Plant Production in the Tropics and Subtropics

Lars Boll

M.Sc. Thesis

Spatial Variability in Maize and Cassava Productivity in the Chieng Khoi Watershed, Northwest Vietnam

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Abstract

With rising population and high world market prices for crops such as maize, the pressure on upland fields for agricultural production has reached a new all time high. Therefore, steep slopes, decreasing soil productivity and high erosion rates do not hinder farmers of doing crop production in mountainous regions.

The overall goal of this study is to better understand the impact of land-use intensification on maize-cassava productivity and related nutrient flows at landscape level. Five fields were selected in the Chieng Khoi watershed, Son La province, Northwest Vietnam to study the impact of field accessibility, based on distance from village, crop performance and soil fertility. At each field, three plots were marked in the upper, middle and lower slope position and monitored during the 2008 cropping season to assess crop performance, in terms of plant density, ground cover, leaf area index and greenness of leaves. Furthermore, yield parameters were collected, and to link towards soil quality, soil samples were collected from each plot from 0 – 10 cm, 10 – 20 cm and 20 – 40 cm depth before planting and after harvest to assess changes in soil fertility. Soil texture, particle size distribution, pH, organic matter, water retention and bulk density were of interest as well as the soil nutrient composition. Amount and quality of runoff as well as total eroded soil within the cropping season was monitored by Gerlach troughs established on upper, middle and lower slope positions. Results were showing a wide spatial variability of yields and crop performance along slope gradients and cropping histories. Yields on upper positions were higher then obtained yields on lower and middle positions but not significantly. Fields with longer distances to homesteads had a more recent cropping history and had, therefore, a higher yield potential than fields closer to the homesteads which were already cultivated for longer periods. Most soil loss occurred after very strong single rainfall events at the first half of the cropping season and especially fields with young cropping history were affected.

Key Words: Land use; field accessibility; intensification; soil degradation; erosion; crop performance