Farmer field school under Trees for Global Benefits project in Uganda. Photo: ECOTRUST

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CHAPTER 7

Who enjoys smallholder-generated carbon benefits?

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Highlights

- Co-benefits from SALM practices exceed the direct benefits of carbon revenues.
- Carbon and co-benefits both play a role in poverty alleviation and biodiversity conservation.
- Revenue from carbon diversifies incomes and contributes to smallholder resilience.
- Providing links between farmers and the market is crucial for access and procedures.

7.1 Smallholders generating carbon benefits

Climate-smart agricultural (CSA) practices that contribute to mitigation and provide adaptation measures to climate change are often mainstreamed into the agricultural development agenda[1]. This happens regardless of incentives, since CSA practices are meant to enhance the sustainability and efficiency of smallholder agriculture[2]. Revenue from selling environmental services such as reduced greenhouse gas (GHG) emissions and carbon sequestration (in short: carbon) can diversify incomes and contribute to the resilience of smallholder livelihoods. Crucial to this happening is the development of the carbon market and the future demand and price of these credits.[3]

Designing payment for environmental services (PES) schemes that work sustainably in smallholder systems requires links between local action among farmer and community groups and other stakeholders at national and regional level. The farmers are the sellers who generate carbon; small farms are aggregated to generate quantities large enough to sell to the market. The national- and regional-level stakeholders are governments, businesses, and non-governmental organizations (NGOs) who pay for carbon credit or regulate carbon trade.

In this chapter, we draw on the experiences and lessons learnt from two different smallholder carbon projects: the *Kenya Agricultural Carbon Project (KACP)* where carbon credits are obtained for biomass (trees) and soil carbon sequestration with payment upon delivery, and the *Trees for Global Benefits (TGB)* project in Uganda where credits for tree carbon are provided through upfront instalments.

This chapter aims to address the following questions, considering that smallholder agricultural carbon can attract a market and get a price:

1. What can be the direct (PES) and indirect benefits for individual smallholder households and farmer and community groups/organizations in the short and long term?
2. To what extent will it contribute to the sustainability and resilience of agricultural systems and livelihoods?
3. Are the revenues outweighing the cost of establishing and running the carbon monitoring?

7.2 Case studies

7.2.1 Kenya Agricultural Carbon Project

7.2.1.1 Design and ownership

The *Kenya Agriculture Carbon Project (KACP)* started in 2009 as the first African agricultural carbon project addressing climate change adaptation and mitigation among smallholder farmers[4]. KACP is implemented in three counties in western Kenya by Vi Agroforestry, an NGO. Farmer groups are contracted by Vi Agroforestry to implement project activities and aggregate carbon credits (Table 7.1). The objectives of the KACP are to (i) provide advisory services, (ii) restore agricultural production, (iii) increase farmer resilience to climate change, (iv) reduce GHG emissions, and (v) sell carbon credits. The KACP promotes and implements a package of Sustainable Agricultural Land Management (SALM) practices such as crop residue, grassland and manure management, cover crops, agroforestry, composting, water harvesting and terracing[5]. Initial technical support was provided by the Bio-Carbon Fund of the World Bank and other entities with funds from the World Bank, Sida, individual Swedish donors and companies. The project provides dedicated extension services to strengthen community structures, and promotes adoption of SALM, farm enterprise development, product value addition and village savings and loans approaches. The project had the first validation in 2012 with verification in 2013, and a second validation/verification in 2016 (Table 7.1).

7.2.1.2 Incentives and negotiations

The carbon project was added to a group advisory concept that has been practiced by Vi Agroforestry for many years. The main incentives to farmers are higher productivity through adoption of SALM, enterprise development and better market linkages by working in groups. Vi Agroforestry negotiates the carbon price on behalf of the farmers. The direct payment for carbon is small and seen as an extra bonus. Vi Agroforestry and the Bio-Carbon Fund of the World Bank have signed a nine-year Emission Reduction Purchase Agreement worth 150,000 t CO_2eq Emission Reductions (ERs). The rest of ERs is open for other interested buyers. The Bio-Carbon Fund supported the start-up phase (3 years) and expects that after 5 years the project will sustain itself if carbon buyers are available.

