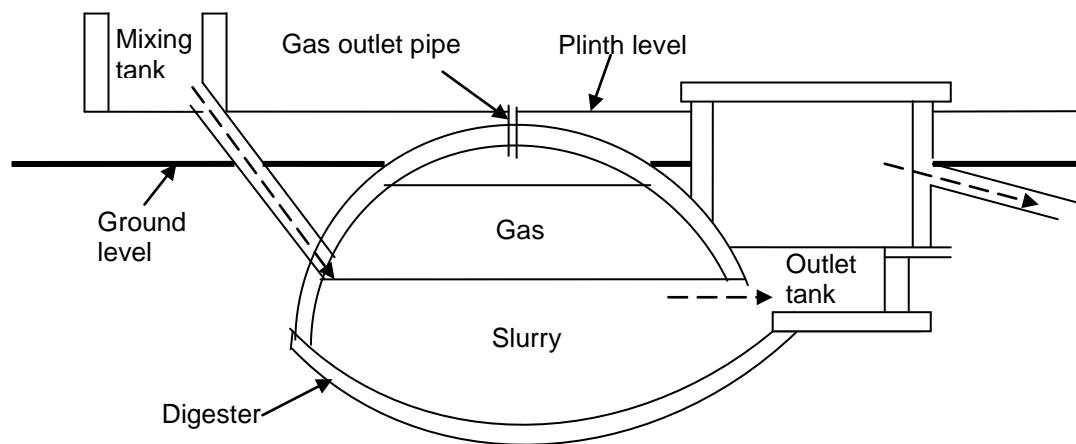
A.2.2.3 The technology

The household biogas plant (Deenbandhu Model) consists of a digester with a fixed, non-movable gas space. Family members load the cow dung²⁹ through an entry point in the ground which goes into the fixed dome (constructed out of bricks and cement), located underground just outside the kitchen. Gas is produced through anaerobic

²⁸ Ramachandra (2008) uses data on livestock residues and demand based on household surveys across Kolar District. Four different scenarios are modelled to compare low production/low demand; high production/low demand; low production/high demand; and high production/high demand.

²⁹ In some households cows are stall fed, whilst in others they are grazing. Data is not available as to the proportion of households adopting these different systems.

digestion of the dung, and is piped into the biogas stove. The pressure from the gas displaces the digested slurry (a form of manure composed mainly of liquids) into a receiving tank which is then used as high quality manure to fertilise crops (A2 figure 2).



A2 figure 2: Components of the Deenbandhu Biogas Plant.

A.2.2.4 Institutional structure

ADATS, the implementing organisation of the project, is a 32 year old comprehensive rural development NGO which works in partnership with the Coolie Sangha, a people's organisation of small and poor peasant families from the five Taluks in which the project is operating (Box A8). Each village participating in the project has a functioning 'Coolie Sangha Unit' (CSU). Each household that is a member of the village level CSUs pays a membership fee called a 'Sangha Tax'. The tax was originally 5% of the family's reported gross income, but is now a lower tax rate based on the family's "honest" income³⁰, and equates to around 2% on average. Because of the poor reach of government provisions to rural areas (and particularly to the very poor members of society), the CSUs provide benefits to the communities either through direct social services or through encouraging the government to act on commitments. Interestingly, membership rates into the CSU increase dramatically when there are droughts – in this way the CSUs are viewed as social safeguards.

³⁰ It is noted that this tax is not truly reflective of family incomes, as members notoriously under report incomes in order to pay a lower fee.

Box 9: Coolie Sangha and ADATS (from Dirk van Esbroeck, 2000)

The Coolie Sangha is a 25 year-old membership based people's organisation formed by small and poor peasant families (landed and landless agricultural labourers) in their respective villages. There are currently around 500 village level Coolie Sangha Units involving around 14,000 families.

Coolie Sangha has political motivations in terms of trying to ensure that the government delivers on its commitments at local levels. However, Coolie Sangha implements a range of activities, including for example children's education, community and referral health and activities to support young widows and deserted women. According to ADATS, which has been instrumental in establishing and supporting Coolie Sangha, the CSUs have resulted in huge increases in child schooling and improved health systems in areas such as cervical cancer (a system which the World Health Organisation has replicated). Regular meetings are held within villages for all Coolie Sangha members and separate meetings are held by women members.

The Coolie Sangha is self-financed through a system of Sangha Fund contributions made by the member families which equate to around 2% of annual income. There is over 70 million rupees in the Sangha fund. The organisation now has substantial political weight both locally and nationally.

The Agricultural Development and Training Society (ADATS) was established in 1978 by a group of social activists who are still leading the organisation. From its inception, it aims at improving the position of the coolies, defined as people who do not employ other people. Over the years, ADATS has been able to learn systematically from its experience and gradually develop and fine-tune its approach. Presently it follows a phased strategy consisting of four phases – formation, formalisation, consolidation and withdrawal – through which so-called coolie sangha units (CSU. groups of coolies at the village level) are supported until they become independent from ADATS. The first three phases each extend over a period of about 3 years; the fourth phase is not time-bound. In this last phase, CSU and ADATS continue to co-operate.

While ADATS functions independently of the biogas CDM project, it is now intricately connected with the project activities. Each "Area" (a clubbing of 30-40 villages) has a team working with the biogas units. The Area Team consists of a Field Worker, a Case Worker, and a Mahila Trainer. Village CSUs hold two types of meetings – one is a mixed weekly forum for all household members, and the other is the Mahila meeting, just for female members. Village level Coolie Sangha Units (CSUs), and especially the Mahila Meetings, play a vital role in selecting appropriate participating families. The CSU has applied selection criteria for households to participate in the biogas programme. Minimum requirements include:

1. Owning a house
2. Having at least 10 ft sq. of space for the biogas unit
3. Owning a cow and a calf
4. Being a member of the Coolie Sangha, or agreeing to the village CSU monitoring their biogas units for 21 long years

A.2.2.5 Monitoring and maintenance

ADATS runs a state of the art monitoring system for the Coolie Sangha and the CDM programme. The ongoing monitoring of the project is done by CS members. All information on both secondary as well as primary stakeholders is entered into a

computerised database and provides clear identification of everyone. Information is constantly collected by the CSUs throughout the year. The number of operating biogas units and its average yearly operational hours are constantly being monitored. The village-level volunteer does a daily monitoring which gets fed into the computerised monitoring solution once a month.

Maintenance issues are immediately identified (flagged by the computer when there is an extended “not used” input) and attended to by the ADATS Area Team and the mason who actually built the unit in the first place.

Emergencies arising from the Participating Family losing a cow or fodder (illness, death, haystack catching fire, etc.) and thereby not being able to operate the biogas unit are dealt with, on the spot, by the village CSU. A temporary/permanent solution is identified and everyone pitches in to get the family back on its feet as soon as possible.

This system of daily monitoring, maintenance, and, most importantly, *the immediate recording of these into a digitised monitoring system*, provides a sound basis for the annual verification undertaken by the designated operational entity (DOE) which verifies the CDM project. Since census data is generated on every biogas unit, as opposed to just a sample needed for PDD approved verification of CER generation, DOE verification is relatively easy.³¹ In the first verification of emission reductions generated, the DOE reduced only 2% of the claimed CERs.

It is clear that monitoring processes to keep a continuous track of each biogas unit's performance were not designed merely to meet UNFCCC standards. Rather, the primary focus is to ensure that each of the 5,500 participating families has a biogas unit that functions daily, for 21 years. This is likely to help ensure that the project is sustainable over a long time period. The large role that the NGO plays in monitoring usage may decrease ownership of the project by the local community. However, the fact that the next Biogas CDM Project registered for adjacent villages in Chickballapur District is actually owned by the Coolie Sangha itself, offers some evidence that communities themselves are playing a role in the development and implementation of such projects.

A.2.2.6 Opportunities and risks

Job creation in the biogas projects is limited mainly to masons during the construction phase. Since family labour is used, no additional wage labour is created. The Bagepalli project trained and created work for approximately 123 local masons with labour supplied by the households.

