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Parameterisation and Calibration of the Tropical Soil Productivity Calculator (TSPC) for Cabbage, Sweet Pepper and Litchi in Mae Sa Watershed, Northern Thailand

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Abstract

For the last 20 years, land use change in Mae Sa watershed has been influenced by governmental decisions and international donors' purposes. The conversion from opium and upland rice production over corn and coffee to its present land use system, consisting mainly of cash crops such as sweet pepper (*Capsicum annuum*), cabbage (*Brassica oleracea*) and litchi (*Litchi chinensis*), in combination with an emergence of greenhouses in the last years are examples of this phenomena. In this context decisions taken by dwellers of marginal upland areas increasingly affect livelihoods of lowland people. This is especially true for water, which has become a limiting factor during the dry season and cannot be easily provided even under capital-intensive farming systems.

Under these circumstances, spatially explicit modelling of land use change can be a valuable tool for an ex-ante assessment of the impact of new land uses. Within the SFB Uplands Program such a Land-Use Change Impact Assessment (LUCIA) model is generated, which builds on the Tropical Soil Fertility Calculator (TSPC) as its crop module. TSPC is characterised by its low data requirements and based on empirical yield functions accounting for C, N, P, K and pH as yield determinants.

For the purpose of LUCIA, water supply will be taken up into the TSPC as an additional constraint to crop production. Water stress functions adapted from those of the CROPWAT model are being integrated to estimate site-specific crop water requirements. In a second step, this study will develop crop response functions for litchi, cabbage and sweet pepper as well as parametrise and calibrate their yield functions for local conditions of the Mae Sa watershed in Thailand. To this end data from field experiments in the area and literature values for each of the crops will be evaluated. The more process oriented crop model WaNuLCAS will provide further estimates of crop response to changing water and nutrient regimes to allow for a comparative validation. Finally, TSPC will be coupled to LUCIA using the PCRaster platform in order to evaluate feedback mechanisms between crop production and watershed functions in the future.

Keywords: *Brassica oleracea*, *Capsicum annuum*, crop modelling, *Litchi chinensis*, northern Thailand, TSPC