A. INTRODUCTION

Erosion includes all processes that result in the physical wearing down of the surface of the earth. Erosion processes are complex, consisting of "natural" (geological) erosion and "accelerated" (man induced) erosion. Natural erosion rates are very high in Nepal because of the constant tectonic uplifting of the major mountain ranges and consequent downcutting of the river systems. The net result of these unrelenting forces are unstable slopes that cannot maintain their river-canyon form. Natural erosion is characterized by different forms of mass wasting,* particularly rock failures, landslides, slumps, riverbank cutting and gullying.

Over the last century, an increasing proportion of the soil loss is attributable to accelerated erosion induced by an increased population pressure on a limited land resource. Forest clearing, overgrazing, poorly maintained marginal arable lands and fire have greatly altered the natural vegetation of Nepal, leaving the soil open to degradation. Accelerated erosion is characterized by the loss of topsoil by sheet and rill erosion.

Erosion processes profoundly affect the economy of the Nepalese villagers and collectively the health of the nation through the following:

- The most serious problem is the loss of topsoil from cultivated and grazing land. As topsoil is eroded, soil fertility declines and the soil is less able to maintain its productive capacity.
- Mass movement of slopes including rock failure, landslides, slumps, and debris torrents cause tremendous destruction of productive land, irrigation systems, paths, road alignments and villages.
- High sediment loads of rivers quickly reduce the useful storage capacity of man-made reservoirs, silt up irrigation canals, and damage turbines and water control structures.
- Sedimentation, in conjunction with peak discharges results in abrupt river channel changes. These cause tremendous hardships for farmers on the alluvial lands of Nepal.

*Mass wasting refers to the en masse movement of fractured rock, saprolite and other unconsolidated materials, including soil from a slope, whereas surface erosion refers only to the loss of topsoil resulting from rainfall or wind erosion.

Himalayan erosion is discussed here under B) Surface Erosion and C) Mass Wasting.

The inability to appreciate the differences between these two distinct processes has resulted in considerable confusion when implementing soil conservation programmes. It is important to determine which erosion processes man can effectively moderate through appropriate land use techniques.

B. SURFACE EROSION

Surface erosion is less visually apparent than mass wasting but it is much more damaging to the livelihood of the people of Nepal. Loss of topsoil by surface erosion is the direct result of heavy rains pounding unprotected soils. Many of man's activities cause the soil to become less protected than it would be in a natural state. (See Photo I.)

The loss of one or two millimeters of topsoil every year may not make a spectacular visual impact, but the cummulative effect is the impoverishment of the soil base. Topsoil has the highest levels of nitrogen, phosphorous and organic matter and is more productive for plant growth than lower soil horizons. Because of the insidious nature of surface erosion, it is necessary to develop a method whereby surface erosion can be quantified.

1. Factors Contributing To Surface Erosion

Scientists have developed a number of regional assessments characterizing soil erosion throughout Nepal. Such exercises are difficult to carry out because of the extreme variability found throughout the country. Rainfall erosivity, wind velocity, aspect, slope, bedrock type and characteristics, land use, forest type and condition must all be considered in the prediction of surface erosion. Surface or topsoil erosion caused by rainfall can be investigated by the use of the Universal Soil Loss Equation (U.S.L.E.) (Wischmeier and Smith 1978) whereas mass wasting events are virtually unpredictable without very expensive on site investigation.

Briefly the U.S.L.E. is $A = RKLSCP$

Where A = the amount of soil loss in tons per ha
R = Rainfall erosivity
K = Soil erodibility
LS = Slope length and steepness
C = Cropping management
P = Erosion control measures