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# Mechanical Methods of Soil & Water Conservation

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To maximize the moisture availability to agricultural crops, moisture conservation methods must be implemented. The purpose of the many recommended practices is to promote infiltration by lowering runoff rates, temporarily impounding water on the soil surface to extend the infiltration opportunity time, and changing the land shape to allow water to collect between fields. Previously, efforts to conserve moisture were focused on building different types of bunds to stop erosion and conserve soil throughout the land slope. Moisture conservation strategies are used to increase the availability of moisture to agricultural crops as well as the infiltration and percolation of precipitation into the root profile.

## Introduction

The fundamental goal of soil moisture conservation is to reduce the quantity of water lost from the soils through evapotranspiration, which is the combined term for evaporation and transpiration. Evaporation is the loss of water directly from the soil. Keeping the soil moist helps reduce crop irrigation needs while maintaining the water supply needed for agricultural productivity. This is particularly crucial in regions where groundwater resources for irrigation are becoming increasingly scarce or limited as a result of climate change or other factors. To preserve soil moisture, a number of techniques can be used. The majority of these methods for preserving soil moisture are rather simple and low-cost, and they mostly rely on the availability of necessary resources and technical capacity locally. Many of the techniques focus on giving the soil some sort of protection from the sun and heat in order to reduce evapotranspiration and direct soil exposure. In general, the majority of techniques used to preserve and improve soil quality will also aid soil moisture conservation. In this article we have discussed about various mechanical methods of soil and water conservation.

## Method for Moisture Conservation

1. **Basin listing:** It is a technique for creating soil and conservation basins using a special implement called a basin lister. Using a basin lister, small depressions (basins) with a depth of 10–15 cm and a width of 10–15 cm can be created at regular intervals. These basins have formed all along the slope. It is normally completed prior to seeding. It works well for all soil types and crops. The order of the basins allows for the longest possible time for rain to soak into the ground. When the

**Fig 1: Basin listing**

basin lister, broad bed former, and chisel plough were put to the test against the conventional method for conserving moisture in dry farming, the basin lister produced crops at a rate that was 11.0 percent higher. It works well for all soil types and crops. Basin listing enhances the amount of rainwater stored in surface depressions, potentially reducing storm flow and increasing the amount of soil water available to crops.

2. **Bunding:** Formation of narrow based or broad-based bunds across slope at suitable intervals depending on the slope of the field. The bunds control runoff by capturing precipitation in the inter-bund gap, increasing infiltration and improving soil moisture storage. To achieve consistent water distribution and eliminate water stagnation in patches, the inter-bund space must be levelled. It can be divided into three categories which are described as follows.

**A) Compartment Bunding:** This technique is one of the most economical ways to conserve rainwater and is appropriate for rain-fed mountains with slopes lower than 1%. To hold rainwater where it falls and prevent soil erosion, the entire field has been partitioned into discrete sections of specified sizes. Runoffs are prevented in compartmental bunding because the water flow is restricted to a small region, and compartmental bunds are built using bund formers. In order to raise rabi crops on the stored moisture, this approach increases the amount of rain water that reaches the soil profile. Compartmental bunding has been shown to improve vertisol profile moisture and preserve in-situ moisture in several investigations. According to recent research, compartmental bunding is more efficient in boosting yields in rainfed and dry land farming environments.

**B) Graded Bunding:** While soil preservation in high rainfall locations is crucial, excess water must be drained to prevent the soil from becoming soggy. To impede the safe dumping of water into the nala, the bunds are consequently gently graded longitudinally, roughly 7.5 cm per flowing 33 m. The cross sections into in order to safely remove extra runoff water, it is crucial to create sufficient waste water or outlet structures at acceptable locations to prevent damage to bunds in the event that a day receives a lot of precipitation. Stone outlets are typically used when there are little to no raindrops. In heavy soil, grass outlets have been found to be efficient and less expensive. The crest wall should be 30 cm above the contour level, and its length should be planned to provide for the quick drainage of excess water during a heavy downpour. 1,250 mm. Terrace bunds are relatively small embankments that are built at regular intervals across the slope. Depending on the slope, type of soil, rainfall, etc., the vertical distance between bunds may vary from 1 to 2 m. Bench terracing, which consists of a sequence of step-like platforms along contours, is done when the gradient is steeper than 10%, like in the hilly regions of the Himalayas, Sahyadri, etc.

**C) Contour Bunding:** It entails building a series of suitable-sized earthen bunds along contours every 60 mm on the lateral side or every 1 to 1.5 m on the vertical side. Thus, the piece of land is divided into more flat, smaller sections that can hold both soil and rainwater. One-fourth of the common land surfaces, or around 75 million hectares, are thought to be affected by soil erosion. In Maharashtra State, where it is predicted that out of 186 lakh hectares, 144 lakh hectares need bunding. The planning commission has so placed a lot of emphasis on the contour bunding programme because it has been discovered that bundling alone can boost agricultural output by 20 to 30 percent. The area's slope, soil type, and rainfall patterns all affect the size, cross-section, and interbund spacing. Studies have been conducted on the spacing of bunds, shrinkage of bund sections, hydraulic gradients, type and position of outlets, etc. in various soil and rainfall conditions in Maharashtra State in order to enhance the bunding technique. This research

has led to the conclusion that the distance between bunds shouldn't be allowed to exceed 1.5 metres vertical drop or 67.5 metres lateral spacing.

**Fig 2: Contour bunding**

**Fig 3: Compartment bunding**

**D) Ridges and furrows:** over the slope, furrows of 30–45 cm width and 15-20 cm height are created. When it rains, the furrows safely direct runoff water. Avoid standing water if the intensity is strong. When the rainfall intensity is lower, they gather and store water. It grows well in medium-to-deep black soils as well as deep red soil. Cotton, maize, chiles, tomatoes, and other crops with wide rows can be used. It is not good for sandy or gravelly soils, shallow red soils, or shallow black soils. It is not good for crops or broadcast-seeded crops. sowed with a row spacing of less than 30 cm Sowing by dibbling or planting alone is possible since furrows are frequently made before sowing. Tie ridging is a modification of the above ridges and furrows method in which the ridges are joined or tied at 2–3 m intervals along the furrows by a short bund. Another variation where discontinuous ties are used is random tie ridging. Furrows with a width of 20–25 cm, a length of 45–60 cm, and a depth of 15 cm are created.

**E) Dead Furrow:** Dead furrows of 20 cm depth are made at intervals of 6–8 rows of crops during or immediately after sowing. In the furrow, no crop is grown. Across the slope, sowing and furrowing are done. In both black and red soils, it can be done with a wooden plough.

**F) Broad Bed Furrow:** Here beds of 1.5 m width, 15 cm height and convenient length are formed, separated by furrows of 30 cm width and 15 cm depth. Crops are sown on the beds at required intervals. It is suitable for heavy black soils and deep red soils.

## Conclusion

The above methods of soil and water conservation are greatly helpful to prevent runoff, reduce soil erosion and the best part in it will conserve in-situ moisture. In rainfed agriculture these practices will largely influence the farming practices. The method of moisture conservation can be chosen according to land slope, soil type and rainfall of that particular region where moisture conservation practices are to be adopted. The costing of implementing all of the above measures will vary as some of them require proper implement with tractor attachment and some of them will be implemented using simple shovel, hand hoe and chisel.

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