SOIL EROSION ASSESSMENT

Measurement of Water Erosion

Universal Soil Loss Equation (USLE) -predict annual soil loss by water –Wischmeier and Mannering, (1969).

A = R K L S C P

Where, A= the predicted soil loss (kgm^2s^{-1}) is a product of:

R= rain fall erosivity

K= soil erodibility

L= slope length

S= slope gradient or steepness

C= cover and management

P= erosion control practices

Limitations of the USLE

1. The USLE was designed to predict the amount of soil loss by sheet and rill erosion in an average year for a given location
2. It cannot predict the extent of gully erosion.
3. It cannot predict sediment delivery to streams
4. It is applicable to a plot size of 9% slope and 22 m long

Other prediction models have been developed, which are referred to as the process-based models, Process-based models or analytical component models: They explain mathematically each of the

separate physical processes and then combine the separate effects. Such models often require the use of computers to facilitate their use. These include the following:

1. Revised Universal Soil Loss Equation

- RUSLE (Renard*et al.*,1997), is the successor of the USLE
- The USLE was updated and computerized in the early 1990's to create an erosion prediction tool called the RUSLE.
- The RUSLE uses the same basic factors of the USLE. However, some factors are better defined and improved the accuracy of soil loss prediction
- This computer software package is constantly being improved and modified for better prediction.

2. Water Erosion Prediction Project (WEPP) model -The Water Erosion Prediction Project was initiated in 1986 (Foster et al., 1989).

3. EUROSEM (Morgan *et al* . 1992).

4. GUEST (Misraand Rose 1996; Rose *et al* . 1997)

5. Erosion Productivity Impact Calculator (EPIC) model (Sharpley and Williams, 1990)

6. Modified Universal Soil Loss Equation (MUSLE) : The MUSLE equation was developed by J. R.Williams1975 as a method to estimate sediment delivered from small watersheds for individual storms

Water Erosion Prediction Model (WEPP)

The objective of WEPP is to develop a new generation of erosion prediction technology for use by conservation planner at the field level. The technology is based on fundamentals of erosion

and hydrological sciences, and it is computer-driven. WEPP is a simulation model that computes on a daily basis, the rates of hydrologic, plant-growth, and even litter-decay process.

Soil Erodibility

Soil erodibility values were obtained directly from measurements on soil conservation experiment stations. They can be determined using rainfall simulators on small plots. Still they can be determined from relationships between soil properties and soil erodibility as developed in the Wischmeier nomograph. To use the nomograph the following parameters are needed -

- % silt + % very fine sand
- % organic matter
- % sand (0.10 to 2.00 mm)
- Class of soil structure
- Class of permeability

Slope factor (LS)

Slope length is the horizontal distance downslope from point where overland flow begins to where runoff enters a waterway or where deposition starts. Erosion is proportional to slope length raised to a power, *m*. Values of m range from 0.02 to > 0.8 slope steepness. The standard slope length used in determining K values is 22.1 m (72.6 ft).

Slope steepness is defined as the gradient expressed in units of vertical rise or fall per unit of horizontal distance (decimal fraction). It is convenient in the field to determine slope as the

vertical fall per unit of distance along the land surface. Differences are negligible for gentle grades, but increase as slopes become steeper.

Cover-Management Factor

Cover-management effects on erosion are complex and diverse. Type of crop, stage of growth, and crop and soil management are important. Some crops and crop sequences maintain good soil cover; others leave the land bare for extended periods.

Supporting Practice Factor (P)

Special practices are frequently needed in addition to the protection provided by normal crop and soil management practices. Most common practices are contour cultivation, contour strip cropping, terracing.