STAGGERED CONTOUR TRENCHING

Fig: Staggered Contour Trenching

What?

In medium rainfall areas with highly dissected topography, Staggered Contour Trenches (SCT) are adopted. The length of the trenches is kept short around 2-3 m and the spacing between the rows may vary from 3-5 m. The chances of breaches of SCT are less as compared to Continuous Contour Trenches. Over time, experience of watershed programs has shown that it is better to stagger the digging of contour trenches. This is because it has been found that invariably errors have been made in contouring over long distances. If the contour trench is not level and by mistake sloped, then water starts to flow from the high point to the low point, cutting a path and in-creasing soil erosion. Therefore, instead of making trenches continuously, they should be in a staggered, discontinuous manner. Therefore, instead of making trenches continuously, they should be made in a staggered and discontinuous manner. Dig a trench 2 m long on a contour line. Give a gap of 4 m. Dig another 2 m trench along the contour. The trenches are further dug in the similar fashion along this particular contour. Then, come to the next contour line. Begin digging in a stretch, which covers the gap left in the higher contour line. The gaps in this contour line should fall below the trenches in the higher contour line. In this way, we maximize the amount of harvested runoff by the trenches. In other words, chains of staggered trenches should be made along successive contour lines so that water left by one line of trenches is captured by the immediately lower line.

Where?

In areas where there is an abundance of trees and vegetation, gaps in excavation are in any case essential to allow space for the roots of the trees to spread. Also, where there are hard rocks underneath the soil, trenches must be staggered. In areas where slopes are in between 10 to 25 %..In medium to high rainfall areas.

Why?

- Slowing down the velocity of runoff
- Checking soil erosion
- Improving local soil moisture profile

How?

Design: Size of trench depends on the depth of soil and also on some other factors of watershed. In general, the most popular size has been used in the many watersheds is with a depth of 50 cm and a width of 50 cm.

Berm: The mud excavated is piled up 20 cm away, downstream of the trench. This gap between the trench and mud is called the berm. This distance is essential so that this mud does not fill up the trench again.

Plantation: If grass has to be planted along the trenches, then the excavated mud should be piled up in a 10cm. high rectangular layer. If trees have to be planted, they should be planted either in the space after the trench or on either side of the trench.

Staggered Contour Trenches: Step-by-Step:

1. Measure the slope in one section of the ridge area. Ensure that it is between 10 - 25%
2. Draw a straight line with wet lime between the highest and the lowest points along the slope
3. Decide the interval between successive lines of trenches
4. On the straight line, marks points at the decided interval
5. Starting from each mark, demarcate the contour line
6. Dig staggered trenches along these contour lines
7. Depending on the specific conditions (such as thick vegetation, rocks etc.),leave gaps in the excavation from place to place
8. Make sure that the water left out of one line of trenches is stopped by the line of trenches below
9. Undertake plantation as seems appropriate

Staggered Contour Trenches: Don'ts

1. Do not make trenches on slopes higher than 25%. Instead adopt vegetative measures
2. Do not make trenches on slopes less than 10%. Instead construct contour bunds
3. Do not excavate trenches where there is already dense vegetation
4. Do not plant inside the trench
5. Do not excavate if roots of a tree are encountered
6. Do not excavate trenches across large streams or drainage lines

Design Example

(Q). Design a staggered contour trenches in a 25 hectare area. The run-off coefficient of this area is 0.40. The daily quantum of rainfall is 100 mm and only 75 % of the run-off has to be stored in the trenches. Each trench gets filled twice in a day. The length of one trench is 5 meters and the distance between two trenches in a row is 2.5 m. The longest section of the ridge area is 2500m.

Sol

(1) Find out the quantum of runoff

$$Q = CRA$$

Where Q = Runoff in cu.m

C = Coefficient of runoff

R = Daily rainfall in meters

A = Area taken up for design in Square meters

Given data:

C= 0.40

R= 100 mm = 0.10m

A= 25 ha x 10000 sq, m per ha = 250000 sq.m

Q = CRA = 0.40X0.10X250000 = 10000 cu.m

Since the contour trench has to catch only 75 % of the run-off then

Qd = 10000x 75/100 = 7500 cu.m

Qd is design runoff

(2) Find out number of contour trenches required

Usually a contour trench is made 0.5 m wide and 0.5 m deep.

We know that the length of each trench is 5 m long.

Volume of each trench = V= L*W*D = 5 * 0.5 * 0.5 = 1.25 cu.m

Since this trench gets filled twice in a day. Effective capacity of the trench = 1.25 cu.m * 2 = 2.50 cu.m

Number of contour trenches = Volume of runoff to be captured / Volume of each trench

= 7500/2.5 = 3000 trenches

(3) Find out the length of Contour trenches

We know that each trench is 5m long, we also know that the space between each trench in a row is 2.50m.

The total length over which the trenches are spread = Total number of trenches * (Length of each trench + Space between two successive trenches in a row)

= 3000 * (5 + 2.5) = 3000 * 7.5 = 22500 m

(4) Find out distance between rows of contour trenches (d)

d = A/L = Area taken up for design in square meters / Total length over which the trenches are spread

= 250000/ 22500 = 11.11 m

(5) Find out number of rows of contour trenches (N)

N= Length of the longest section of ridge area (L) / Distance between successive rows of contour trenches (d)

N= L/d = 2500/11.11 = 225