The primary and direct benefit is that households are provided with free biogas units with consistent monitoring and reliable maintenance. The only cost to the family is manual labour during the construction of the units.

The biogas plants reduce smoke in the kitchen which means reduced health risks for women and children. The plants also increase time availability for women who no longer need to spend their time collecting fuel wood. One beneficiary in Karkur village of Bagepalli Taluk informed us that she now has significant time savings given that she no longer spends 15 hours per week collecting fuel wood (which was collected from the government forest). Velcan Energy's annual monitoring report (2007)

³¹ Other monitoring requirements found in the Monitoring Plan section of the PDD are carried out on a limited number of randomly selected units.

reports that 97% of total fuel wood consumption of recipient households has been replaced by biogas. Currently, only 3% of fuel wood is being used (but this wood is reported to be from a renewable source). Time savings also occur in that cooking time is faster than with wood-fired stoves.

The slurry manure produced as a by-product of the biogas is used as an enriched fertiliser and considered superior to farm yard manure in terms of its NPK content. While in some cases the application of slurry can reduce the use of chemical fertilisers, most households in this area are too poor to buy chemical fertiliser. Instead, the slurry is used as a supplement to enrich farm yard manure. An evaluation study of biogas conducted by the Government of India showed that over 70% households perceived improvements in crop production as a result of application of slurry manure in the field (GOI, 2002).

In theory, such projects should also improve natural capital through the preservation of forest ecosystems. Approximately 75% of all biomass in the Kolar District (where the Bagepalli project is being implemented) has been estimated as coming from unsustainably harvested sources.

While it was not possible to conduct a wealth ranking of the villages, by the very nature of the project it is clear that those who are benefiting are not the 'poorest of the poor'. This is because the minimum requirements to participate are that the families own a 'few cows'. While there may be an opportunity for those without cattle to collect dung from livestock grazing areas, installation of a biogas unit for a family without cattle is rare. This implies that, while the rural poor (and in particular the Coolie caste of rural labourers) are the beneficiaries, those who are completely without assets (such as cattle) are excluded. It is however unclear how many households in the five Taluks are without livestock.

From an **equity** standpoint, the project, through the Coolie Sangha model, works to elevate the status of women. Through the Mahila meetings, ADATS and Coolie Sangha encourage their policy of 'positive discrimination in favour of Coolie women' (ADATS website).

From a political/institutional perspective, it is clear that ADATS has strong connections to national policy channels. National and regional policy makers have been voted in through the Coolie Sangha system. ADATS is also growing its international outreach through the establishment of the Fair Climate Network, a North-South information sharing network to help assist NGOs looking to set up CDM projects. There is however a risk that the politics surrounding the Coolie Sangha approach could potentially conflict with local political institutions in some cases and create issues for the functioning of the CDM project. For instance, there is a high dropout rate of the Coolie Sangha members; this is because some of the Coolie Sangha Units have stopped functioning in certain villages, perhaps because villagers have lost interest or because of political opposition (generally from more conservative members who do not agree with the focus on lower caste members or focus on gender equity). While it is reported that these dropout rates and non-functioning CSUs in certain villages do not affect the CDM project as monitoring activities continue regardless, it is not entirely clear what this impact may have on the functioning of biogas units in areas without a functioning CSU.

A.2.2.7 Carbon finance

The project has been developed using a small-scale CDM modality which is applicable to projects that reduce emissions by sources and directly emit less than 60 kilotonnes of carbon dioxide equivalent annually. Small-scale CDM projects benefit from simplified procedures and are applicable to smaller projects than standard CDM projects, with the aim of making greater contributions to sustainable development by allowing smaller producers to benefit from the market. The Bagepalli biogas project has also received the Gold Standard CDM certification, meaning the project meets stricter criteria than required for conventional CDM certification. The Gold Standard is the world's only independent standard for creating high-quality CDM projects and requires that projects meet strict criteria relating to social sustainability and development benefits and positive local environmental impacts.

In the Bagepalli project, each biogas unit reduces emissions by about 3.6 tonnes per annum, totalling 19,800 tonnes for the 5500 units. The exact ERPA volume, over 7 years, is 122,000 CERs due to reduced emission reductions generated in the first year. The effective price per CER at which ADATS forward sold to Velcan Energy is € 9.01 (roughly \$13.50³²). In return, ADATS received € 1.1 (\$1.65) million from Velcan for the forward sale of the CERs generated in the first 7 years (the exact amount received from Velcan Energy, as per ADAT's audited books, is INR 61,933,692).

ADATS has spent a total of INR 60,924,181 on the project from the date of its commencement. This is slightly less than the € 1.1 (\$1.65) million received from Velcan. Therefore there is an unspent balance of Rs 1,009,511 which ADATS keeps aside for repair and maintenance costs for the next few years.

Velcan Energy sold its CERs for USD 33/CER (€ 22/CER). That price, less the \$13.50/CER (€ 9.01/CER) they paid ADATS, would be Velcan's profit.

The biogas unit costs are met entirely by the upfront financing. The cost to construct each biogas unit is roughly 10,700 INR (including costs to labourers). Other funds are used to provide support activities. Any remaining funds are placed in a long-term Fixed Deposit to generate funds used to maintain the 5,500 units and keep them in good condition. A small amount of the funds (approx. 250-300 INR per year) will be used for ongoing maintenance.

ADATS does not charge administrative overheads on the CDM projects implemented, nor does it take any money from the carbon sales. ADATS is funded from other sources, such as through European Union development aid. It has been agreed that the profits will go to the investing company in the first seven year crediting period, but that after this period, profits from carbon will go to the women in the Coolie Sangha units if the crediting period is renewed. This implies potentially huge incomes for these groups in the future. The detailed operation of this system has yet to be worked out.

Given that the project is in its fourth year, the direct monetary benefits have not yet been delivered to the community. While the amount that would go to the households is not yet established, it is likely that each unit owner would sell 3.56 CERs per unit per annum. Assuming a price of \$15 per CER (a conservative estimate for Gold Standard CDM energy projects in the carbon markets), each household would receive \$53.4 (or 2,670 INR) per year. While income statistics for Kolar District are not available, it is likely that average household income for the rural poor is around

³² Exchange rate €1 = \$1.5 as 1 December 2009

15,000-20,000 rupees per year (roughly USD 300-400). Based on this back of the envelope calculation, this demonstrates that family income would increase by roughly 13-17% with the income of revenue from CERs.

The carbon finance aspects of these projects have resulted in some new risks for project participants in terms of liabilities relating to the delivery of emissions reductions.

Carbon traders and some carbon standards will usually operate their own insurance mechanisms, such as spreading risks between a portfolio of projects and withholding a 'buffer' of carbon from sale, in case credits are not generated as predicted. These systems are in place in all of the bioenergy projects reviewed here. However, given the incentives to deliver as many credits as possible, risks could still arise in terms of the burden of liability that is placed on sellers to use and maintain technologies. In biogas projects, some of the main risks include the failure of the technology (for example, leaks forming in the lining of the digesters) and the loss of fuel (particularly through the death of cows). In the Bagepalli project there are provisions for maintenance built into agreements with the implementing NGOs, and maintenance staff are employed to make regular check ups. The risk of cow loss is dealt with through livestock insurance and villagers breeding young cows. In the Bagepalli project, the Coolie Sangha will apparently help with replacing cows or providing dung for the digesters. Whilst households are expected to maintain their use of the biogas units, the responsibility for emissions reductions lies with the implementing NGO rather than the farmers themselves. It is not clear what would happen if households voluntarily opted out of using their biogas units, though this seems an unlikely scenario as project participants appear to be happy with their systems. However, such a situation could occur, especially in areas closer to cities where land price inflation could incentivise farmers to sell their land. This is a risk that has been considered in due diligence procedures for the Bagepalli project but was considered negligible given the distance from major urban conurbations.

