

ABSTRACT

An erosion study was conducted at St. Michael Station, on the Maracas soil type (Orthoxic tropudult) in the Northern Range, Trinidad. The magnitude of water runoff and soil loss caused by natural rainfall, was evaluated on a 47 percent slope, under two plant densities of corn (Zea mays L.) and the bare soil surface. During the three month cropping period, twenty rainstorms were monitored.

The bare soil surface lost 57.63 t ha^{-1} , the wide plant spacing (41,500 plants per hectare) lost 31.97 t ha^{-1} , and the close plant spacing (62,500 plants per hectare) lost 20.50 t ha^{-1} of soil. Runoff losses averaged 33.16 cm water for the bare soil, 29.07 cm water for the wide plant spacing and 24.94 cm water for the close plant spacing. An average of 50 percent of the total rainfall of 49.63 cm, was lost as runoff. The increased leaf area index (from 6.0 to 9.5) with the increased plant population, significantly reduced runoff and soil losses, but still did not provide adequate soil protection. Soil losses were much higher than the recommended tolerance levels.

A few intense storms caused a disproportionate amount of soil loss (the three largest storms caused 60 percent of the total soil loss) and soil loss from the bare soil was particularly marked for the heaviest storms. The close plant spacing reduced bare soil treatment losses of 20.62 t ha^{-1} to 3.92 t ha^{-1} for the heaviest rainstorm. Slope aspect significantly influenced the runoff and soil loss values obtained, but had no effect on leaf area index or yield. LAI values

for the two plant spacings were significantly different, but crop yield, measured at the green cob stage, showed little difference. There was a trend of increased LAI and crop yield down the slope.

The following rainfall parameters were related to each other and to runoff and soil loss: rainfall amount, rainfall duration, maximum intensities of rainfall for 7.5, 15, 30 and 45 minutes, rainfall energy (KE), rainfall energy multiplied by each of the four maximum intensity values ($EI_{7.5}$, EI_{15} , EI_{30} and EI_{45}), $KE > 25$, and AI_m . All the rainfall parameters except rainfall duration, gave significant correlations with each other and with runoff and soil loss. Extremely high correlation was found between rainfall amount and rainfall energy. $KE > 25$ was the rainfall erosivity index with the highest correlation with soil loss for all treatments, and rainfall kinetic energy KE was the index with the highest correlation with runoff for the treatments.