EROSION LOSSES FROM BANANA-PINEAPPLE INTERCROPPING AND SOIL LOSS PREDICTION USING RUSLE

T. Jamal, M.A. Almas and W.H. Wan Sulaiman

Faculty of Agriculture
Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia

Keywords: conservation, intercropping, runoff water, RUSLE, soil erosion.

Introduction

Planting of annual crops like groundnut and maize, for example, as intercrops with newly replanted rubber increases the risk of soil erosion as compared with the traditional practice of planting cover crops (Mokhtaruddin et al. 1991). These annual crops require more intensive cultivation, thereby exposing the soil to erosion by rain. Short term perennials are likely to be more viable crop options as intercrops of rubber as these crops involve less cultivation of the soil and therefore diminish the susceptibility to erosion. The purpose of this study was to evaluate erosion losses from banana-pineapple intercropping and to predict soil loss using the Revised Universal Soil Loss Equation (RUSLE).

Materials and Methods

In this study four erosion plots with an average slope of 9% were prepared on ultisol – one was planted with banana, a second with pineapple, and third with intercrop of banana and pineapple, whereas one plot was kept bare with regular cultivation every fortnight. Runoff water and sediment loss was measured after every erosive rainfall. For soil erosion prediction, the RUSLE model was used. Soil erosion was predicted for each growth period and overall experimental period. Predicted results were compared with actual measurements from the plots.

Results and Discussion

There was 25% more rainfall than the average of the last 10 years. The maximum soil and water loss was from bare plot, whereas the lowest soil loss was from pineapple plot and lowest water loss was from intercrop plot. The difference of soil loss between intercrop and pineapple plots was insignificant. In the early growth period soil and water loss from the cropped plot was not significantly different from the bare plot. After the establishment of the crop canopy and root network of the plants, soil and water loss from the cropped plots were reduced significantly as compared to bare plot. The canopy cover protects the soil from raindrop impacts and the root network strengthens the soil structure. Soil nutrient analysis showed that there was a decrease in the fertility status from the top to the bottom of the slope of each plot. The clay and silt particles might have settled in depressions and small cavities on the soil surface as they were transported from top to the bottom of the slope. Analysis of the sediment loss showed high organic carbon loss followed by N, Ca, K, Mg, and P, whereas analysis of runoff water showed high loss of K followed by Ca, Mg, N and P. Total loss of N, P and K, that is through sediment plus runoff, showed very little difference between intercrop and pineapple plots but significantly lower than banana plot. Results of soil erosion prediction with RUSLE showed underestimation in soil loss for bare, intercrop and pineapple, whereas for banana there was no difference in measured and predicted soil losses.

Conclusions

It can be concluded that banana-pineapple intercrop is a better alternative practice for controlling long-term soil loss and water runoff from sloping agricultural lands especially in between newly replanted rubber. The pineapple when planted in hedgerows acts as thick barrier against surface runoff. Banana and pineapple provide short-term income while long term crops such as rubber are still growing. RUSLE can be used to estimate soil losses for conservation planning in sloping agricultural areas.

References

Mokhtaruddin, A.M., Eusof, Z., Hashim, M.H., Wahab, M.A., Sudin, M.N. and Bachik A.T. 1991. Effects of cultural practices on soil erosion under immature rubber. In Khanif, Y.M., S.R. Omar, J. Shamshuddin (eds.). Developments in soil research in Malaysia. *Malaysian Society of Soil Science*. p. 183-193.

Supported by IRPA Grant 01-02-04-0206