The additionality criterion of the CDM requires that, without the revenue from CERs, the project would not have been financially feasible or would not have had a high enough internal rate of return to make the project commercially attractive. In other words, the project would not have been financially possible without the carbon finance. By this analysis carbon finance is therefore indirectly responsible for all of the benefits (and risks) that have been created by the project activities.

The project also provided some interesting lessons in understanding potential for **long term institutional sustainability**. The project in many ways can be seen as a model for how to work through existing, well established and trusted institutions. Much of the strength of the Bagepalli CDM project lies in its ability to work through the Coolie Sangha and ADATS institutional system and structure. The incorporation of CDM project activities helps to develop new areas of the existing system. The high transparency, accountability and ongoing monitoring of the project and its demand-driven nature that defines the ADATS model will help to ensure the long term sustainability of the programme.

A.2.2.8 **Conclusions**

The carbon finance component of the Bagepalli biogas Gold Standard CDM project is offering both robust and sustainable benefits to the biogas beneficiaries. The open and transparent Carbon Revenue Sharing Agreement wherein all revenues go to the end user will provide substantial monetary benefits to households in the future. However, it is unlikely that the poorest members of communities are benefitting,

given the minimum criteria needed to be a project beneficiary. The project's strength lies in the community association fostered through the institutional presence of the Coolie Sangha. This may be a vital component to make a truly participatory and grassroots CDM project possible and may make it difficult to replicate.

Another factor that may make replication difficult is the high price offered for the CERs (€23/CER, roughly \$34/CER) which is hard to achieve for many CDM projects. Financial returns are normally likely to be much less. Securing the forward purchasing of CERs tends to be difficult for riskier CDM projects. Normally, investors are only likely to provide the upfront finance if they are certain there will be certified emissions reductions. Whether perceived or real, there is still a level of risk associated with small-scale, dispersed biogas projects.

Aside from the sustainable source of finance without which the project would not be possible, perhaps the most significant indirect impact of the carbon finance is the rigorous and constant monitoring required of the project. The CDM is fostering a 'monitoring culture' among the community-based NGO and helps to reinforce the already strong institutional structure that exists.

There may be some risk in the longer term sustainability (e.g. after 21 years when crediting can no longer be extended) in providing direct monetary benefits to the households. Households may get used to this inflated income level and there are risks associated with a drastic drop in income levels.

A.2.2.9 References

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A.2.3 SKG Sangha Family Biogas and Vermicompost Units project in Hassan District, Karnataka

A.2.3.1 Summary

The Hassan Composite Vermicompost Biogas Project is a Voluntary Gold Standard project which has been implemented by a local NGO called SKG Sangha. It has involved the construction of 500 household biogas digesters and vermicompost units in the Hassan District of Karnataka State, India (A2 figure 3). The aim of the project is to improve the living conditions of the rural Hassan households, while simultaneously reducing pressure on forests and reducing GHG emissions. Each household uses the dung of its cattle to feed the digester to produce biogas for cooking. In addition to the biogas digesters, the project also provides each household with vermicompost units; families can use the slurry from the biogas tank, along with other agricultural residues, to develop a high quality organic fertiliser for use in the fields. Both the biogas units and the vermicompost units reduce emissions. The project is micro-scale with projected emission reductions of 2,668 tCO₂e per year. The project received an Ashden Award for sustainable energy in 2007.

A.2.3.2 Background and context

The Hassan district is located in the Southern Indian state of Karnataka. It is divided into eight taluks and 2369 villages. The geography is mixed between the mountainous region in the west and southwest and plains region in the north, south and east. There are some areas of degraded forest ranges in the central part of the district. The area is predominately agricultural, with coffee, rice, ragi, vegetables, coconuts, chilli and ginger crops grown. The pressure on forest resources in Hassan district is very high. Roughly 70% of households in the area own livestock, and 60% of the community are landholders.



A2 figure 3: Location of SKG Sangha Family Biogas and Vermicompost Units project

The project is being managed and implemented by SKG Sangha, an NGO founded in 1993 and implementing similar projects across Karnataka. They are working with a French not-for-profit organisation called Good Planet which has undertaken most of the design of the carbon project (involving calculations on the use of non-renewable biomass and monitoring methodologies to monitor use of the biogas units). SKG Sangha has a local office in Hassan which coordinates the project and works with six other local offices. Staff members work voluntarily, though they employ local coordinators to monitor the project on a monthly cycle. The Coordinator records any

breakdowns or problems with the function of the unit and is responsible for repairs up to 10 years after the unit has been installed, which is the length of the contract between SKGS and the households. Good Planet visits the site every six months to carry out more detailed monitoring on the number of cattle per household, number of hours spent using the biogas unit and any use of traditional firewood stoves.

A.2.3.3 **Technology**

The technology used for the biogas digesters is the standard Deenbandhu Model, almost identical to that being implemented in the Bagepalli project. It consists of a digester with a fixed, non-movable gas space. Each 'Deenbandu' digester is built on-site, starting with the excavation of a 4 metre diameter hole, about 2 metres deep in which a concrete floor is cast. A brick outer wall is built up, with each circular row of bricks gradually leaning inwards to form a dome. A gas pipe made of galvanized steel is held in place in the centre by pieces of brick and mortar, and takes the gas to the biogas stove in the kitchen through an HDPE pipe. The feedstock, which is mainly cow manure mixed with an equal amount of water, some of which is kitchen wastewater, is collected in an inlet tank at ground level, and flows under gravity into the digester vessel. As the feedstock flows in, an equal volume of digested residue (slurry, a form of manure composed mainly of liquids) is displaced into a ground level reservoir at the outlet. Gas is produced through anaerobic digestion of the dung, and is piped into the biogas stove. All materials used are available locally, except for the gas burners and HDPE piping which come from elsewhere in India.

However, the vermicompost unit is an additional feature of the system. This consists of a set of raised concrete tanks sheltered with corrugated iron that can be used for mixing effluent from the biogas digesters with straw and earthworms. The output of the vermicompost unit is organic nutrient-rich fertiliser that can be used either directly by households for agricultural purposes or sold to other farmers.

A.2.3.4 **Institutional structure**

SKGS has a main office in the Kolar District and an office in each Taluk in which the organisation operates (there are seven Taluk in Hassan) with field staff comprised mainly of local villagers. Interestingly, the management team is working entirely voluntarily. They all come from well-to-do backgrounds and are working as 'professional volunteers'.

In developing the Hassan project, SKGS worked with Good Planet, a French non-profit organisation that purchases the offsets from SKGS. Some of the Good Planet employees, along with a few French students, were in charge of developing the baseline survey for the project area, selecting the villages where the project would be implemented, and also developing the household selection criteria. The selection criteria included:

- A minimum of four cows per family, in order to deliver a sustainable amount of dung to operate the biogas unit (if the family owned hybrid cows, a minimum of two was required as they consume more and therefore generate more dung);
- A maximum landholding of 5 acres per family (in an effort to support small landholders);
- The family consumed a substantial amount of fuel wood for use in the conventional stove.

The units were installed across 60 villages in the Hassan District during a six month period in 2006. For each household that receives the biogas and vermicompost unit, there is an agreement between SKGS and the woman in the household. Each biogas

digester unit is numbered and labelled with SKGS and Good Planet in order to keep records of which units belong to which households.

A.2.3.5 Opportunities and risks

There are several important benefits associated with the SKG Sangha biogas and vermicompost voluntary Gold Standard project. The primary and direct benefit is that households are provided with biogas and vermicompost units. Farmers have to pay 25% of the construction costs, equivalent to around 8,000 rupees. The price subsidised by the VERs is far greater than the subsidy originally granted by the government, reducing the cost barrier to households. This has some positive implications in that it increases ownership and therefore maintenance of the systems³³ but is a significant expense compared to average annual household income of farmers in the area, which is around 20,000 rupees. Income of up to 12,000 rupees per year through the sale of vermicompost has also been estimated in the project design phase, but at present none of the farmers appear to be selling their compost and there does not appear to be a market for it. Currently, SKG Sangha is working with the Agricultural University of Bangalore to independently test the value of the fertilizer. There are some signs of decreases in the use of synthetic fertilizer and fuelwood purchases since the start of the project, which could reduce household expenditure by a few thousand rupees each year. Cost savings are also likely to have been achieved because households have to purchase less fuelwood and kerosene.

