

Estimating the carbon benefits of sustainable land management projects: the carbon benefits project component A

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Abstract

The Carbon Benefits Project (CBP) is working to produce a standardized system for Global Environmental Facility (GEF) and other sustainable land management (SLM) projects to measure, monitor and model carbon stock changes and greenhouse gas (GHG) emissions. The project builds on existing C-inventory tools, of different methodological complexity, developed over the past 15 years at Colorado State University. The CBP will produce a modular, web-based system which allows the user to collate, store, analyze, project and report net C stock changes and GHG emissions for baseline and project scenarios in SLM interventions. Existing SLM projects in Brazil, China, Kenya and the transboundary area between Niger and Nigeria are being used as test cases.

Key Words

Carbon sequestration, sustainable land management, climate change mitigation.

Introduction

Human activities currently emit greenhouse gases (GHG) equivalent to over 50 billion tonnes of CO₂/yr. Approximately 30% come from land use and land use change. Sustainable land management projects have the potential to not only reduce GHG emissions, by reducing emissions from biomass burning, biomass decomposition and the decomposition of soil organic matter, but also to sequester C through practices that increase biomass production and promote the build up of soil organic matter. The GEF co-finance a wide range of SLM activities in developing countries from reforestation and agro-forestry projects, to projects that protect wetlands or foster sustainable farming methods. The carbon benefits of these and other non-GEF SLM projects are likely to be considerable. However at the moment it is difficult to compare the C benefits of different land management interventions as a wide range of different methods are used to measure them. Equally it is difficult for SLM activities in developing countries to benefit from financial incentives from emerging carbon markets. The aim of Carbon Benefits Project (CBP) is to produce a standardized system for GEF and other SLM projects to measure, monitor, model and forecast C stock changes and GHG emissions and emission reductions. The system being developed will be end-to-end (applicable at all stages of an SLM project cycle), cost effective and user friendly. The project consists of two components: A — being led by Colorado State University (CSU), with greater emphasis on cropland and grazing land, and B — led by the World Wildlife Fund (WWF), with special attention to forestry and agro-forestry.

This paper describes the activities, methods and projected outputs of component A of the CBP (<http://carbonbenefitsproject-compa.colostate.edu/index.htm>).

Methodology

Premises

GEF and other SLM projects need to know if SLM interventions affect C stocks or GHG emissions and this involves measurement, modelling and verification for a baseline scenario (the stocks and fluxes that would have occurred in the absence of the intervention) a project scenario (stocks and fluxes that occur with the intervention) and the incremental change between the two. A protocol is therefore needed which guides the user through all stages of delivering an SLM intervention in terms of proving net C benefits, from

forecasting at the planning stage, monitoring and verification at the implementation stage to long term projection of future impacts.

The CBP is developing a modular web-based system (Figure 1) which allows the user to collate, store, analyze, project and report C stock changes and GHG emissions for baseline and project scenarios in SLM interventions in a standardized and comprehensive way. Decision trees will guide the user to different options of varying complexity depending on the stage of the project and the level of detail required in terms of reporting net C benefits.

