

ABSTRACT

THAPA, BIR BAHADUR, University of the Philippines Los Baños, November, 1991.
Evaluation of Infiltration, Surface Runoff and Soil Losses at Various Levels of Rainfall in Relation to Surface Cover, Tillage and Soil Management Practices.

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The characteristics and behavior of rainfall, infiltration and surface runoff were evaluated during a corn-mungbean cropping cycle in a 15 - 20% slope Tropudalf. The effects of cropping practices, mulching and tillage on infiltration, runoff and soil losses were determined using three alley croppings, namely: with clean culture and conventional tillage (T2), using conventional tillage and mulching (T3) and with mulching and conservation tillage (T4). These were compared to farmer's practice which employed conventional up and down the slope tillage and clean culture (T1). Twelve plots, each having an area of 72 m², were laid out in a randomized complete block design. The plots had electronically controlled devices designed to measure simultaneously the rates and amounts of rainfall and runoff, and amount of soil losses.

Out of the 216 rainy days in 1988 to 1990, 50% had daily rainfall amount of 10 mm or less. The highly erosive rainfall events with 50 mm/day or greater were only 14% and appeared as outliers in the frequency distribution curve. Maximum daily rainfall was 268 mm/day.

The kinetic energy (KE, ton-m/ha) of rainfall and erosivity index (EI30) were linearly related to the amount of daily rainfall (X, mm/day), as described by the following equations:

$$KE = -20 + 24 X \quad (r = 0.98^{**})$$

$$EI30 = -4 + 0.90 X \quad (r = 0.71^{**})$$

The maximum KE and EI30 of daily rainfall were 6221 ton-m/ha and 239, respectively, while the corresponding most frequent ranges for each were ≤ 200 ton-m/ha and ≤ 10 .

Runoff and infiltration were influenced by antecedent soil moisture content, rainfall and the treatments. During the start of rainy season in May, when the soil was relatively drier, infiltration was almost equal to rainfall, and there was insignificant amount of runoff in all the treatments. As the soil became wetter towards peak rainy season in June to October, runoff increased with increase in rainfall intensity. Amount of runoff (TQ), peak runoff rate (PQ) and average effective runoff rate (AQ) were significantly higher in the farmer's practice than in the alley cropping treatments. For the annual rainfall of 1884 mm in 1990, the total amounts of runoff were 508, 349, 205 and 210 mm for T1, T2, T3 and T4, respectively. For the same set of treatments, the highest recorded peak runoff rates during a 29 mm rainfall event were 164, 56, 15 and 13 mm/hr, respectively. The general behavior of infiltration was opposite that of runoff.

Steady state infiltration rates, determined by using double ring infiltrometer, were two to six times faster in the hedgerow strips than in the tilled portion or alleyways of T2 and T3, and T1. As a result, runoffs initiation time was delayed and the amount of runoff was significantly reduced by the presence of hedgerows.

Total soil loss was 219.5, 24.6, 5.4 and 5.3 ton/ha/year in T1, T2, T3 and T4, respectively. The tremendous reduction of soil loss in the alley cropping treatments specifically T3 and T4 was attributed to the combined effect of hedgerows, mulching, and contour or minimum cultivation. This reduced not only the total runoff amount but also the sediment concentration. The 1990 average sediment concentrations in g/li for T1, T2, T3 and T4 were 43.2, 27.0, 2.6, and 2.5, respectively.

The use of hedgerows in combination with mulching and/or minimum tillage in an alley cropping system was found to reduce annual erosion rate to less than 6 ton/ha/year.

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