However, there are also some equity implications relating to how the project has been established. The project chose to target small landholders (those with landholdings under five acres) in order to provide benefits to those who have fewer assets. However, given that the households also need enough cattle to produce sufficient dung, ample space to build the biogas units and vermicompost structures, and enough liquidity to cover the 25% of construction costs, it is clear that the beneficiaries are not the 'poorest' and in fact seem to have substantial incomes. Some of the farmers we spoke to had net incomes of roughly 50,000 INR per year. The households who are completely without assets will not pass the selection criteria.

There have also been some economic benefits beyond the households. The project has created work for masons and labourers but over a very short period (exact figures are not known). Whilst SKG Sangha runs training courses for local masons it was reported that it has been difficult to employ local masons to construct the plants because there tend to be too many interruptions to their work (e.g., masons leaving the construction project for weddings and other family affairs). Therefore, they prefer to hire non-local masons. In this case, the masons hired for construction come from a neighbouring state (Andhra Pradesh). This may have been a missed opportunity in terms of developing local skills.

In theory, the project should improve natural capital through the preservation of forest ecosystems. 54% of biomass in the Hassan District (where the SKG Sangha project is being implemented) has been estimated as coming from unsustainably harvested resources³⁴. The effluent from the digesters may also have environmental benefits as an organic fertiliser, which is more enriched with nitrogen than fertiliser from more standard manure pits used in the region. The vermicompost process can also

³³ A fact commonly associated with the success of household biogas systems. See for example http://practicalaction.org/practicalanswers/product_info.php?products_id=42

³⁴ Defined by the amount of biomass used from natural forests minus the replacement rate of such forests by natural regeneration.

increase the value of the fertiliser, but the benefits are thought to be much lower than synthetic fertiliser. Those farmers interviewed did not indicate that they had decreased their use of synthetic fertiliser, though most of the vermicompost units are very new, so it is difficult to assess their value.

The biogas plants eliminate smoke in the kitchen which means reduced health risks for women and children. The plants appear to increase time availability, particularly for women household members who spend less time collecting fuel wood. There are of course time requirements involved in collecting dung to feed the digesters that need to be taken into account, but it appears from the interviews conducted in this study that such requirements will be significantly less than those involved in collecting wood, given that in many households, cows are stall fed or under nearby tethered grazing so dung is in close proximity and readily available for collecting. Time savings also occur, in that cooking time with biogas stoves is faster than with wood-fired stoves. While wood-fired stoves need constant surveillance in order to keep the fire going, biogas stoves require very little time and attention when cooking. The women can attend to other duties, such as house cleaning or child education.

The project has relied on the local coordinator working through village structures for most coordination activities, though groups only appear to have been convened for the initial stakeholder consultations. Agreements for plant construction are signed by the female head of the household (an aspect of the project that is promoted). Women are targeted as the main beneficiaries of the biogas stoves, contributing to decision power of women in the household. Additionally, women were intended to be the main beneficiaries of the income generated from selling the vermicompost. In practice they still appear to have been involved in quite a 'tokenistic' way and have had a relatively small role in decision making. For example, in one household the female head of the house had not been involved with any discussions with the coordinator prior to project implementation.

A.2.3.6 **Carbon finance**

The Hassan project was registered as a voluntary Gold Standard project in 2008 with construction ongoing from April-October 2008. The project started to claim carbon credits from the beginning of 2009.

In the SKG Sangha project, each biogas unit reduces emissions by about 5.3 tonnes per annum, totalling 2668 tonnes per year for all of the units. SKG Sangha has received upfront around \$360,000 for carbon which will be sold for the first five years of the project, with carbon sold at around \$29 per tonne (roughly €250,000 at €20/VER to cover five years). This has covered approximately 75% of the construction costs for 500 units, with the other 25% (approximately 8000INR) covered by households. The costs for building and maintenance covered by SKG Sangha include:

- Build cost (biogas and vermicompost, including labour) minus the 25% by communities = 22,500INR = \$450 per unit = \$225,000 total cost (for all 500 units)
- 7,000 INR for maintenance per biogas unit over 5 years = \$150 = \$75,000 (for all 500 units)
- Total costs = \$300,000

Because there is a surplus in revenue from the carbon sales, the extra money will be used for the ongoing validation, verification, monitoring and maintenance of the project after the initial five year contract agreed in the emissions reduction purchase

agreement (ERPA – box A9). According to Action Carbone³⁵, the crediting period for the project is seven years, which can be renewed twice by updating the baseline scenario, totaling 21 years of the project's potential lifetime. Alternatively, projects can apply for a 10 year non-renewable crediting period, meaning the project would end permanently after the 10th year. None of the money from carbon finance goes directly to the recipients.

Box A9: Details of the emission reduction purchase agreement (ERPA)

In the emissions reduction purchase agreement (ERPA) between SKGS and the French investors, it states that the investors will receive VERs for a period of five years (based on the demand for 100 tonnes of CO₂e offset, which takes five years to complete). In this case, the crediting period is based on the demands of the investor who want to offset by a certain number of tonnes. However, SKGS has agreed that they will continue to monitor and verify the emissions reductions for ten years, independent of the ERPA with the French investors. To complicate matters, the agreed crediting period with the Voluntary Gold Standard is seven years; this is due to the manner in which the Voluntary Gold Standard conducts its renewal process for project cycles (a project can decide to add on another seven year crediting period at the end of the first crediting period, whereas if your crediting period is for ten years, there is no chance for renewal).

Cow ownership is a critical issue which also affects the baseline emissions from households and illustrates how carbon offset projects require baseline emissions to exist, which can have direct equity implications. This has important implications for the eligibility requirements in the carbon project and has affected the equity of biogas implementation across the villages involved.

Because carbon credits are being sold from carbon biogas projects for a set period of time (ten years in the SKG Sangha project), rigorous monitoring systems are required. This may be a key benefit of such carbon projects, as both the build quality and ongoing maintenance is more likely to be checked. One problem with this system is that most of the monitoring of the project is being carried out by Good Planet which may limit opportunities for local skills development within the area. A similar concern surrounds the initial stakeholder consultation, which appears to have been led by Good Planet and carried out in an ad hoc way. It was reported that the selection of eligible houses was decided by the French project developer rather than SKG Sangha. Some beneficiaries reported that they were not invited to or at the initial stakeholder meetings. This approach may of course have reduced the risks of bias had the local coordinator selected houses, but it may also imply that consultation was not necessarily representative across all of the project areas.

Carbon traders and some carbon standards will usually operate their own insurance mechanisms, such as spreading risks between a portfolio of projects and withholding a 'buffer' of carbon from sale, in case credits are not generated as predicted. However, given the incentives to deliver as many credits as possible, risks could still arise in terms of the burden of liability that is placed on sellers to use and maintain technologies. In biogas projects, some of the main risks include the failure of the technology (for example, leaks forming in the lining of the digesters) and the loss of fuel (particularly through the death of cows). In the SKG Sangha project there are provisions for maintenance built into agreements with the implementing NGOs, and maintenance staff are employed to make regular check ups as described above. The

³⁵ www.actioncarbone.org/en

risk of cow loss is dealt with through livestock insurance and villagers breeding young cows.

It is not possible to tell what risks SKG Sangha are exposed to if they cannot deliver the projected emissions reductions. The same is true for the households involved, where it is not clear what would happen if they were to opt out or sell their land. There does not appear to be any formal documentation of the agreement between the beneficiaries and SKGS or Good Planet and none of the interview respondents were clear on the details surrounding the project agreement.

A.2.3.7 **Conclusions**

The project is clearly providing benefits on a number of fronts to the households involved. It is too early to tell how great these are, but they may be lower than projected given that a significant proportion of benefits are meant to be from sales of vermicompost, for which there does not appear to be a large market at present. The project also fails to include the poorest households, who are least likely to own the cattle necessary to feed a biogas unit.

