ROHINI
COLLEGE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT OF AGRICULTURAL ENGINEERING

AI3402 SOIL AND WATER CONSERVATION ENGINEERING

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UNIT III

3.1 Erosion Control Measures

Introduction

Soil erosion takes place both due to natural causes and anthropogenic factors. The adverse effects of uncontrolled soil erosion are loss of valuable top soil lowering crop productivity per unit of land, sedimentation in rivers and irrigation canals drawing water from the rivers reducing their carrying capacity, sedimentation of reservoirs reducing their active life, structural damages to the buildings and formation of gullies and ravines, to name a few important ones. Soil erosion control measures are adopted to reduce or minimize the intensity of the aforesaid adverse effects. Catchment Area Treatment (CAT) is adopted to reduce soil loss from catchments due to runoff flow, after ascertaining erosion severity on sub-watershed basis. CAT comprises mechanical (engineering) and vegetative (afforestation) measures. Mechanical and vegetative practices on agricultural lands are employed on the milder slopes for conservation of soil, by farming across the slope of the land. The basic principle underlying this approach is to cause reduction in the effect of the runoff velocity and, thereby reduce soil erosion. On steeper slopes, mechanical measures (such as terracing) and other structures are constructed to reduce the effect of the slope on runoff velocity. The following types of vegetative and mechanical practices are being used at present:

Vegetative Practices

(i) Contouring

(ii) Strip cropping

(iii) Tillage operations

(iv) Mulching

Mechanical Practices

(i) Terracing

(ii) Bunding

(iii) Grassed waterways and diversions

Vegetative practices are described in this lesson and mechanical practices are described in the subsequent lessons.

Contouring

Contouring is the practice of cultivation along contours, as illustrated in Fig. 1.1, laid across the prevailing slopes of the land where all farming operations, such as ploughing, sowing, planting, cultivation, etc. are carried out approximately on contours.

Fig. 1.1. Contouring. (Source: http: //www. watershedbmps.com)

The intercultural operations create contour furrows, which along with plant stems act as barriers to the water flowing down the slope. In between two adjacent ridges runoff or irrigation water is detained for a longer period of time, which in turn, increases the opportunity time for the water to infiltrate into the soil and increase the soil moisture. To lay a contour farming system, contour guide lines are laid out first and tillage operations are carried out simultaneously. Experimentally it has been observed (Antal, 1986) that reduction in the intensity of soil erosion, owing to water, by contour ploughing is about 30% of that by ploughing along the slope, and there is increase in moisture content by about 40% and reduction in surface runoff by about 13%. Furrow cultivation on contours has been found to be the most effective soil conservation measure. Contour farming is recommended for lands with the slope range of 2 to 7%.

22.3 Strip Cropping

Strip cropping is the practice of growing strips of crops having poor potential for erosion control, such as root crops (which are intertilled crops), cereals, etc., alternated with strips of crops having good potential for erosion control, such as fodder crops, grasses, etc. which are close growing crops. Strip cropping is a more intensive farming practice than farming only on contours. Close growing crops act as barriers to runoff flow and reduce the runoff velocity generated from the strips of intertilled crops, and eventually reduce soil erosion.

22.3.1 Purpose of Strip Cropping is to:

(a) Reduce soil erosion from water and transport of sediment and other water-borne contaminants

(b) Reduce soil erosion from wind

(c) Protect growing crops from damage by wind-borne soil particles.

22.3.2 Methods of Strip Cropping:

(a) Contour strip cropping

(b) Field strip cropping

(c) Buffer strip cropping

(a) Contour Strip Cropping

In contour strip cropping, alternate strips of crops are sown more or less along the contours, similar to contouring. Suitable rotation of crops and tillage operations are followed during the farming operations. Fig. 1.2 shows contour strip cropping.

Fig. 1.2. Contour strip cropping. (Source: https: //www.weru.ksu.edu)

(b) Field Strip Cropping

In a field layout of strip cropping, as shown in Fig. 1.3, strips of uniform width are laid out across the prevailing slope, while protecting the soil from erosion by water.

Fig. 1.3. Field strip cropping. (Source: https: //www.weru.ksu.edu)

To protect the soil from erosion by wind, strips are laid out across the prevailing direction of wind. Such practices are generally followed in areas where the topography is irregular, and the contour lines are too curvy for laying the farming plots.

(c) Buffer Strip Cropping

Buffer strip cropping is practiced where uniform strips of crops are required to be laid out for smooth operation of farm machinery, while farming on a contour strip cropping layout. Buffer strips of legumes, grasses and similar other crops are laid out between the contour strips as correction strips, as illustrated in Fig. 1.4. Buffer strips provide very good protection and effective control of soil erosion from strips of intertilled crops.

Fig. 1.4. Buffer strip cropping. (Source: https: //www. passel.unl.edu)