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Does *Tephrosia candida* as fallow species, hedgerow or mulch improve nutrient cycling and prevent nutrient losses by erosion on slopes in northern Viet Nam?

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Abstract

Agroforestry is considered to be a promising alternative to short-fallow shifting cultivation or other monocropping systems. An on-farm experiment was established in 1996 in northern Viet Nam to examine the contribution of the leguminous bush *Tephrosia candida* (Roxb.) D.C. as a fallow or hedgerow species and as a mulch producer to improve nutrient cycling and prevent nutrient losses by erosion. The systems tested were upland rice monocropping (Mono), natural fallow (NaFa), fallow of *Tephrosia* (TepFa), hedgerow intercropping with upland rice (*Oryza sativa* L.) and internal mulching using pruned *Tephrosia* biomass (TepAl), and upland rice with external mulching using *Tephrosia* biomass (TepMu). Over two cropping seasons, from April 1996 to April 1998, nutrients recycled and inputs and exports were recorded, as well as changes in C-, N- and P-pools, and in pH in the 0–5 cm topsoil layer.

The *Tephrosia* systems (TepFa, TepAl, TepMu) prevented nutrient losses by erosion effectively. Compared to the NaFa system, the TepFa system accumulated 34% more N in the above-ground plant parts and increased topsoil N by 20%, probably due to N-fixation. There was a trend that the less labile P-pools (NaOH-P) were reallocated into the more labile P-pools (Bicarb-P) in the soil of the TepFa system. Burning released significant amounts of the inorganic P-pools in both the NaFa and TepFa systems and this effect seemed to be more pronounced in the TepFa than in the NaFa. Organic input to crop export ratios for N and P were >1 in the TepAl and TepMu treatments. This was due to a sufficient quantity and quality of the *Tephrosia* mulching material. However, moderately labile NaOH-extractable organic P seemed to be depleted in the topsoil due to high P uptake in the TepMu treatment. Thus, nutrient cycling and nutrient balances were improved under the *Tephrosia* systems. But for long-term P sustainability, there is a belief that a combined use of mulching and mineral P fertiliser is needed.

Keywords: Slash and burn; Erosion; Nutrient cycling; Improved fallow; Viet Nam

1. Introduction

Shifting cultivation (ShC) occupies about 3.5 million ha in the highlands of Viet Nam (Do Dinh, 1994).

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