Soil erosion: Controlling factors

Part II (1+1+1 System) Geography Hons.
Paper: IV
Module: VI
Topic: 2.1

Decades of agricultural research coupled with centuries of farmers' experience have clearly identified the major factors affecting accelerated erosion. These factors are included in the universal soil-loss equation (USLE).

$$A = R \times K \times LS \times C \times P$$

A, The predicted soil loss, is the product of

R	=	*Rainfall erosivity*	*Rain-related factor*
K	=	*Soil erodibility*	*Soil-related factors*
L	=	*Slope length*	
S	=	*Slope gradient or steepness*	
C	=	*Cover and management*	*Land management factors*
P	=	*Erosion control practice*	

Working together, these factors determine how much water enters the soil, how much runs off, how much soil is transported and when and where it is re-deposited.

i. Rainfall erosivity factor *R*

The rainfall erosivity factor R represents the driving force for sheet and rill erosion. It takes into consideration the total rainfall and more important, the intensity and seasonal distribution of the rain.

Rain intensity is of great importance for two reasons:

a. Intense rains have a large drop size , which results in much greater kinetic energy being available to detach soil particles, and
b. The higher the rate of rainfall, the more runoff occurs, providing the means to transport detached particles.

Gentle rains of low intensity may cause little erosion, even if the total annual precipitation is high. In contrast, a few torrential downpours may result in severe damage, even in areas of low annual rainfall.

ii. Soil erodibility factor *K*

The soil erodibility factor K indicates a soil's inherent susceptibility to erosion. The K value assigned to a particular type of soil indicates the amount of soil lost per unit of erosive energy in the rainfall, assuming a standard research plot(22 m long, 9% slope) on which the soil is kept continuously bare by tillage.

The two most significant and closely related soil characteristics influencing erodibility are (a) infiltration capacity and (b) structural stability. High infiltration capacity means that less water will be available for runoff and the surface is less likely to be ponded (which would make it more susceptible to

splashing). Stable soil aggregates resist the beating action of rain and thereby save soil even though runoff may occur.

iii. Topographic *factor LS*

The topographic factor LS reflects the influence of length and steepness of slope on soil erosion (assuming a standard research plot of 22 m long, 9% slope). The grater the steepness of slope, other conditions being equal, the greater the erosion, partly because more water is likely to run off but also because of increased velocity of water flow.

The length of the slope is important, because the grater the extension of the inclined area, the greater the concentration of the flooding water.

iv. Cover and Management factor *C*

Erosion and runoff are markedly affected by different types of vegetative cover and cropping systems. Undisturbed forests and dense grass provide the best soil protection and are about equal in their effectiveness. Forage crops (both legumes and grasses) are next in effectiveness because of their relatively dense cover. Small grains, such as wheat and oats, are intermediate and offer considerable obstruction to surface wash. Row crops, such as corn, soybeans and potatoes offer relatively little living cover during the early growth stages and thereby leave the soil susceptible to erosion unless resides from previous crops cover the soil surface.

v. Erosion control practice *P*

On some sites with long and/or steep slopes, erosion control achieved by management of vegetative cover, residues and tillage must be improved by the construction of physical structures or other steps aimed at guiding and slowing the flow of runoff water. The P factor the ratio of soil loss with a given support practice to the corresponding loss if row crops were planted up and down the slope. The support practices include tillage on the contour, contour strip cropping, terrace systems and grassed waterways, all of which will tend to reduce the P factor.