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“Development on the margin”

Assessing Impacts of Farmers' Land Use Change Decisions on Long Term Soil Fertility in North West Vietnam using a Reverse Modelling Approach

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Abstract

During the last two decades, farmers in Son La province, North West Vietnam, have reduced and finally omitted fallow periods when replacing the traditional swidden system with intensive maize monocropping. Land use in upland areas has been in a transition from upland rice, cassava and local maize varieties as staple crops towards hybrid fodder maize as cash crop. Despite higher expenses for seeds, synthetic fertiliser, pesticides and draft power, a hybrid maize boom has been observed in the region since 2007, which can be explained by the high productivity, revenues and direct cash income related to this crop. At the same time farmers are aware that intensification is not sustainable and soils are heavily degraded, mainly through water erosion when cultivating on steep slopes.

The study assesses impact of land use and management on soil fertility during 20 years under known land use change using a landscape model. Based on field information on land use, history trends of soil fertility are reconstructed in the simulations and model outcomes are validated against recent field measurements of soil fertility related parameters.

Aerial photos (1954, 1999) and satellite imagery (1999, 2007, 2010) were used to create land use maps using visual interpretation and supervised classification, past ground truth points supplemented by transect walks and key person interviews. More detailed information on cropping history and farmers' decisions were obtained from semi-structured household interviews and focus group discussions. Soil samples were collected along transects that reflect expansion of cultivation areas over time. Soil carbon, texture, available N and P were analysed and used for validation of the LUCIA (Land Use Change Impact Assessment) model.

Results of this study will serve as model validation and a basis to assess alternative land use options. Assessment of soil fertility changes under land use change will support land development agencies at local and national level when planning sustainable development in the area under current challenges, e.g. the rubber boom. In a second instance, data on land use history and farmers' decisions will be used to develop a decision-making module for the LUCIA model.

Keywords: Farmers' decisions, LUCIA, maize, soil fertility, Vietnam