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## Translocation and Utilisation of Fertiliser N in Tropical Sloping Land as Affected by Soil Conservation

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### Abstract

Fertilisers are essential inputs for maintaining or increasing soil fertility in intensive agricultural systems. Due to high fertiliser costs and limited supply in developing countries, enhanced nutrient management needs to be pursued through maximising the efficiency of nutrient uptake, in order to sustain increased crop productivity and simultaneously enhance nutrient cycling and soil and water conservation. The fertiliser N consumption of Thailand, moreover, increased from 0.78 million tons in 1997 to 1.04 million tons in 2007 and is expected to further increase in the future. Both chili (*Capsicum annuum*) and maize (*Zea mays*) are important upland crops of Thailand. Particular maize receives substantial amounts of fertiliser due to its increasing market demand in the past. However, the fertiliser N utilisation (FNU) and translocation (FNT) in maize-chili and maize-chili-leucaena systems have yet not been studied, especially on sloping land. This research examined FNU and FNT in hillside agriculture as affected by crop management and soil conservation. Therefore, a field experiment was conducted in 2010 at Queen Sirikit farm, Suan Phueng District, Ratchaburi province in West Thailand (on hilly terrain with slope gradients up to 25%). The treatments consisted of four maize based cropping systems were (T1) maize monocrop, tillage, (T2) maize-chili intercrop, tillage, (T3) as T2 but with minimum tillage, relay cropped with *Canavalia ensiformis*, and (T4) as T3 but with *Leucaena leucocephala* hedgerow. <sup>15</sup>N labeled urea (10 atom % <sup>15</sup>N) was applied to a maize row in the upper part of each plot. 62 kg ha<sup>-1</sup> of N was split applied at 30 and 60 days after maize sowing. Plant and soil samples of various positions along the slope, sediment, runoff and resin core samples of each plot were collected for stable isotope analyses to study the N recovery from fertiliser application and the N translocation. Total FNU in maize was highest in T4 indicating that the hedgerow system had positive effects on FNU due to reduced runoff. Only very small movements of <sup>15</sup>N labeled fertiliser were detected along the slope in all treatments, indicating most of the N losses were of volatile nature.

**Keywords:** Chili, hedgerows, intercropping, maize, minimum tillage, nitrogen fertiliser use efficiency, relay cropping, soil conservation, stable isotopes, Thailand, translocation