7.2.1.3 New carbon standard methodology for monitoring, reporting and verification (MRV)

Carbon credits are generated and claimed based on a newly developed and approved Verified Carbon Standard (VCS) methodology called VM0017[6]. The methodology addresses the need for a robust but cost-efficient monitoring system, and at the same time assists smallholder farmers to reach their objectives (productivity, food security and climate resilience). The VCS methodology requires accounting for three carbon pools (live aboveground biomass, live belowground biomass and soil organic carbon) and four emission sources (burning biomass, nitrogen fixing species, burning fossil fuel and fertilizer application). Field data required to estimate GHG emissions and removal are obtained through an annual farm-level survey

completed through interviews from the start and throughout the project. The methodology applies to project activities implemented on degraded land, either cropland or grassland but not on wetlands or forest land. After an assessment of the baseline agricultural activities, the adoption of SALM is monitored as a proxy of the carbon stock changes using activity-based model estimates and a Roth-C Model[7] to quantify changes in soil carbon.

7.2.1.4 Benefits distribution and co-benefits

The plan is that farmers changing practices to SALM are increasing carbon stocks in agricultural systems which will generate annual revenue until 2029. The increases in staple food production and other products will continue even further. The first carbon revenue payment was released in 2013 based on the C sequestration for the first 2 years (2010–2011), and a second payment has been released in 2016 for the following 3 years (2012–2014). For the first payment, Vi Agroforestry received 4 USD per tonne carbon. However, due to uncertainty in agricultural carbon, they were only paid for 90% of sequestered C and of that 60% went to the farmers and 40% to the administrative work and part of the advisory service. Monitoring and evaluation was paid through other development funds. The carbon payment per farmer was very low. However, the co-benefits of the project after three years were larger and have been quantified in terms of higher maize yields (30–50%), more months of food self-sufficiency (37% had more than 10 months food sufficiency compared to 17% in the central group) and higher levels of monthly savings: 73% of the KACP farmers were saving 3–5 USD per month compared to only 44% in the control group in the same area.[8]

7.2.1.5 What is unique about the KACP?

Carbon credits are obtained for soil carbon in addition to biomass (tree) carbon, and the KACP has been the basis for the development of a methodology that accounts for soil carbon sequestration. The majority of carbon projects in sub-Saharan Africa are offered only for forestation (afforestation and reforestation) projects, leaving out other important sink activities relevant to smallholders such as agroforestry and carbon sequestration in agricultural soils. This has been attributed to lack of methodologies and complexities in measuring and monitoring the impacts of soil-based mitigation activities. Moreover, carbon payment is only one component of the KACP which is based on advisory services to farmer groups, farm enterprise development, and village savings and loans.

Agroforestry practice with wood lot in a smallholder farm. Photo: KACP Vi Agroforestry/Francis Olenya

Agroforestry practice with cassava intercropped with fruit and timber trees. Photo: KACP Vi Agroforestry/Francis Olenya

7.2.2 Trees for Global Benefits project in Uganda

7.2.2.1 Design and ownership

Trees for Global Benefits is a cooperative community carbon offsetting scheme in Uganda linking smallholder farmers to the voluntary carbon market[9]. The targeted districts have several protected areas including forest reserves, national parks and communal forests (Table 7.1). The project combines carbon sequestration with rural livelihood improvements through small-scale, farmer-led forestry or agroforestry projects while reducing pressure on natural resources. Project participants undertake a suite of land-use activities that provide carbon sequestration, biodiversity conservation, watershed functions and food security. The practices promoted include mixed woodlots of native or naturalized tree species and fruit orchards. The carbon credits belong to individual farmers but they sell them together—group marketing. Since the start in 2003, TGB has been transformed into a self-financing mechanism that provides upfront funding for farmers to initiate forestry activities, and that uses the market to increase cash flow and invest in expanding the number of participating farmers.

7.2.2.2 Incentives and negotiations

Trees for Global Benefits was created by ECOTRUST, a Ugandan national NGO, and seeks to reduce the unsustainable exploitation of forest resources and decline of ecosystem quality, while diversifying and increasing incomes for rural farm families. It operates as an innovative financial mechanism that motivates farmers to engage in activities that generate sustainable income and reverse ecosystem degradation for improved ecosystem health, while generating capital to recoup investments and scale up participation and diversity. Participating farmers receive cash incentives for increasing carbon stocks on their land (Table 7.2). The structure of payments allows farmers to consider long-term investment horizons, using part of their land to develop assets that not only provide short-term cash from annual crops but also long-term benefits from materials and income from trees.

