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Soil fertility in contour hedgerow systems on sloping oxisols in Mindanao, Philippines

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Abstract

Although contour hedgerows are widely advocated to sustain food crop production in cereal-based farming systems in the tropics, little is known about the nutrient dynamics of these systems or the spatial gradients in soil fertility that may develop in the terraces that evolve behind the vegetative barriers. We studied the effects on soil chemical properties of four contour hedgerow systems: double rows of a tree legume *Gliricidia sepium* (Jacq.) (G); a row of *G. sepium* and a row of a native pasture grass *Paspalum conjugatum* (GPas); a row of *G. sepium* and a row of a productive fodder grass *Penisetum purpureum* (napier grass) (GPen); and a double row of *P. purpureum* (Pen). An open-field control (C) without hedgerows was included. The research was conducted in Mindanao, the Philippines on two Oxisols (Ferralsols) with slopes ranging from 20% to 30%; average alley width was 4.7 m and the average hedgerow width was 0.8 m. The prunings of *Gliricidia* were mulched on the alley (food-crop planting) area, the clippings of *Penisetum* were removed from the plots, and no pruning was done for *Paspalum*. Crop residues were distributed uniformly on the alley area as mulch. Each of the two crops in the rotation, rice (*Oryza sativa* L.) and corn (*Zea mays* L.), received 20 kg ha⁻¹ each of P and K and 60 kg ha⁻¹ of N. After 4 years of experimentation exchangeable Mg was about 40% lower in the Pen treatment compared to that in the C treatment. There was a tendency for the Pen treatment to have the lowest exchangeable K, Ca, and Mg and Bray-2 extractable P. Exchangeable Ca and Bray-2 P increased while exchangeable Al decreased linearly with a decrease in soil elevation in the alleyways in the hedgerow treatments, although these gradients were not always significant at the $p = 0.05$ level. Exchangeable K decreased linearly with the decrease in the soil elevation in the Pen treatment ($p = 0.12$). The use of *Penisetum* grass as hedgerow crop and at the same time for supplying fodder, mined the soil nutrients indicating that the system is unsustainable unless accompanied by fertilization or manuring. © 1999 Published by Elsevier Science B.V. All rights reserved.

Keywords: *Gliricidia sepium*; *Paspalum conjugatum*; *Penisetum purpureum*; Contour hedgerow

1. Introduction

Alley cropping is a farming system in which food crops are planted in alleys between hedges of trees or shrubs or a combination of both (Kang et al., 1981). A

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