Research Note

MAGNITUDE OF SOIL LOSSES THROUGHOUT THE CARIBBEAN[1]

The purpose of this note is to develop awareness of the magnitude of soil losses in selected countries of the Caribbean Basin as a basis for implementing erosion control programs and adopting technologies to restore productivity where feasible. The original data were obtained through systematic measurement of soil losses at various locations under a diversity of cropping systems and through on site observations. Awareness of the dangers of soil erosion can lead to shifts in land use, conservation of the natural resource base, restoration of soil productivity and increased crop yields.

According to Wilson (1976)[2], food crop production for local consumption in steeply sloping areas of the Caribbean has caused major erosion problems. Ahmad and Breckner (1973)[3] reported that many of the soils on steeply sloping topography in Trinidad and Barbados have developed on shales and schists and hence are susceptible to landslides and other forms of erosion caused by runoff. Breckner (1973)[4] reports soil losses ranging from 116 to 236 t/ha/yr in the soils of Tobago.

In the arid and semiarid lands of the inner arc of islands to windward—Antigua and Barbuda—wind erosion is a serious problem (Hill, 1964)[5]. It is often aggravated by torrential rains, which can sometimes occur after long periods of drought, when the land is unprotected by the sparse vegetative cover.

Wahab et al. (1985)[6] measured soil losses of 192 t/ha/yr in an Ultisol in Jamaica for two consecutive crop years from plots planted to yams on individual hills without hillside ditches. With the construction of hillside ditches, and intercropping yam with Irish potato, soil losses decreased by 35%. Further reduction was achieved by planting on continuous contour mounds interrupted by hillside ditches. Greatest reduction in soil loss was attained when a grass buffer strip was planted between contour mounds.

Enormous soil losses ranging from 95 to more than 300 t/ha/yr have been measured in some relatively small watersheds of the Dominican Republic (Tirado and Lugo-López, 1984)[7]. These are catastrophic losses, which if not minimized, might eventually lead to further destruction of the resource base, declining productivity, and silting of reservoirs.

The classical work of Smith and Abruña (1955)[8] provided valuable data on soil erosion losses under conditions in Puerto Rico. Water and soil losses were collected in sheet metal tanks. The studies

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[3]Ahmad, N. and E. Breckner, 1973. Erosion hazard and farming systems in the Caribbean countries, Mimeograph, Univ. West Indies Library, St. Augustine, Trinidad.

[4]Breckner, E., 1973. Soil erosion in the West Indies and its measurement on three Tobago soils, M. Sc. Thesis, Univ. West Indies Library, St. Augustine, Trinidad.

[5]Hill, I. D., 1964. Soil and land use survey no. 19: Antigua, Univ. West Indies Library, St. Augustine, Trinidad.

[6]Wahab, A. H., M. A. Lugo-López, B. M. Woo, F. Rosales and J. Dehaney, 1985. Alternatives to bench terraces on the hillside of Jamaica: I. Soil losses, *J. Agric. Univ. P.R.* 69(3):255-64.

[7]Tirado, G. and M. A. Lugo-López, 1984. Erosion on the hillsides of the Dominican Republic, *J. Agric. Univ. P.R.* 68(1):117-119.

[8]Smith, R. M. and F. Abruña, 1955. Soil and water conservation research in Puerto Rico, 1938 to 1947. 1955. Univ. P.R. Agric. Exp. Sta. Bull. 124.

were conducted for a nine-year period on a deep, reddish-brown Tropeptic Haplorthox, 40 to 50% slope. Crop rotation reduced losses to almost 10% of those measured in desurfaced plots, i.e., from 339 to 39 t/ha/yr. Under bare fallow conditions, losses were reduced from 339 to 283 t/ha/yr. Soil losses under sod were minimal, i.e., 2 t/ha/yr, a striking contrast with the amount of losses from bare fallow and desurfaced plots. Data from land planted to coffee in Vertic Eutropepts, 62% slope, reveal that ground cover rather than individual terraces is a major factor in minimizing soil losses. When the ground cover was cut clean and removed, losses increased fifteenfold. Losses of comparative magnitude were measured by Bonnet et al. (1950)[9] in sugarcane fields when the crop residues were removed instead of being left as a mulch.

Recent observations throughout Haití (Wahab et al., 1987)[10] and Costa Rica (Lugo-López and Villarubia-Cruz, 1985)[11,12] reveal that perhaps larger soil losses are occurring. These are attributable to rampant deforestation, poor pasture management, and clean cultivation of steep slopes.

There is ample evidence attesting that soil losses can be substantially reduced through minimum tillage, conservation practices and appropriate crop and soil management technologies (Lugo-López et al., 1981)[13]. Soil conservation practices must be simple, low cost and effective. The use of high-yielding crop cultivars, pest control, rational fertilization and liming are essential components of the soil conservation package of practices.

Data have been recently provided by Abruña and Lugo-López (1987)[14] indicating that productivity of eroded deep acid Ultisols and probably Oxisols of the humid tropics can be restored rapidly through fertilization, liming, addition of organic matter sources and appropriate management. Exposure to heat as well as to drying and wetting cycles under field conditions rapidly improved the tilth of an exposed subsoil in an Orthoxic Tropohumults. With proper fertilization the exposed subsoil produced 80% as much forage as the topsoil. There were beneficial effects attributable to an organic matter source.

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[9]Bonnet, J. A., F. Abruña and M. A. Lugo-López, 1950. Trash disposal and its relation to cane yield, soil and water losses. *J. Agric. Univ. P.R.* 34(3):286-93.

[10]Wahab, A. H., M. A. Lugo-López and G. Acevedo, 1987. Soil erosion in southwestern Haití. *J. Agric. Univ. P.R.* 71(2):239-240.

[11]Lugo-López, M. A. and J. Villarrubia-Cruz, 1985. Observation on the physical geography and agriculture of the Río Nosara Watershed in the Nicoya Península of Costa Rica. *J. Agric. Univ. P.R.* 69(3):449-50.

[12]Lugo-López, M. A. and J. Villarrubia-Cruz, 1985. Conflict of land-use in the Puriscal Area of the Río Parrita Watershed in southwestern Costa Rica. *J. Agric. Univ. P.R.* 69(3):451-3.

[13]Lugo-López, M. A., F. Abruña and R. Pérez-Escolar, 1981. The role of crop and industrial residues on erosion control, properties and productivity of some major soils in Puerto Rico, Univ. P.R. Agric. Exp. Sta. Bull. 266.

[14]Abruña, F. and M. A. Lugo-López, 1987. Restoration of productivity in tropical eroded soils under appropriate management. *J. Agric. Univ. P.R.* 71(1):13-22.