Unit 2 : Water Conservation

Chapter 3 : Catchment/watershed treatment

Catchment/watershed area

The area from which water naturally flows and flows through a particular place is called the catchment/watershed area of a stream. Each surface reservoir and each stream has its own catchment/watershed area.

Some of the methods used to soak up rainwater in such catchment/watershed are called catchment treatment. This method achieves the objectives of soil conservation i.e. prevention of soil erosion and protected irrigation for plant growth.

(A) In-situ treatment

1. Farm bunding:

2.3.1 Check dam

Before sowing, a dam is built in the sloping area of the field to prevent the water falling in the field during the rainy season. A horizontal embankment is called a main embankment and a vertical embankment is called a side embankment. When it is raining, water is pumped out of the field with a large hose to keep the dam from bursting and soil erosion.

2. Sloping or level check dams :

Sloping check dams construction work is carried out in rainfed areas. These check dams are laid along the fields. Accordingly, a level check dam is constructed by connecting a level earthen check dam or a slope earthen check dam and biological check dam. It is not for storing water but for slowing the moving water. Sloping dams are used to reduce soil erosion and to trap groundwater.

2.3.2 Sloping or level check dams

3. Bunds:

Water flows very fast on steep slopes. In such places, sloping lands are converted to bunds to cultivate and water the soil. From a long distance, these slopes look like steps on some hills. It is a field prepared on slopes by digging some part and filling half part like steps. Where the soil depth is sufficient and water is available, the slope is converted to bunds. In the rain-fed region of Maharashtra, paddy fields are prepared on hill slopes and land is brought under paddy crop. The types of these bunds are as follows: bunds with plain

2.3.3 Bunds

fields, bunds sloppy at the inner side and bunds sloppy at the outer side .

4. Contour Trench:

Flat trenches are dug in the fallow land on the hill slopes. On land with 0 to 33 % slope, Consecutive contour trenches of this size 0.60 m. wide and 0.30 m. deep as well as 0.60 m. wide and 0.45 m.deep are dug. Depending on the slope of the land, the length of the trench is 833 m. to 2174 m. Normally per thousand running meters length and 0.30 m. depth, 180 cubic meter and 0.45 m. depth, 270 cubic meter water is stored.

Contour trenches slow down the rapid flow of rainwater on the mountain tops and reduce soil erosion. Trenches, grass or tree roots slow down the flowing water and it gets absorbed in the soil. Due to protected irrigation, waste land becomes productive and this area is brought under cultivation to some extent.

2.3.4 Contour Trench

5. Deep Continuous Contour Trenches :

Continuous Contour Trenches treatment is applied on fallow land which is unsuitable for cultivation. 1 m. wide and 1 m. deep continuous contour trenches are dug. The water flowing down the hill slope is stored in the trenches and results in good soil and water conservation. 240 m long, 1 m. wide and 1 m. deep trenches should be dug per hectare. The vertical distance between the two trenches should be 33 m. And after every 20 m.long trench, leave a gap of 2 m to remove excess water and then dig another 20 m. long trench . While digging the second row, the first trench must be 10 m long instead of 20 m. Leave a 2 m gap. At the same level dig another trench of 20 m.length. Sow 4.80 kg of grass seeds per hectare at full length of trenches . Eg. Hamata, Pavana, Marvel, Mountain grass, Madras Anjan, Sheda, Nil grass.

2.3.5 Deep Continuous Contour Trenches

These deep furrows / trenches are very useful for retaining the fertile soil layer on the ground and for infiltrating water in the soil. It prevents soil erosion. Due to the seeped water in the mountains, the groundwater table lasts longer. Helps in tree and grass conservation.

(B) Stream control treatment:

A stream is a natural current of water flowing down a slope or from a flat land. Brooklets, runnels are included in the stream. All these are considered while controlling the flow. These streams flow for some time after the rain stops. The water in it is conserved for taking a crop. In this method the following types of dams are laid on this stream.

1.Rough stone dam / Loose Boulder Structure :

In the upper part of the catchment area, rough stones are used to stop the erosion of the streams. The rough stones are the stones found in nature. These stones are small and large in size. Coarse stone check dams are laid horizontally on the stream. This increases the rate of water retention in the soil. It also prevents soil erosion.

2.3.6 Rough stone dam / Loose Boulder Structure

2. Gabion check dams:

The gabion dams are the dams built in streams / runnels (nala) .They are made up of coarse stone embedded in metal meshes. Gabion-style dams are constructed to conserve water in areas where the slope of the runnels is high and the rough stone dams cannot survive due to excess rainfall. The dam is built into a stream of water by placing large and small stones in a galvanized mesh cover. The mesh is inserted up to 2 m. in the runnel banks, on both sides.

2.3.7 Gabion check dams

During the construction of the dam, the cavities in the stone are filled with small stones or chips. Care is taken to ensure that the shape of the dam does not change under any circumstances due to floods. The head width of the dam is 0.45 m. The inner and back side of the mesh is lifted and placed at least 15 cm above the head. It is made to overlap and tied to the head with binding wire. The mesh is tied tightly by rubbing with the stone check dam. The hollow on both sides of the mesh is filled with soil and the runnel bank is made as before. 1 meter long and 1 meter wide stone pitching of the gully and backside (tapering towards the runnel edge) is done. The pitching width at the runnel banks is equal to the base width of the gabion structure.