Carbon finance has played a major role in subsidising the units, and it is unlikely that they would have been built without this. Households have to pay quite a lot for installation, which may increase ownership but they will not receive any direct carbon payments in the long-run. This raises questions about where the additional carbon finance will go after costs have been paid back. It is also unclear how risks such as non-delivery of emissions reductions or sales of property are dealt with. It is possible that households or SKG Sangha could be exposed to new risks.

The project includes monitoring and maintenance systems that appear to be longer term and more thorough than government-led biogas dissemination projects. This is directly attributable to the fact that this is a carbon project and could contribute to better sustainability in the long run. However, there are some concerns surrounding how these systems and other institutional elements have been established and are being run. There is quite heavy involvement from the external project developers, Good Planet, whilst SKG Sangha plays less of a role; the digesters were built very rapidly by labourers from a neighbouring state; and consultation and selection processes appear to have been quite ad hoc. All of these factors may affect the institutional sustainability of the project.

A.2.3.8 **References**

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<http://unesdoc.unesco.org/images/0015/001587/158792EB.pdf>

A.2.4 Malavalli 4.5MW biomass power plant

The Malavalli 4.5MW power plant is a Clean Development Mechanism registered carbon offset project located in rural Mandya District, 125km from Bangalore in Southern India. The plant generates electricity by burning crop residues from surrounding farms, avoiding greenhouse gas emissions from fossil fuels (usually coal) that would have been used to provide electricity in such an area. Approximately 20,000 metric tonnes of CO₂ equivalent per annum are calculated to be avoided by the plant. Electricity from the plant is delivered to the national grid and distributed to around 40 villages in the vicinity of the plant. Benefits to local communities arise from both the electricity delivered and a new supply chain that has been established to deliver agro-residues to the plant. The plant has also been certified by the Gold Standard which exists to assure carbon buyers that the project is making greater contributions to environmental and social sustainability than standard CDM projects.

A.2.4.1 Overview and history of the project

The Malavalli Power Plant was developed between 1997 and 2000, and began running in 2001. It was developed by Malavalli Power Plant Limited (MPPL), a power company which focuses on developing bioenergy projects for producing electric power. The plant was constructed with the objective "to showcase an innovative way to convert seemingly worthless biomass residues into a valuable energy source that contributes to sustainable development in rural areas by creating additional revenue streams for local farmers." (CDM PDD 2006) It was registered as a Clean Development Mechanism (CDM) project in 2006 and was the first project in the world to generate Gold Standard certified emissions reductions. It is also one of few Indian biomass power plants that systematically uses agricultural residues other than those from mills (e.g. rice mills).

Since the development of this pilot project, MPPL's activities have expanded. A sister company, Green Planet Energy Pvt. Ltd. supported by GTZ, is registering a CDM Programme of Activities (PoA) for 600 MWe of Modular Biomass Power Plants in India. Green Planet Energy Private Limited is to invest 9.6 billion rupees (US\$228/€145 million) on setting up 14 biomass power projects in the Indian state of Punjab. Proposed under the so-called 'Agri-Mega Project Scheme' of the Punjab government, the company has planned to generate 147 MW of biomass-based power in the state with estimates that the project will provide direct employment for 3,000 persons and indirect employment for more than 7,500 people. MPPL is also promoting the development of an SEZ (Special Economic Zone) at Channai in India with a mission to be a 'catalyzing force' that propels the holistic growth of the Renewable Energy Industry in India and thereby offer "mainstream" options to future energy needs.

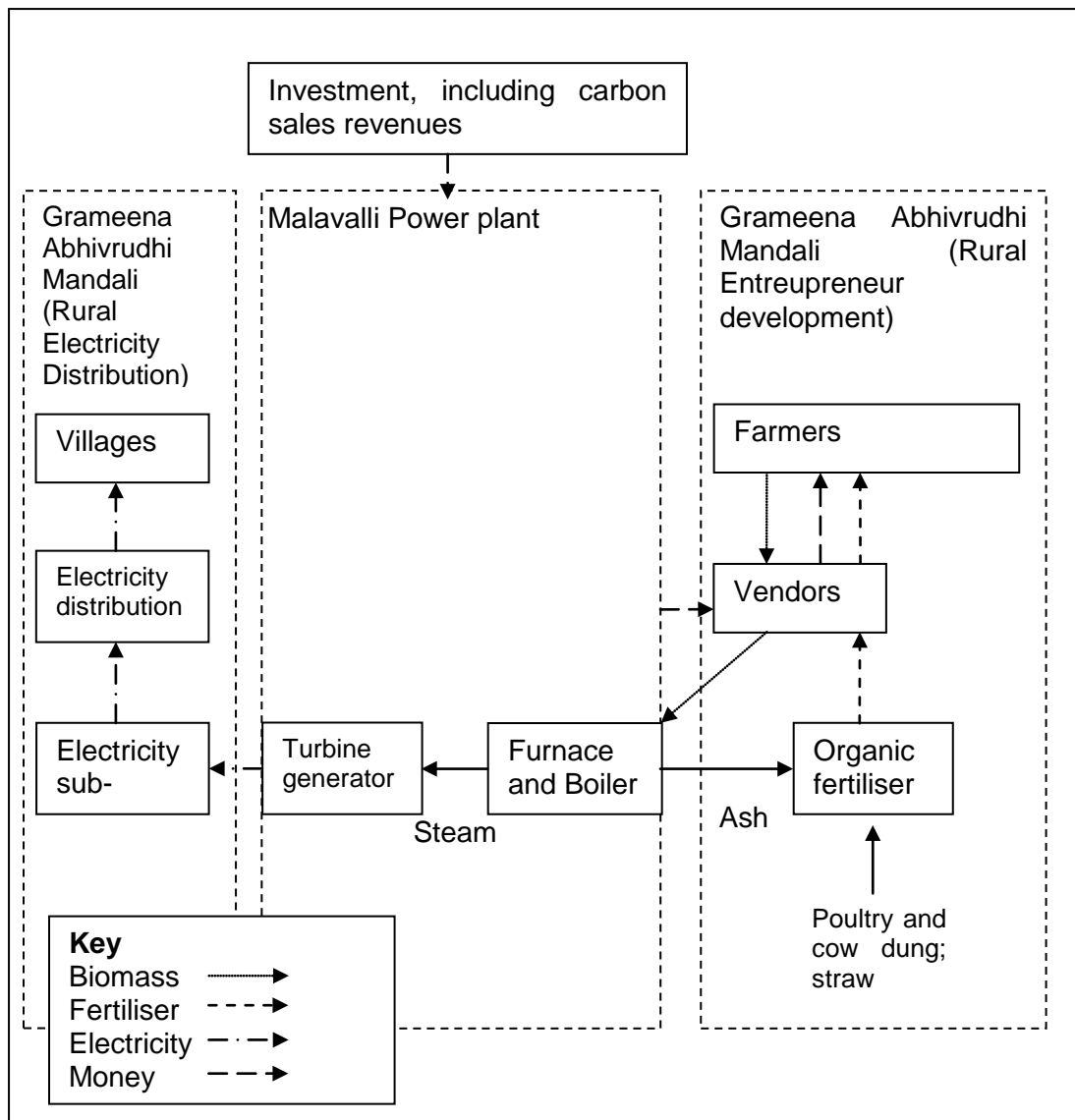
The Malavalli plant generates electrical power through the 'Rankine Cycle', in which heat from combustion is converted into steam and then electricity. There are seven main steps in the power generation cycle:

- 1. Collection and transport of biomass:** Biomass is collected from farms surrounding the plant, up to a 150km radius, though the bulk of material comes from a 15km radius. 'Primary' feedstocks (80% of the total fuel) collected from fields include sugarcane trash, coconut fronds and woody branches and toppings. 'Secondary' feedstocks (20% of the total fuel) which have to be purchased from local industries include rice husks, corn kernels and sawdust. These are collected by a system of vendors and delivered to the plant continuously. At the time of the fieldwork (June 2009) around 20

trucks were delivering to the plant each day. Each truck carries 2.5-3 tonnes of sugarcane trash or 5-6 tonnes of coconut fronds. The plant requires around 150 tonnes of feedstock per day.