The project works with established community structures to mobilize farmers and enable ongoing monitoring of land management plans. Farmers from the targeted communities receive training and attend workshops to identify forestry activities that are suitable to their needs. Once the smallholder farmers are registered, they enter into sale agreements specifying sale quantities and conditions. Through the farmer groups, they identify new areas that may require the development of technical specifications, as well as financing and market opportunities. ECOTRUST aggregates credit from the various farmer groups and, on behalf of the farmers, negotiates prices with multiple buyers either directly or through brokers. This ensures that the smallholders who would not normally access this market are able to do so. ECOTRUST also supports the building of capacity of local institutions that will enable the farmers to use the income from the carbon revenues to diversify their livelihood and thus build resilience to climate change.

7.2.2.3 Measurement, reporting and verification

Trees for Global Benefits uses the Plan Vivo Standard (http://www.planvivo.org) which is a set of criteria for project design, monitoring and reporting against which carbon offsetting activities (and the projects' co-benefits) can be certified or verified. The technical specification for each planting system clearly spells out the different tree management stages, the milestones and targets at those stages, and the expected payment on achieving the target (Table 7.2). Trees for Global Benefits is a long-term project with ex-ante carbon credits calculated over a 20-year crediting period in the case of single-species woodlots, and a 25-year

period in the case of mixed native woodlots. The long-term carbon sequestration potential of project activities is estimated from measurements of tree-growth rates, and carbon estimates are derived using allometric equations provided by the National Biomass Study.[10]

The project applies both independent assessments and self-reporting, and submits annual reports to Plan Vivo. Verification is done by Plan Vivo through a review of the annual report and occasional field visits; independent third-party verification is done by Rainforest Alliance every five years. The approval of the annual report triggers the annual issuance of certificates into the Environmental Market Registry. ECOTRUST also manages a database that traces each credit to the farmer that generated it, the buyer, and keeps track of the amounts, the price, the tree planting progress and the payment instalments.

7.2.2.4 Benefits & co-benefits

The farmers receive their payments in instalments after activities have been monitored. Plan Vivo requires that a minimum of 60% of the carbon revenue be shared with local stakeholders (Table 7.1). Each farmer is paid according to the number and species of trees planted, the agroforestry system adopted and the tree growth rate over a 10-year period. Farmers that do not meet their respective targets are requested to undertake corrective action before they get paid.

The Trees for Global Benefits project generates significant benefits beyond carbon sequestration, which include economic (improved livelihoods), environmental (biodiversity conservation; building resilience of communities and ecosystems) as well as social benefits (building social capital). Plan Vivo Standard has strict requirements for the documentation of co-benefits and therefore excludes projects with high chances of adverse impacts, e.g. on the environment. Some of the carbon revenue is used to facilitate smallholder farmers to integrate tree planting as part of their livelihood strategies. Farmers can gain access to local and national markets for timber, pole wood, medicinal extracts and fuel wood; the production of fruit and fodder improves both human and animal nutrition, while nursery establishment and seedling production provide income opportunities. Through social networks and regular meetings, the communities are able to find solutions to marketing challenges, often in the form of group marketing. An example is the Bunyaruguru carbon group that has created a beekeepers' association through which the honey has been processed, branded and marketed as 'Escarpment Honey'. This is a very successful model that other resource use groups such as fruit growers, medicinal extracts processors and milk producers will be facilitated to learn from and form their own marketing groups.

7.2.2.5 What is unique about Trees for Global Benefits?

Trees for Global Benefits has inspired smallholder farmers in Uganda to work together towards protecting, restoring and improving the natural and productive ecosystems on which they depend. ECOTRUST ensures that tree planting does not enter into competition with but rather enhances crop production, and carefully evaluates the farming system and the extension of land to be planted. Farmers are advised to plant according to three systems: 1) boundary planting, 2) agroforestry or 3) woodlot planting, depending on how much land the household has.

