DEPARTMENT OF AGRICULTURAL ENGINEERING

24AG402 SOIL AND WATER CONSERVATION ENGINEERING

Dr.D.PRINCE SAHAYA SUDHERSON

Associate Professor

2.31 Revised Universal Soil Loss Equation

The Revised Universal Soil Loss Equation (RUSLE) is an upgrade of USLE that is land use independent. It can be used on cropland, disturbed forestland, rangeland, construction sites, mined land, reclaimed land, military training grounds, landfills, waste disposal sites, and other lands where rainfall and its associated overland flow cause soil erosion. RUSLE was first introduced in the USDA Soil and Water Conservation Service in 1993. RUSLE maintains the same empirically based equation as USLE to compute sheet and rill erosion as follows**:**

$$A=RKLSCP$$

A = Computed soil loss per unit area (tons per acre)

R = Rainfall factor # of erosion index units in a normal year's rain. Erosion index is a measure of the erosive force of a specific rainfall

K = Soil erodability factor erosion rate/unit of erosion index for a specific soil in cultivated continuous fallow on a 9% slope 72.6 feet long

L = Slope length factor ratio of soil loss from the filed slope length to that from a 72.6- foot length on the same soil type and gradient

S = Slope gradient factor ratio of soil loss from the field gradient to that from a 9% slope

C = Cropping management factor ratio of soil loss from a field with specified cropping and management to that from the fallow condition on which the factor K is evaluated

P = Erosion control management factor ratio of soil loss with contouring, strip cropping or terracing to that with straight-row farming, up and down slope

where A is computed soil loss, R is the rainfall-runoff erosivity factor, K is a soil erodibility factor, L is the slope length factor, S is the slope steepness factor, C is a cover management factor, and P is a supporting practices factor.

The major changes compared to USLE are in the values given for erosion as modified by vegetative cover and better calculations of the slope (LS) factors, as well as more advanced computerization.RUSLE gives more credit to the ability of surface residues to reduce erosion, as well as residues incorporated in the soil near the soil surface. Where USLE assumed that runoff was uniform over the catchment, RUSLE takes better into account that some runoff is channeled into rills and gullies. RUSLE also captures better than USLE that long rains can saturate the soil, leading to reduced intake and greater erosional runoff. In contrast with USLE, RUSLE can handle converging and diverging terrain and considers areas with net sedimentation.

An additional change incorporated in the RUSLE is to account for rock fragments on and in the soil. Rock fragments on the soil surface are treated like mulch in the C-factor, while K is adjusted for rock in the soil profile to account for rock effects on permeability and, in turn, runoff.

2.32 Permissible erosion

Permissible erosion refers to the maximum allowable rate of soil loss from a particular area while still maintaining its long-term productivity and sustainability. This concept is fundamental in soil conservation and land management, aiming to strike a balance between agricultural productivity and the preservation of soil resources.

The determination of permissible erosion involves considering factors such as soil characteristics, climate, topography, and land use. The goal is to establish a threshold beyond which soil loss would lead to degradation, reduced fertility, and compromised ecosystem services. This threshold is often expressed as an acceptable rate of soil erosion over a specified period, usually measured in terms of soil depth lost per unit area (e.g., millimeters per year).

1. **Soil Productivity:** The permissible erosion rate is often set to ensure that soil remains fertile and capable of supporting agricultural activities without a significant decline in yield.
2. **Sustainability:** Permissible erosion is determined based on the ability of the soil to regenerate and recover from natural processes. It seeks to avoid long-term degradation and loss of soil productivity.
3. **Environmental Impact:** The concept takes into account the potential impact of soil erosion on the environment, including water quality, sedimentation in water bodies, and the overall health of ecosystems.
4. **Land Use Planning:** Permissible erosion rates guide land use planning and management decisions. They help in identifying suitable conservation practices to prevent erosion and maintain soil health.
5. **Local Conditions:** Permissible erosion rates vary depending on local conditions, including climate, vegetation cover, and land management practices. Different regions may have distinct thresholds based on their unique characteristics.

It's important to note that permissible erosion is not a one-size-fits-all concept; rather, it needs to be tailored to specific conditions and land use goals. Conservationists, land managers, and policymakers work together to establish guidelines that balance the need for agricultural production with the need to protect the soil resource.

Various soil conservation practices, such as contour plowing, cover cropping, terracing, and agroforestry, are implemented to prevent soil erosion and keep erosion rates below the permissible limits. Regular monitoring and adaptive management are crucial to ensure that conservation measures are effective and can be adjusted as needed over time.