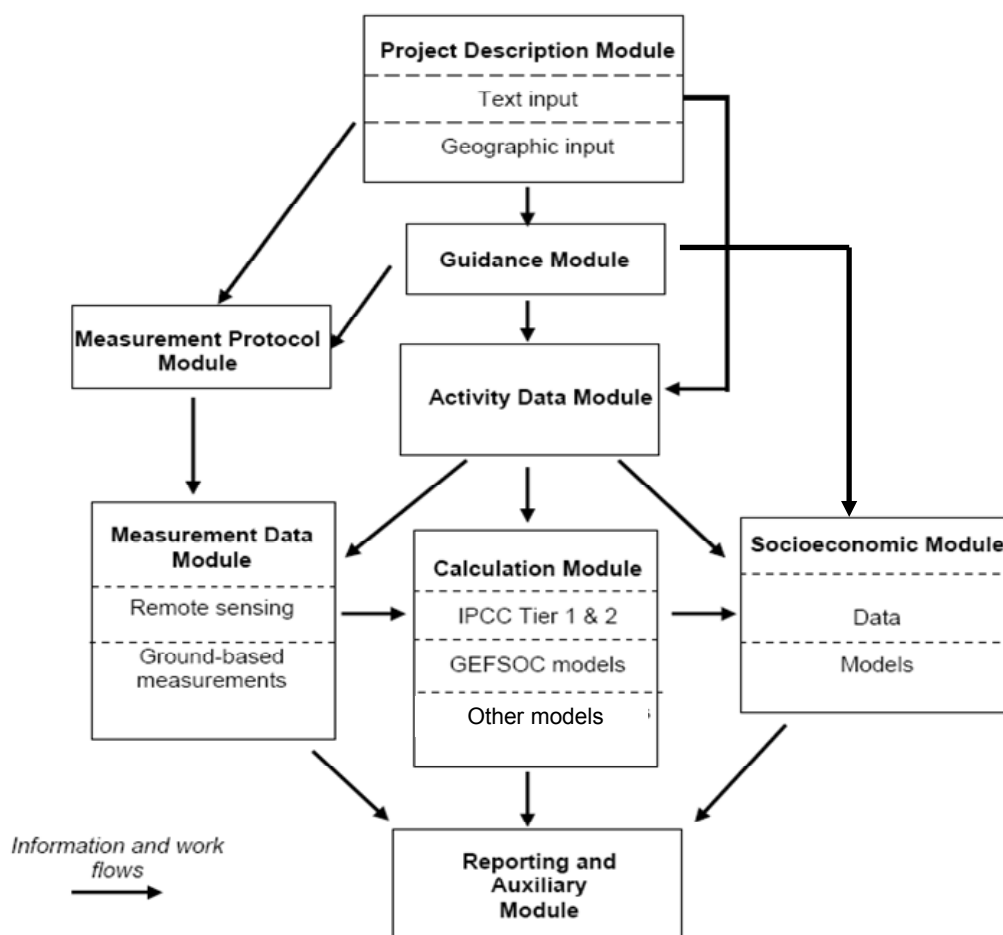


Figure 1. System overview of the CBP tool.

Modeling approaches

Carbon inventory assessments involve estimation of stocks and net fluxes of carbon from different land use systems in a given area over a given period and under a given management system. Ultimately, the scale of a project, the objective of the project (whether a C mitigation project or an SLM project with an interest in C) and the time and resources available for monitoring will determine the methods and data to be used for the carbon assessment (Ravindranath and Ostwald 2008).

The Carbon Benefits Project builds on more than 15 years of experience at Colorado State University of producing project and national scale carbon inventory tools for the agriculture, forestry and land use sector which represent IPCC Tier I, II and III approaches. The CBP is adapting and building on three tools in particular: The Agriculture and Land Use Tool (ALU), a national GHG inventory tool based on a Tier I/II approach (www.nrel.colostate.edu/projects/ghgtool/); COMET-VR a web-based decision support tool for the assessment of C stock changes at the field scale (Paustian *et al.* 2009, www.cometvr.colostate.edu); and the GEFSOC System (Milne *et al.* 2007; Easter *et al.* 2007), a Tier III tool for estimating national and sub-national scale soil C stock changes in developing countries.

Socio-economic dimensions of SLM interventions are also being considered in the project to ensure that SLM activities with a positive impact on C and GHG mitigation do not have detrimental effects on society or livelihoods. Socio-economic considerations are often key determinants of possible success in terms of improved livelihood, for example through payment for environmental services.

Test case areas

The CBP system is being developed and tested, in close collaboration with five test case partners. These are helping to develop the CBP system by providing feedback on the C reporting needs of GEF SLM projects and testing parts of the system. The test cases include four GEF SLM projects and one non-GEF project:

- The Ningxia Integrated Ecosystem Management (IEM) and the Gansu IEM Projects, both part of the GEF PRC in China. These projects are located in the arid northwest of China and are implementing a number of measures to address land degradation such as shelterbelt establishment, conservation tillage and re-vegetation with drought resistant shrub species.
- The Kenya Agricultural Productivity and Sustainable Land Management Project (KAPSLM) which will promote sustainable land management in three watersheds in Kenya which cover humid to semi-arid areas of the country.
- The Niger-Nigeria Integrated Ecosystem IEM Project which is implementing a number of measures such as orchard establishment and rehabilitation of degraded rangelands to address land degradation in the transboundary area between Niger and Nigeria
- Also, one non-GEF Project, the Environmental Impact of Agricultural Expansion in South-west Amazonia project which is providing detailed data sets for the verification and testing of modeling components in the CBP system.

The test case areas vary in size, from landscape scale projects at 80,000 km² to pilot plot-scale at 12 km². They cover a range of SLM interventions, including conservation agriculture, agro-forestry, wetland protection, and grassland management. The projects are partners in the CBP to help develop a system that meets their C stock and GHG reporting needs; these range from very detailed - where GHGs are the main focus of the project to very broad based – where GHGs and C stocks are a minor part of the project. The SLM Project Partners will be implementing the CBP system by the end of Phase I of the project (May 2011). Phase II of the project will involve a series of workshops to role out use of the CBP system to other GEF networks of projects and non-GEF SLM projects.

Conclusion

A standardized C benefits protocol will allow a consistent comparison of different SLM projects by the GEF and other donors. It would also bring developing countries, and project managers, closer to being able to gain reward for land management activities that sequester carbon and reduce greenhouse gas emissions.

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