7.3 Is carbon payment the way to go for smallholders?

The low carbon price has so far been an issue for smallholder groups entering into the volunteer carbon market. However, the co-benefits are significant (although not well quantified) and have been driving the success so far. The role of national or international organizations and schemes providing the link between the farmer groups and the market is

crucial, both for market access and for the required monitoring, evaluation and verification procedures[11,12,13]. Building on lessons learnt, there are ways forward for smallholder carbon payment schemes and projects. In addition, through tree planting and sustainable land management practices, farmers are contributing to control soil erosion and improve soil fertility (in particular through nitrogen-fixing trees) leading to improved productivity which ultimately results into improved food security and improved livelihoods for rural people who are mostly subsistence farmers.

7.3.1 Sustainability and ownership aspects

The price of carbon credits is too low but farmers receive many co-benefits from group advisory services and improved productivity which keep up their interest. There is a need to reduce monitoring costs, which so far has mainly been covered by development funds since it is too expensive to sustain from the carbon credits. To make it sustainable and increase ownership, farmers have been trained to record their own plans, implementation and performance/yield data. The data are aggregated at group level by the group leaders who also do some data verification before submitting the data using a SMS system. To be sustainable, the farmer groups need to be organized at a larger scale so they can do the monitoring and evaluating and sell the carbon.[14]

7.3.2 Equity, gender, social inclusion aspects

Gender and social inclusion have been mainstreamed in the case study projects from the start. In the KACP committees, it is ensured that each location is represented by two people: a woman and a man. The task of the committees is to give and receive feedback from farmer groups on the KACP implementation. Experience has shown that when men are responsible for the revenue there is risk that women are marginalized. Over time, Trees for Global Benefits has developed a number of inclusion strategies to ensure the participation of marginalized groups. This includes providing multiple income-generating options and a household approach involving both spouses and the older children.

Land ownership is another crucial aspect; however, the payment is given to the person managing the land, not to the owner. One other social inclusion aspect is that farmers with too little land will have difficulty carrying out the required practices and taking part in the carbon projects. Trees for Global Benefits strengthens the communities' tenurial rights to community forests through the formation of Communal Land Associations for the management of community forests.

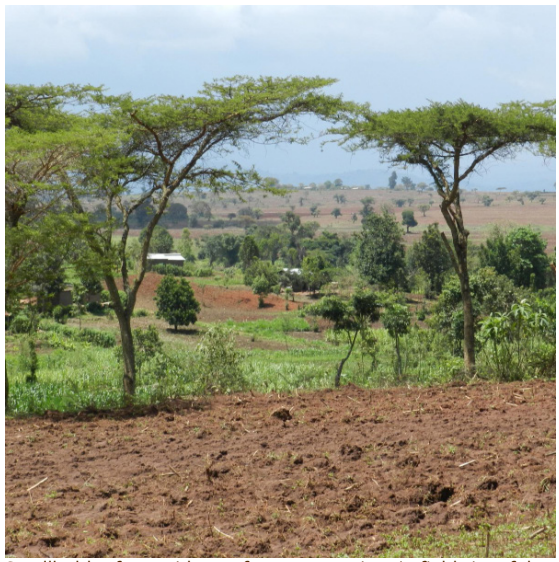
7.3.3 Challenges

Based on experience, there are three main challenges: (1) An economy of scale disadvantage of smallholder projects: Buyers and brokers prefer projects that deliver large volumes with low transaction costs and minimum uncertainty. Remote geographic locations, the large number of farmers involved, and additional work required to aggregate carbon sequestered increase the transaction costs and the uncertainty, and result in that not all the carbon revenue is returned to the local communities or the farmers. (2) Inadequate capacity or skills for project implementation, monitoring and verification. Complex procedures require input of qualified experts, which increases costs. (3) The limited number of methodologies approved for carbon sequestration in agricultural soils and the complex procedures hinder development of new methodologies. However, KACP currently uses two methodologies approved by VCS for soil carbon sequestration: VM0017 and VM0021 (www.v-c-s-.org).

7.3.4 Opportunities

There are upcoming opportunities for the carbon market, e.g. the pooled permanence buffer (permanence of emission reduction achieved), which may increase demand and price[15]. Based on lessons learnt, e.g. from KACP, co-investment with the private sector has been developed, linking carbon and water ecosystem service schemes with smallholder dairy production within the Mt Elgon Dairy and Livelihood project. In order for payment for ecosystem services to become a viable mechanism for smallholders, national policies need to be developed and co-investment schemes have to be initiated together with the private sector. Government policies with incentives for farmers to render environmental services can be part of a national strategy to implement the sustainable development goals (SDGs).

