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Farmers’ and academia’s views”

Soil loss reduction and rainwater management in climate smart maize and coffee production systems

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Abstract

Adequate rainwater management at the field level is an important measure to increase the resilience of agriculture to the effects of climate change. The implementation of soil and water conservation practices can significantly reduce erosion, increase the amount of plants available soil water, and mitigate the effects of intra-seasonal dry periods.

The ALRI-RAICES project began measuring soil loss and runoff in maize and coffee production systems in 2021 in the department of Ahuachapan, El Salvador. Three erosion measurement plots were established at each of the two sites in San Raymundo (maize) and Apaneca (coffee) with the following characteristics: bare fallow (SR1 and AP1), conventional maize (SR²), maize with mulch (SR³), shaded coffee (AP2), and shaded coffee with vegetative barriers of Vetiver and cover crop (AP3). During the measurement period between May and October, 1204 mm of rainfall was recorded in San Raymundo and 2197 mm in Apaneca.

Measured soil erosion and surface runoff varied significantly among the different plots. In the conventional maize plot, 94.6 t/ha soil loss was measured, of which 86 % was due to six heavy erosive rains at the beginning of the rainy season and in the early stage of crop development in May and June. In comparison, mulching was a very efficient measure to reduce soil loss to only 1.2 t/ha. In addition, 143.8 mm more rainwater was absorbed and infiltrated on the SR³ plot than on the SR² plot, equivalent to 1490 cubic meters per hectare, which demonstrates the importance of ground cover for in-field water management.

In both coffee plots, only a single rainfall event of 245 mm triggered low soil loss of 0.02 (AP2) and 0.1 t/ha (AP3). The implemented soil protection measures had no additional effect under the given conditions. Coffee cultivation in the shade cropping system with multi-stratified vegetation cover and advantageous soil properties created a resilient system that provides high hydrological services. The two bare fallow plots (SR1, AP1) showed significant differences in runoff development and erosion resistance, highlighting the importance of soil properties in the erosion process and for field water management.

Keywords: Cover crops, erosion measurement, in-field rainwater harvesting, mulch, soil loss and runoff, vegetative barriers