2. **Shredding of biomass:** The biomass is shredded on arrival at the plant to ensure that it is of a size that maximises efficiency in combustion.
3. **Delivery of biomass to combustion chamber:** Biomass is delivered to the combustion chamber by conveyor belt, where it is burnt to produce heat for a boiler.
4. **Steam turbine:** The steam produced is used to power a steam turbine running at 8200 revolutions per minute (RPM)
5. **Electricity generation:** The steam turbine is connected to an electricity generator
6. **Delivery of power to the electricity grid:** The plant is connected to a local electricity sub-station. This provides electricity for approximately 40 villages in the area. It is unclear what proportion of the energy provided is coming from the biomass plant.
7. **Ash collection and fertiliser production:** The waste ash from the combustion chamber is continuously removed and delivered to an on site organic fertiliser production facility. Here it is mixed with 50% cow dung and dry biomass, to produce manure. Local farmers can collect this for free.

The plant is designed with gross output of 4.5 MW and hence capacity to export 4 MW to the electricity grid, after utilisation of 11% generated power as auxiliary power consumption. According to MPPL the plant has established Boiler availability of 87.71% and combustion efficiency of 76.54% while firing close to 70% of low density crop residues. The Boiler efficiency is impacted by the characteristics of the Biomass Feedstock (primarily low density crop residues) on account of varying factors of size (post shredding), moisture (post sun/air drying) and consistency of feed rate (linked to availability of feeding labour). The Boiler's availability is a function of planned/forced outages (which are relatively higher due to the slagging/ corrosion impact from firing low density crop residues as primary fuel) as well as the 11 KV grids in rural India which are subject to frequent failures).



A2 figure 4: Institutional structure of the three main parts of the Malavalli supply chain.

A.2.4.2 Institutional structure

One of the key features of the Malavalli plant is the institutions that are used to ensure that it runs efficiently (A2 figure 4).

In addition to private capital which is invested in MPPL, a not-for-profit social organisation called GAM (Grameena Abhivrudhi Mandali) is involved. GAM's role in the project has evolved over time. It originally started as a community organisation in Kirugaval, but has now grown into a formal organisation, headed by the director of MPPL. In the initial stages of the project, GAM took a Business Process Outsourcing (BPO) contract from the local Distribution Utility MESCOM, for a five year period from 2004, to showcase a model for Decentralised Management of Rural Electricity Distribution. Up to March 2005 GAM performance was deemed satisfactory and MESCOM paid performance incentives to GAM. In April 2005 a new Distribution Utility, CHESCOM, was created out of MESCOM and, according to MPPL, the new management of CHESCOM neither had the vision or the commitment to support this Pilot Project. Between April 2005 and February 2008 CHESCOM only released payments to GAM in Feb/March 2006 and thus effectively starved the project of

funds. This part of the project was subsequently terminated and through arbitration proceedings chaired by the Principal Secretary Energy, Government of Karnataka, a settlement was arrived at that CHESCOM would pay dues to GAM for work done.

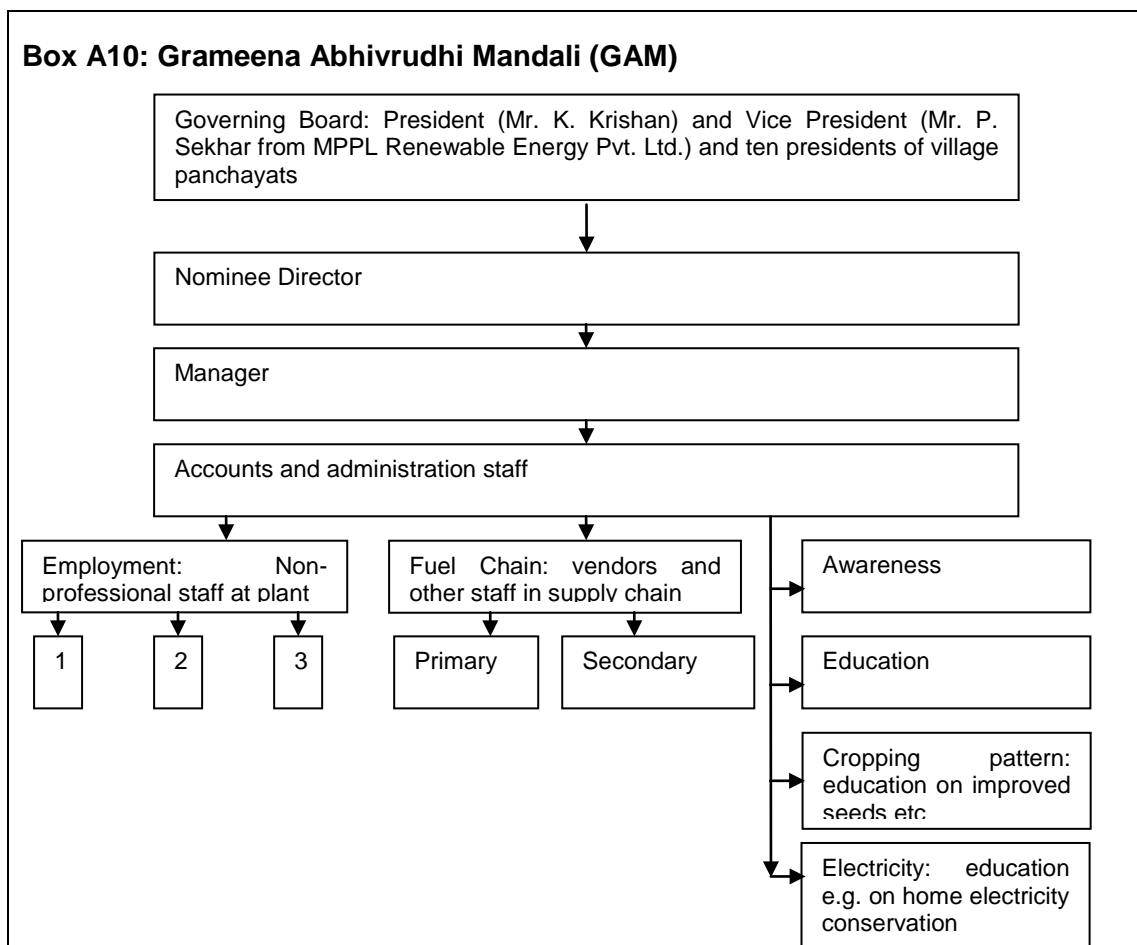
GAM now provides a management structure with three main functions (box A10):

1. To manage the employment of all non-professional staff at the plant;
2. To manage the fuel chain staff, particularly the vendors and their contractors;
3. To raise awareness about the plant in local villages and issues related to cropping and electricity use.

One of the main functions of GAM is to incorporate local village development goals and interests into the running of the plant. The governing board includes presidents of the local panchayats. Monthly meetings are also held in villages³⁶ in order to deal with issues arising from the plant and broader issues of local development where GAM could play a role. Common issues that are raised in these meetings include:

1. Problems of power theft. GAM tries to educate villagers not to steal power because it leads to distribution problems and unstable supply;
2. Problems with being able to pay electricity office bills;
3. Line loss.

According to MPPL, this function means that GAM plays an important role in helping to de-risk the project.



³⁶ This includes villages that are receiving electricity from the plant and villages that are providing biomass. In many villages these overlap, but some only benefit from the sale of biomass due to the coverage of the local electricity grid.

A.2.4.3 Local context

Mandya District is situated in the south of Karnataka. The northern districts of the state tend to be poorer but there is considerable variation within divisions.