3. Earthen stream (Mati Nala) Dam:

Earthen stream Dam is a treatment for both flood control and V-shaped valley control. The purpose and benefits of an earthen stream dam are as follows. After the formation of V-shaped valleys (ghal) and stream, rain water flows through it very fast. As a result, the banks of the stream become eroded and the stream bed expands and the surrounding arable land decreases.

2.3.8 Earthen check dams

In such a case, if the water is stopped by constructing a check dam at the right place in the stream and the excess water is released at a controlled speed, the day to day expansion of the stream will be curtailed.

In drought prone areas, such stopped water seeps into the soil, helping to increase groundwater reserves. The water level of the wells in the area of influence of the dam increases. In the case of sure or high rainfall areas, the water stored at the site of stream check dams can be used during the temporary drought period to save some of the crops that are drying up due to lack of rainfall.

Water is available to the animals for drinking seasonally. There are different types of earthen stream dams depending on the catchment area. Stream dam with catchment area 10-40 hectares and with catchment area 40 to 500 hectares.

4. Concrete cement stream check dams :

The concept of constructing a concrete cement stream dam came into existence with a view to infiltrating the rain water on the spot and preventing leakage of water from the dam. Due to such dams , water storage has increased to a large extent, which has increased the water level in many wells as well as the ground water level. The use of cement concrete instead of stone construction will increase the quality and the lifespan of the dam.

2.3.9 Concrete cement stream check dams

5. Deepening the streams:

Within a few years after the construction of concrete cement check dams or other types of check dams, they are filled with rock soil or accumulated vegetation remains, so in the rainy season, excess water continues to flow rapidly from nearby fields or filled sreams. As a result, a large amount of soil erosion has been found in the fields. Therefore, it is necessary to deepen such filled check dams.There are some criteria for deepening the streams. Eg. streams should not be deepened where there is sand storage in the streams basin. These works should be implemented as a priority in highly absorbed areas and absorbed catchment areas. It is not advisable to undertake the work of deepening the streams in the alluvial (made up of silt) region as the soil layer is impermeable due to clay. Therefore, water will not be infiltrated and won't be converted into groundwater. However, the "Bazada" part of the topography in the silt area is very suitable for this measure.

6. Diversion check dam:

The cement dam that is built in the stream basin to divert the water flowing from the stream to the field through the river is called a diversion dam. In many places of the Konkan and Ghat head, water is flowing from the streams till the month of December / January. Every year on such streams, the farmers irrigate the crops by placing raw earthen embankments/ bunds and diverting the water to the fields. The earthen embankments burst every year. So, if these dams are paved and the water flowing from the stream is diverted to the fields and made available to the crops, the wetlands of the place will increase and alternatively the yield will increase. The cost of such a dam is also reduced. In this way the water is diverted naturally and as long as the water flows through the stream, 24 hours running water is available to the crops in the field. This allows for 1 to 2 guaranteed water shifts for the crops grown during the rabi season as well as for stress during the rainy season, so this work is in great demand among the farmers.

2.3.10 Diversion check dam

Precautions to be taken for Catchment/ Watershed treatment:

1. There are definite benefits if proper water conservation measures are taken by studying the type of soil, slope, thickness of soil layer, type of soil, geographical conditions etc.
2. No one can exactly predict the properties, location and capacity of the water source. It can only be guessed. It is better to have this work done by an expert and experienced officer, so the success rate increases a lot.

3. It is a misconception that if the well gets water then the borewell will also get water.

4. Water conservation work should be done on tributaries, streams, springs, etc. before working on the main river.

5. Before removing the sludge, when deciding the nature of work, first study the surrounding slopes, geographical conditions, speed of water flow, etc. and then decide the amount of sludge to remove. Consult a suitable experienced person. Build at least 2 Gabion dams at the top of the stream. So the mud will not come back immediately in the rain. While removing sludge, maintain the natural slope of the source. It should not be changed, a 45 degrees slope on both sides must be kept. It brings stability and avoids the sides from collapsing.

6. If you decide to build a check dam, the plan should be prepared by the officer in charge of the concerned department. In order to prevent siltation in the dams, there should be ways for sludge to escape. The type of dam should be selected according to the local geographical conditions. No dam type should be chosen arbitrarily. It also risks permanently destroying the resource.

Exercise

1. List the catchment/ watershed treatments in your area.
2. Explain the care to be taken while deepening the streams ?
3. State the main benefits of catchment/watershed treatment.
4. What should be done to prevent check dams from collapsing?

Record observations

1. Which of the following check dams would be suitable for water conservation, a rough stone dam and a gabion dam in a rain-fed catchment area?
2. Does soil erosion hinder water conservation work? Explain your point.
3. Explain the statement “Farm ponds with plastic bottoms cannot be part of water recharge”.
4. Which treatment in the catchment / watershed area has made it possible to cultivate in the hills?
5. Would water conservation works be useful on a flat surface with abundant rainfall?

Visit:

1. Visit the website of the Department of Soil and Water Conservation. Understand its functions.
2. Observe the condition of dams in your area.
3. Observe the difference between an earthen check dam and a cement check dam.