



Tropentag, September 17-19, 2013, Stuttgart-Hohenheim
“Agricultural development within the rural-urban continuum”

An Integrated Modelling Approach to Determine Environmental Services and Trade-off Effects under Land Use Change

GEORG CADISCH¹, SERGEY BLAGODATSKIY¹, JIAN CHU XU², CARSTEN MAROHN¹

¹*University of Hohenheim, Institute of Plant Production and Agroecology in the Tropics and Subtropics, Germany*

²*Kunming Institute of Botany, The Chinese Academy of Sciences, Center for Mountain Ecosystem Studies, China*

Abstract

In South East Asia large scale conversion of tropical rainforest into rubber monocrop plantations is taking place at accelerated rates. Such land use change can curtail ecosystem functions and reverse carbon sinks into potential C sources through burning, clearing, and increased rates of run-off, erosion, sediment transport in rivers, soil respiration and leaching. Due to the high latex demand and high profitability an increasing trend to even convert food crop areas into monocrop rubber plantations is ongoing. On the other hand, alternative land use or management options may have the potential to mitigate these impacts and combine food crop production with utilisation of renewable resources.

The assessment of the impact of such land use changes on food production, C dynamics, biodiversity and water cycles will be done with the spatially explicit dynamic Land Use Change Impact Assessment (LUCIA) tool. Plot and watershed level measurements from experiments in a case study area of Xishuangbanna, South-West China, will form the basis for parameterisation, calibration and validation of LUCIA. LUCIA is an integrated assessment tool able to simulate, besides C sequestration, the effect of land use intensification on environmental services such as habitat fragmentation, changes in hydrological cycle and agro-ecosystem productivity. One relevant module to be implemented in this context is LUCIA-Choice, which shall simulate farmers' decision-making based on soil fertility and cropping rules, taking into account behavioural components (*e.g.* crop profitability, farmers cultural preferences, distance to fields, or cost-benefit calculations). Through the dynamic simulation of the effect of land use change at landscape level LUCIA is able to assess the environmental impact and changes in environmental services and hence estimate trade-off effects with productivity and welfare. Model concepts and first results of the model will be presented.

The improved LUCIA model and modelling outputs will serve as tools for future land use planning purposes and also serve as a tool to interact with local stakeholders to jointly assess trade-offs between environmental services and agricultural intensification and to develop improved and acceptable land use options.

Keywords: Environmental services, land use change, LUCIA, rubber, trade-off