Agriculture is the main activity in the district. The major crops of the district are ragi (85,467 ha), rice (79,892 ha), sugarcane (30,630 ha), pulses (predominantly horse gram and to some extent tur, cowpea, green gram, black gram, avare) and oilseeds (mainly groundnut and sesame)³⁷. There are 35 Rice mills and 4 Sugar factories in the district and it is the third largest producer of sugarcane in the State. Agriculture in the region is dependent on rainfall, river, well and tank irrigation.

Around 50% of land holdings in the State are less than one acre in size and 27% are between one and two acres. Scheduled tribes, castes and other poor people generally have smaller land holdings than higher castes³⁸.

Agricultural labour households constitute the largest segment of the population and account for 40% of the total population in rural Karnataka. The average level of consumption of this segment is lower than that of all other households in rural Karnataka and approximately 25% of households in this category are considered poor. The self-employed in agriculture constitute the second largest segment (38%) of the population. Their average consumption level is higher, and around 13% of households are in this category are considered poor. At 2004 prices, average agricultural wages for men were 64.97 rupees per day and for women 32.94 rupees per day³⁹.

The power is evacuated through 66/11 KV sub-station at DG Koppalu with 6.3 MVA transformer. This sub-station services 47 villages with 11,450 consumers and 9,250 households. The load as on 2001 was 2.9 MW but the current load is 9.6 MW and KPTCL, the transmission utility, has recently enhanced the sub-station capacity to 12.5 MVA. Furthermore, a 24 hour down feeder has been provided to Kirugaval town near to the plant.

A.2.4.4 Implications of the Malavalli Plant for local communities

The main opportunities are new employment, increased stability of employment throughout the year, additional income generation for farmers and increased stabilisation of electricity supply. It is estimated that about 500 jobs in total have been created by the power plant (though these estimates vary from 450 to 650). The opportunities created by the plant accrue to five main categories of people:

1. Employees at the biomass plant
2. Vendors in the biomass supply chain (those who manage the supply chain and its labourers, and transport the biomass from farm to plant)
3. Labourers in the biomass supply chain (those who collect the biomass from farmers)
4. Farmers supplying biomass to the plant, via the vendors
5. Electricity consumers

³⁷ <http://www.mandya.nic.in/agri.htm>

³⁸ Estimates of rural and urban poverty correspond to the Government of India Expert Group Poverty Lines per month at current prices for the year 1999-2000 as follows: Rs. 309.59 (Rural Karnataka), Rs. 327.56 (Rural all-India), Rs. 511.44 (Urban Karnataka) and Rs. 454.11 (Urban all-India) published in Government of India (2001d): Poverty Estimates for 1999-2000, Press Information Bureau, New Delhi.

³⁹ <http://planning.kar.nic.in/khdr2005/English/Main%20Report/4-chapter.pdf>

Employees at the plant

The plant employs around 130 contract labourers, seven engineers and 41 technicians in each 24 hour period. Work is on a shift basis (with three shifts every 24 hours). Additional benefits include free healthcare and payment of 12% of salary into a pension fund each month.

Contract plant labour work includes feeding the biomass into the plant, loading and unloading trucks and other manual labour around the plant (e.g. fertiliser production, which employs twelve people). Average incomes have been reported by Hansson and Sundemo (2007) to be between 2100 and 3000 rupees per month, which represents a significant increase compared to their recalled earnings before working at the plant, mainly due to the fact that they work more days per month.

Contract plant labourers come from diverse backgrounds, although a high percentage (approximately 40%) have been, or still are, agricultural labourers. These groups represent the bulk of the rural poor in Karnataka (Karnataka Planning Authority, 2005). It is not clear whether the bulk of contract labourers come from local communities, but this seems likely, as it has been reported by both the farmer interviewees and the stakeholder consultation report prepared as part of the CDM process.

Biomass supply chain

Keeping the plant running at maximum capacity requires about 140 tons of biomass every day. Biomass is sourced from within a 150km radius of the plant. Sugarcane trash is sourced from a radius of about 15km of the plant, woody biomass from up to 25km radius and coconut fronds from up to 150km radius. The main actors in the biomass supply chain include vendors, biomass collectors and farmers. Evaluating the value chain is complicated as prices vary with distance and the type of fuel (which can vary depending for example on the demand for poles, which will influence how much woody biomass is available at any time).

A2 table 1 gives an estimate of how costs break down for the supply of biomass sourced from a 10km radius in a single day, and per tonne. It illustrates the large vertical variation in the value chain between vendors and labourers. Note that for the farmers, this payment is likely only to happen once per year at the time of harvest.

Cost category		Cost (INR) per day (assumes 9T of biomass collected per day)	Cost (INR) per tonne
MPPL payment to vendor		6300	700
Costs to vendor	Transport costs (truck rental and gas) ⁴⁰	1000	111
	Payment to one farmer (one time annual payment during harvest)	900	100
	Payment to 10 labourers	2300 (230 per labourer)	256 (26 per labourer)
Profit margin for vendor		2100	233

⁴⁰ Transport costs assume one tractor carries 3T and makes three trips in one day; diesel is 34INR per litre and 1L=5km.

A2 table 1: Break down of value chain costs per day (assuming 9 tonnes of sugarcane trash collected per day) and per tonne⁴¹. Source: MPPL interviews

Vendors

There are currently 22 vendors who are contracted by MPPL to manage the biomass supply chain. According to MPPL's records 94-98% of the biomass fuel is now supplied through vendors (Hansson and Sundemo 2007). Vendors manage teams of labourers, collecting and transporting biomass residues from farmers' fields to the plant. Each vendor manages a few groups of labourers (called a 'gang') and is responsible for ensuring the quality of the biomass that is sourced and providing transportation. They have regular groups that they work with, but there is some variation given that labourers are hired on an informal basis.

Biomass is weighed and checked for moisture content when it arrives at the plant and payment is based on these factors, which means that they have to be careful to check the quality of the material that they source. Diesel costs, vehicle hire and labour cost and quality are the major costs for the vendors.

There is no formal group structure for their work, but they have set areas that they source from, which prevent competition. Logistics supervisors at the plant who are informed about harvesting in particular areas (for example, when certain sugar factories are harvesting) help with the allocation of farmers for the supply of biomass. Hansson and Sundemo (2007) note that MPPL has to be careful in the recruitment of vendors, to avoid political favouritism, but there does not appear to be a formal procedure for recruitment. A number of the vendors interviewed were from families whose land was bought to build the plant, so they have also benefitted from the sale of land. Vendors earn around 15000-20000 rupees per month, which is a substantial income and they are potentially earning more than this, as they have other investments. Some of them also practice agriculture, but this is now a secondary activity.

Some farmers deliver biomass to the plant themselves by tractor or cart, though this option is mainly limited to those living in relatively close proximity. It is not clear how many farmers do this.

Labourers

There are currently around 300 labourers (or 'collectors') employed in the biomass supply chain. They usually work in gangs of up to ten people and there are gang leaders who are oversee the work of the gangs whilst in the fields.

Labourers are paid about 150-250 rupees per day though this varies depending on the feedstock type (some is priced per tonne and some is priced per bundle). There are also significant differences in wages between gang leaders and other gang members, possibly reflecting the fact that they have a higher skills base (to become a gang leader requires the completion of elementary school and being literate). Gang members receive around 150-200 rupees per day and gang leaders 200-250. The farmers interviewed reported standard agricultural labour wage rates of around 130 rupees per day, implying that the labourers are earning significantly higher wages than average labour wage rates⁴².

⁴¹ Note that biomass collection does not take place every day and varies significantly depending on the season.

⁴² Note that wages in Mandya increased between 1993/1994 and 2004 almost doubled. Assuming similar levels of inflation since 2004, the average labour rates suggested by interviewees are only slightly higher than what might be expected.
<http://planning.kar.nic.in/khdr2005/English/Main%20Report/4-chapter.pdf>

Farmers

Farmers benefit from the sale of biomass from their land. Typical yield of sugarcane per acre is around 40 tonnes. Cane trash (excluding the toppings, which could be used as fodder) constitutes 10% of the total weight of cane, i.e. 4 tonnes/acre. Farmers can earn INR 400 annually (based on a payment of INR 100/tonne). Benefits to cane trash supply contractors also include free issue of organic fertiliser (around 1 tonne/acre of organic manure). Thus effective earning for the farmer would be INR 400 in cash + 1 tonne of organic manure/acre.

