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Improvement of Water Harvesting and Anti-Erosive Cultural Practices for Sustainable Rainfed Multiple Crop Production on Sloping Land

MATTIGA PANOMTARANICHAGUL¹, SIVAPONG NAREUBAN²

¹Chiang Mai University, Department of Soil Science and Conservation, Thailand

²Ministry of Agriculture and Agricultural Co-operative, Maehongson Research and Technology Service Centre, Thailand

Abstract

This experiment aims to evaluate the effects of water harvesting strategies and anti-erosive cultural practices on the improvements of soil and water conservation for sustainable rainfed multiple crop production on sloping land. The field trials (Sites A and B) in Borkrai Village, Northern Thailand, consisted of 12 sub plots (5 × 30 m) each site, with rotations of maize (*Zea mays*) followed by upland rice (*Oryza sativa*) and lablab bean (*Lablab purpureus*). The experiment was a completely randomised design (CRD) with three replicates of 4 anti-erosive cultural practices, **(i)** Conventional contour planting (CP), **(ii)** Contour furrow cultivation and alley cropping with the hedgerows of mixed fruit trees (CF -AL), **(iii)** Contour furrow cultivation with mulching and alley cropping (CF-M-AL), and **(iv)** Conventional contour planting and alley cropping + vetiver grass rows (CP -AL-VG). The measured data were top soil chemical and physical properties, surface runoff and soil loss, 1 m soil water content profile, crop total dry biomasses and yields.

The results obtained from Site A (which were similar to Site B) during the first experimental year are described as follows. **(i)** CF-M-AL tended to give better soil properties than the other treatments. **(ii)** The lowest surface runoff and soil loss occurred in CF-M-AL plots (87 m³ ha⁻¹ and 57 t ha⁻¹) while the highest amounts were found in CP plots (132 m³ ha⁻¹ and 315 t ha⁻¹), compared to CF-AL plots (92 m³ ha⁻¹ and 90 t ha⁻¹) or CP-AL-VG plots (97 m³ ha⁻¹ and 189 t ha⁻¹). **(iii)** The highest amount of mid-dry season soil water contents (1 m soil depth) was obtained under CF-M-AL (165 mm), compared to CP (133 mm) or CF-AL (139 mm) or CP-AL-VG (125). **(iv)** Maize yields was the lowest under CP (4.32 t ha⁻¹) compared to CF-M-AL (7.20 t ha⁻¹), CF-AL (6.20 t ha⁻¹) and CP-AL-VG (5.87 t ha⁻¹). CF-M-AL gave the highest total biomass yield of maize and lablab beans compared to the other treatments. The results indicated that contour furrow cultivation with mulching (CF-M-AL) was the best while conventional contour planting (CP) was the worst strategy for soil and water conservation, and multiple crop production improvement.

Keywords: Alley cropping, anti-erosive, contour furrow cultivation, multiple cropping, water harvest