Forest restoration by trees for global benefit in Uganda. Photo: ECOTRUST



Smallholder farm with agroforestry practices in field site of the Kenya agricultural carbon project. Photo: World Agroforestry Centre/Ingrid Öborn

Table 7.1 Summary of the Kenya Agricultural Carbon Project (KACP) and the Trees for Global Benefits Project (TGB) implemented in Uganda

Project attribute	Kenya Agricultural Carbon Project	Trees for Global Benefits Project
Location	Bungoma, Kisumu Rural and Siaya Counties, Kenya	Bushenyi, Hoima, Masindi and Kasese Districts, Uganda
Project proponent	Vi Agroforestry (Swedish NGO)	ECOTRUST: Environmental Conservation Trust of Uganda (NGO)

Project attribute	Kenya Agricultural Carbon Project	Trees for Global Benefits Project
Other actors/experts	Bio-Carbon Fund of the World Bank, Joanneum Research, Pete Smith, Aberdeen University, UK	World Agroforestry Centre (ICRAF); CARE International; DFID, USAID and Uganda Forestry Department
Project activities	Sustainable agricultural land management (SALM), farm enterprise development, village saving and loaning	Afforestation, reforestation, agroforestry
Crediting period	20 years (2010–2030)	20–25 years (started in 2003)
Targeted carbon sequestration (t CO_2e)	Total emission reduction: 1,980,088	Total emission reduction: 53,514
	Annual emission reduction: 135,527	Annual emission reduction: 2,676
Target area (year)	45,000 ha (2019)	50,000 ha (2028)
Project farms and area (year)	29,497 farmers in 1730 farmer groups covering 21,966 ha (in 2014)	32 farmers (2003); 3,278 smallholders (2014)
Target participants/groups (year)	60,000 farm households within 3,000 farmer groups (2019)	4,000 farmers
Carbon offset standard	Verified Carbon Standard	Plan Vivo Standard
Monitoring reporting & verification	In KACP, two types of monitoring and evaluation are carried out (1) by Vi Agroforestry staff on 100 project farms per site, in total 200 farms, and (2) by the individual farmers on all farms after which the results are aggregated at group level and compared with the 200 farms	Group members are involved in monitoring activities, supervised by ECOTRUST Staff; the project has been validated (and verified) according to Plan Vivo standard; ECOTRUST prepares annual reports reviewed by Plan Vivo
Benefits distribution & co-benefits	**Direct benefit** from carbon revenues is shared between farmers (60 %) and to cover some costs for the administrative work and part of the advisory service (40%). Monitoring and evaluation are being paid for through other development funds. Vi Agroforestry distributes carbon benefits to farmers	**Direct benefit** from carbon revenues is shared between tree growers (55%), carbon community fund (6%), Plan Vivo (6%), verification cost (5%) and ECOTRUST (28%). Carbon benefits are distributed through microfinance schemes or institutions
	Indirect benefits quantified so far are higher agricultural productivity, larger monthly savings and more months of food self-sufficiency compared to control farms	**Indirect benefits** include improved incomes and livelihood security through employment opportunities, income from income-generating activities such as beekeeping, passion fruit growing, and growing

Project attribute	Kenya Agricultural Carbon Project	Trees for Global Benefits Project
		neglected and under-utilised plant species, increase fuel and timber supply, and capacity building
	Others benefits include soil conservation, strengthened institutional capacity (mainly community groups and cooperatives), gender equity etc. [12,13]	**Other benefits** include environmental conservation (reduced pressure on nearby forest, soil conservation), improved watershed function and management, and habitat restoration

Table 7.2 Performance-based payment scheme for Trees for Global Benefits. Payments are made up-front in five instalments, against agreed milestones.

Year	Percentage	Milestone
0	30%	At least 50% of the planned number of trees planted
1	20%	100% of the planned number of trees planted
3	20%	At least 80% of the planted trees surviving
5	10%	An average Diameter Breast Height (DBH) of 10 cm
10	20%	An average DBH of 20 cm

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