

Small-holder agriculture monitoring and baseline assessment tool

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The Small-Holder Agriculture Mitigation Benefit Assessment (SHAMBA) tool provides a simple, robust and easy to use method for estimating greenhouse gas (GHG) emissions or removals resulting from a change in land management practices.

The SHAMBA tool has been developed by the tropical land use team at the University of Edinburgh with the aim of putting land use GHG analyses at the fingertips of smallholder farmers, with less need for technical specialists. This tool was developed for the purpose of accounting for changes in soil and woody biomass carbon stocks and GHG emissions due to changing agricultural practices and tree planting. Soil carbon and woody biomass changes are modelled with simple quasi-process-based approaches, whilst emissions from other sources (e.g. biomass burning, the use of fertilisers) are accounted for using simpler (IPCC Tier 1-type) approaches. The model consists of three sub-models, one for soil, crops and woody biomass, working on a per hectare basis.

A key issue with current GHG accounting approaches is that their complexity makes the costly and inaccessible to non-specialists, including smallholder farmers. SHAMBA addresses this issue through being pre-parametrised and through a basic user interface. To run the tool, users only need simple easily collected activity data – the type of data that is normally collected in the course of agroforestry or conservation agriculture projects. The SHAMBA tool contains databases of emission factors, tree allometry, climate and soil information which means that the user does not need access to the scientific literature to generate state of the art estimates.

SHAMBA is designed to model a baseline scenario (where land management activities continue as business as usual) and an intervention scenario consisting of activities that can be described as Climate Smart Agricultural practices (CSA), including: conservation agriculture; agroforestry; and other tree planting. It models the changes in carbon stocks in soils and woody biomass, and the GHG emissions from biomass burning, plant nitrogen inputs to soils, and fertiliser use over the accounting period for baseline and intervention activities. Net emissions and removals are calculated on a yearly basis for the length of the accounting period, in units of tonnes of carbon dioxide equivalent (CO₂e) per hectare. Version one of the SHAMBA model is designed to work with smallholder systems in sub-Saharan Africa.

Key Benefits

- Easy to use tool to estimate the GHG impacts of changing agricultural practices
- Typically the user will already be collecting the data needed to drive the tool
- Access to state of the art modelling for non-technical users
- Access to the databases of soil and climate data

Potential Applications

- Greenhouse gas accounting of climate smart agriculture projects at a variety of scales

Key Publications

- Berry, N. J. & Ryan, C. M. Overcoming the risk of inaction from emissions uncertainty in smallholder agriculture. *Environ. Res. Lett.* 8, 011003 (2013). [Link to article: <http://bit.ly/1ni4F07>]

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Access to the 'Small-holder agriculture mitigation benefit assessment tool' and user guide will be provided following acceptance of the University's Open Technology standard terms and conditions.