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“Resilience of agricultural systems against crises”

Viability of Soil Conservation on Steep and Fragmented Lands – Recent Experiences from Northwest Vietnam

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Abstract

As a consequence of an increasing animal feed demand, maize production area of Northwest Vietnam has strongly increased in the past, mainly by expansion into forested uplands. Farmers usually slash and burn their fields to prepare a tidy field for a new season. Exposed to heavy rainfalls at the onset of the monsoon rains this leads to severe erosion and barren lands in the long run. Changes in rainfall pattern associated with increasing flood risks pose another threat. This study aimed at quantifying benefits of soil conservation in relation to soil loss, soil cover and yield in maize based systems to foster their adaption by local farmers. In 2009, we established a field trial on a Luvisol with slope gradients of 47-62 % in the Son La province of Vietnam. The treatments were maize under farmer's practice (T1), with *Panicum maximum* grass barriers (T2), under minimum tillage and *Arachis pintoii* as cover crop (T3) or relay cropped with *Phaseolus calcaratus* (T4). The results showed that erosion mainly occurred few weeks after sowing when high rainfall intensities coincided with a low soil cover (T1). Later when maize covered the soil well, erosion was minimal. Well-established grass barriers reduced soil loss (60 %) and provided animal fodder but significantly reduced maize yields (34%) compared to T1. In dry years maize yield declined up to 21 % but grass production increased by 26 % compared to a normal rainy season. Minimum tillage either with simultaneous growing cover crops or relay cropped strongly reduced soil loss compared to conventional cropping. Already established cover crops significantly reduced maize yields due to competition (T3). But a cut and carry system based on *A. pintoii* additionally provided a protein-rich animal fodder (3.3 t ha⁻¹). The most promising option, however, was maize with relay cropping, where maize yield reached the same level as T1 and, in addition, produced 1.16 t ha⁻¹ of *P. calcaratus* beans. Such extra-benefits from soil conservation may help promoting adoption by local farmers, particularly in view of markets. Sound management of cover crops, however, is necessary to minimize competition for water, nutrient and light.

Keywords: Cover crop, maize, minimum tillage, relay cropping, soil cover