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Mineralisation and Leaching of Nitrogen as Affected by Contour Hedgerow Systems on Moderate Slopes in Northeast Thailand

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Abstract

Minimizing soil erosion by introducing contour hedgerow systems has been proposed by several development agencies. These systems have been widely tested in hillside cropping area of tropical mountainous regions over the last two decades. Apart from influences on crop performance, this alteration of the production system is associated with changes of the nitrogen availability, e.g. leaching and mineralisation. The objective of this research was, therefore, to assess the mineralisation and leaching of nitrogen in three contour hedgerows systems and their impact on the crop performance compared to a control without hedgerows. The field experiment was established as split plot design with two replicates in 2003 at Na Haew district (17°33' N and 101°1' E), northeast Thailand. The treatments were three contour hedgerow systems, vetiver grass (*Vetiveria zizanioides*) barriers and ruzi grass (*Brachiaria ruzizienses*) barriers, leucaena (*Leucaena leucocephala*) hedges and a control without hedgerows and two fertiliser levels (no fertiliser and 61 kg ha⁻¹ of N plus 14 kg ha⁻¹ of P). In all treatments maize (*Zea mays*) cv. Suwan 1 was planted, relay cropped with jack bean (*Canavalia ensiformis*) using minimum tillage. Plot size was 4 m by 18 m. Data on N mineralisation were recorded in 2004 and 2005. N mineralisation and leaching were measured by using the soil core and the resin core method. Resin cores were established at a depth of 90 cm. A significantly higher N mineralisation (0–75 cm) was observed in all fertilised treatments compared to those without fertilisation. The highest total N mineralisation without N fertiliser was found in the treatment with leucaena hedges. On average, it ranged from 133 kg ha⁻¹ in 2004 to 154 kg ha⁻¹ in 2005. The highest total N mineralisation was found in the leucaena hedges treatment with fertiliser application about 186 kg ha⁻¹ in 2005. The cumulative N leaching was slightly higher in contour hedgerows systems compared to the control without hedgerow (50 vs. 45 kg ha⁻¹ year and 36 vs. 32 kg ha⁻¹ year in 2004 and 2005, respectively). These findings indicate that improved nitrogen availability is counteracted by higher leaching losses despite the presence of hedgerows.

Keywords: Hedgerow systems, nitrogen leaching, nitrogen mineralisation, resin core method, tropical mountainous regions