Farmers are selected by the vendors who send out a message when the crops are ready to harvest. This is helped by the sugar mills which have a harvesting plan. For sugar they harvest within a radius of about 15km. The vendors reported that there was no pattern in terms of which farmers are chosen, given the high demand for biomass (particularly near the plant, where transportation distances are short). However, they do not go to the really remote villages but some farmers will bring their own trash to the plant if they are organised. In the 15km radius of the plant a very high percentage of farmers are supplying biomass (MPPL estimates that about 80-90% of farmers within 10km radius are supplying to the plant). In the areas visited (which were within 15km of the plant), the farmers interviewed reported that nearly all farmers were supplying biomass to the plant. Further from the plant there may be some incentive to exploit economies of scale and source from larger farms, but this cannot be substantiated.

There appear to be few opportunity costs associated with the process, as the low density residues that are supplied have no, or few, other uses (palm fronds are used in building, but there is a large surplus in most plantations, and the stacks are usually burnt). There will be some opportunity costs in terms of time, though these are likely to be negligible, given that it is mainly the labour gangs that are carrying out the collection work.

The benefits of the fertiliser have been much promoted in the available literature on the project, though there is considerable ambiguity about whether the fertiliser is making a significant contribution to either the plant or the farmers. Sutter (2003) reports that farmers receive fertiliser from vendors instead of payments, which reduces expenditure on inorganic fertiliser. Hansson and Sundemo (2007) describe how the plant originally tried to sell the fertiliser to farmers, but that this scheme was revised as farmers were unwilling to purchase it. Instead, MPPL resorted to offering the fertiliser as an alternative to payment (100 rupees per tonne) for the biomass collected, though they were making a small loss on this in 2007. According to Hansson and Sundemo (2007), 70% of farmers have apparently taken up this option. The farmers interviewed in the present study appeared to be using some fertiliser from MPPL, but also receiving payments. The vendors interviewed reported that they only infrequently take fertiliser to farmers, suggesting that the situation has changed since Hansson and Sundemo's (2007) estimate. Most farmers have to collect their own fertiliser – something which is only likely for those farmers situated relatively near the plant. If it is the case that little of the fertiliser is being returned to farmers, there is a potential issue that some nutrients are being removed from farmers' fields as biomass is exported and not replaced, though this would not have a major impact in the short term (<10 years).

Electricity consumers

MPPL supplies electricity to an estimated 11,450 consumers (of which 9250 are households) from around 47 villages in the vicinity of the plant (Hansson and Sundemo, 2007). A number of interviewees reported that the electricity supply in

these villages had become more stable, though there is some ambiguity surrounding exactly which villages receive electricity from the plant. The substation that is fed by MPPL also receives electricity from hydropower plants, which are more active in the rainy season. The biomass plant (which generates more electricity in the dry season), is therefore a good complement and has increased supply by about 72% (Hansson and Sundemo, 2007). There are also some benefits in terms of the GAM outreach programme in villages, which is trying to raise awareness about the problems caused by electricity theft.

A.2.4.5 Carbon Finance

Carbon finance for the project has been generated through sales of carbon credits from MPPL. It has been registered as a CDM project and certified against the Gold Standard on the basis of the benefits that it is bringing in this rural area. Approximately 20,000 metric tonnes CO₂ equivalent per annum are calculated to be avoided by the plant. Some of these have been sold to South Pole Carbon Asset Management Ltd, a Swiss company that helped develop the project and which works with project developers to identify and manage GHG emissions reductions projects and range of other services for buyers of carbon. Some credits are sold through a related not-for-profit organisation also based in Switzerland called 'MyClimate' which is selling offset credits from the project through its website. The terms of the emissions reduction purchase agreement are confidential, but the current price for Gold Standard CDM projects in the MyClimate portfolio is Euro 22 to 26 (\$33-39) per tonne of CO₂e. None of the payments for carbon are made directly to project beneficiaries (e.g. those in the supply chain) and there appear to be no formal contractual agreements between farmers and the vendors.

Carbon finance has been an important enabling factor in the MPPL project. However, it was long up and running before it was registered, so Certified Emissions Reductions (CERs) were received retroactively. This was partly because it took a long time to convince the Executive Board of the CDM that there was a need for funding and the fact that the connection to MyClimate was originally informal. It has been difficult to obtain information on the value of the carbon sold in the Malavalli project, but according to MPPL, who developed the project, it has been crucial for its development and the whole venture was in danger of going bankrupt before the carbon finance agreement was signed. Hanssen and Sundemo (2007) made estimates of potential returns to investment between cases without any carbon finance and those with carbon finance from selling 'Gold Standard' carbon credits. The results range between -8.5% and 20.5%, illustrating the difference that carbon finance can make in such a project. The carbon finance constitutes about 20% of the income generated by the project.

MPPL staff members involved in the design of the power plant believe that the fact that the project has been prepared for the CDM means that it is structured better, better records are kept and efficiency is improved. In effect, the entire management system is streamlined.

Risk sharing arrangements between the Malavalli plant and the buyers of carbon are not known. However, because of the way that the project is set up there is little direct transfer of liabilities for emissions reductions to farmers in the biomass supply chain. In order to keep the plant running in a cost effective way and hence generating emissions reductions close to what is projected, adequate high quality biomass is constantly required. This has been dealt with by sourcing biomass from a diversity of sources, including coconut fronds from up to a 150km radius of the plant and

purchasing rice husks from milling processes in nearby industries (rice husks and other secondary fuel sources make up about 20% of the fuel mix). There may be some risks in terms of opportunity costs related to rice husks as these can be used in energy generation in other sectors or by individuals. The vendors may also face some risks as their payments are based on quality control of moisture content in fuels as they are delivered to the plant. This may affect the ability of some farmers to sell their crop residues, but it does not appear to have been an issue to date.

The biomass supply chain represents the biggest risk to the efficiency of the plant. Sugar prices influence the area under sugar cane on a yearly basis and the demand for poles also influences the amount of biomass from woody sources. Coconut waste (from 100-150km away) has been introduced as another feedstock because there are large volumes and it helps to iron out fluctuations in local biomass supply. This has implications for the replicability of such approaches on a large scale.

A.2.4.6 **Summary**

The project has created a new value chain which is benefitting members of the local community. Farmers supplying biomass are benefitting from biomass sales – the annual income is small but it is additional to other earnings and appears to have few opportunity costs. Agricultural labourers involved in biomass collection appear to be benefitting from higher wages and more consistent work throughout the year. The largest benefits appear to be accruing to the smaller number of ‘vendors’ who have become ‘rural entrepreneurs’ managing the supply chain.

The organic fertiliser production system also offers potential benefits for local farmers. Reports are varied as to how many farmers have been choosing to accept fertiliser instead of payments in return for their biomass (as originally planned). However, interviews with vendors, employees at the fertiliser yard and farmers indicate that it has not had a widespread uptake. This raises questions about the nutrients being lost as a result of the removal of biomass and how they are replaced over time. There are likely to be trade-offs relating to the fact that farmers do not burn their fields (which may reduce root damage but also reduce the fertilisation effect of ash) and the potential need for farmers to buy in organic or synthetic fertilisers.

The institutional structure (Grameena Abhivrudhi Mandali) has apparently been crucial for the plant in terms of reducing risks related to the electricity distribution systems and the sustainability of the biomass supply chain. There is high representation from the village authorities and regular meetings with villagers. However, it is not clear to what extent this is a two-way process which gives a voice to local farmers and particularly the poorest farmers in the way the biomass supply systems are organised.

According to MPPL, carbon finance has been crucial to financing the project and to demonstrate the viability of this model of biomass energy system. It has also improved the way that the plant is managed and monitored.

A.2.4.7 **References**

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