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WaNuLCAS Modelling of Improved Swidden Agriculture Systems by Indigenous Fallow Management with *Melia azedarach* in the Uplands of Ban Tat, Northern Viet Nam

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Abstract

In Viet Nam, economic development and demographic pressure has resulted in fragmented landscapes. Especially mountainous areas are prone to environmental degradation. Government efforts to stop shifting cultivation were not successful. Until today, many hill tribe communities apply swidden agriculture on upland fields. Nevertheless, indigenous knowledge created also useful adoptions to the local environmental setup. The Da Bac Tay minority group of Ban Tat, in northern Viet Nam intercrop *Melia azedarach*, a fast growing deciduous tree, at different stages of the swidden cropping cycle, to improve the restoration of soil fertility. The Centre for Agriculture and Ecological Studies (CARES) of the Hanoi Agricultural University carried out a long-term nutrient balance analysis of selected local cropping systems. In this context, on plot erosion and run-off measurements were conducted within a small watershed of the Ban Tat area. The assessment of long-term effects of such systems is often difficult to predict. Therefore, the objective of this study was to test the applicability of the Water, Nutrient, Light Capture in Agroforestry Systems (WaNuLCAS) model related to run-off and erosion under the local conditions of Ban Tat. Results and information based on farmer interviews of CARES were used to calibrate the model. Selected input parameters on agricultural management, climate, soil structure and topography were used for a sensitivity analysis and to define threshold values for the calibration process of the Ban Tat dataset. Three scenarios of the CARES experiments were used to validate model results. The scenarios represented the experimental setup related with the local swidden practices. WaNuLCAS predicted quite well the overall measured run-off of selected plots from 2000 to 2002 in total sum. The range of runoff in between the selected years was consistent in all scenarios compared to experimental measurements. Nevertheless, the model did not illustrate sharp declines of erosion in the second year as measured in the field. WaNuLCAS 3.2 can serve as useful tool to validate relationships of run-off and erosion within a selected setup of parameters. In general, model applications can help to understand the behaviour of a defined system, but should not be taken as authoritative statement per se.

Keywords: Biophysical modelling, indigenous fallow management, *Melia azedarach*, northern Viet Nam, swidden agriculture, uplands, WaNuLCAS

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