



SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution Coimbatore – 35

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and Affiliated to Anna University , Chennai.

DEPARTMENT OF AGRICULTURAL ENGINEERING

19AGE308

WATERSHED PLANNING AND MANAGEMENT





TERRACING

Save slide



- Terracing is a practice to reduce runoff, soil erosion, and sediment delivery from upland areas by constructing broad channels across the slope of rolling land.

Reasons for constructing terrace

If surface runoff is allowed to flow unimpeded down the slope of arable land there is a danger that its volume or velocity or both may build up to the point where it is not only carries the soil dislodged by the splash erosion but also has a scouring action of its own.

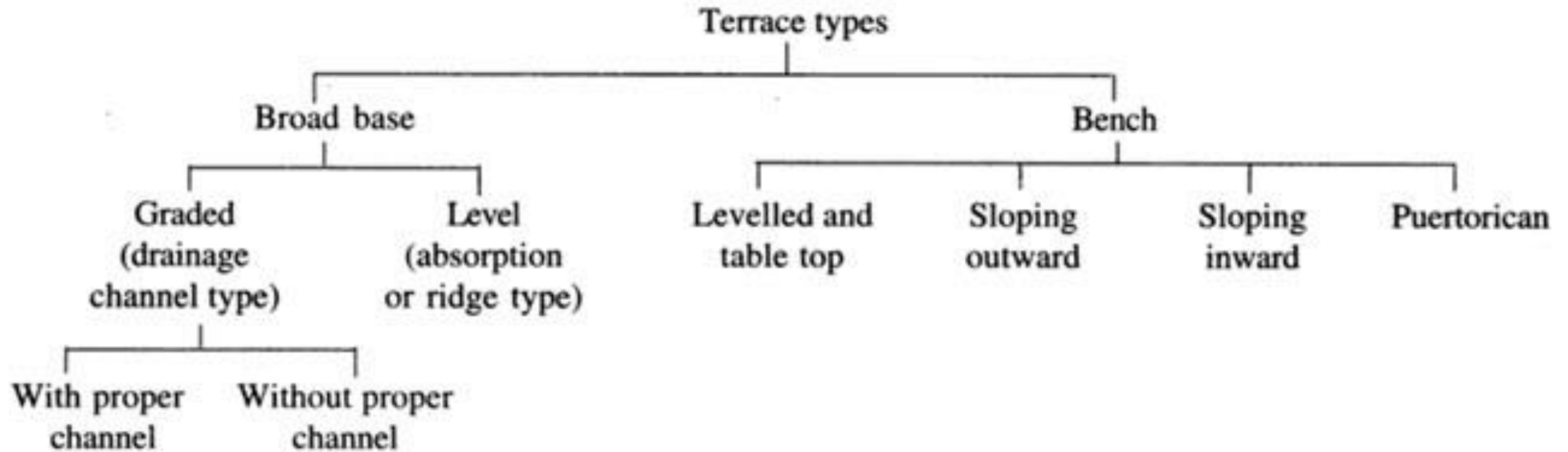
various names given to this techniques are:

- terraces (U.S.A).
- ridge or bund (common wealth countries).



Functions

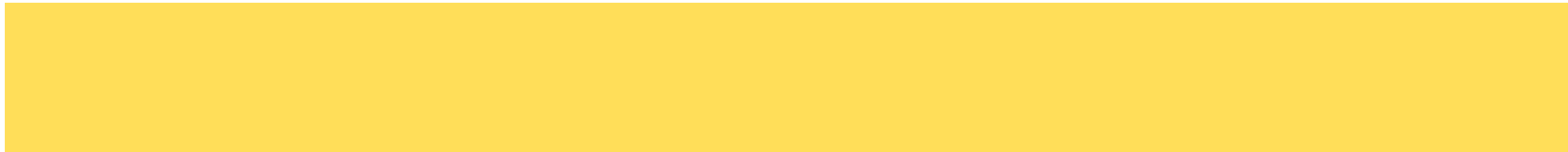
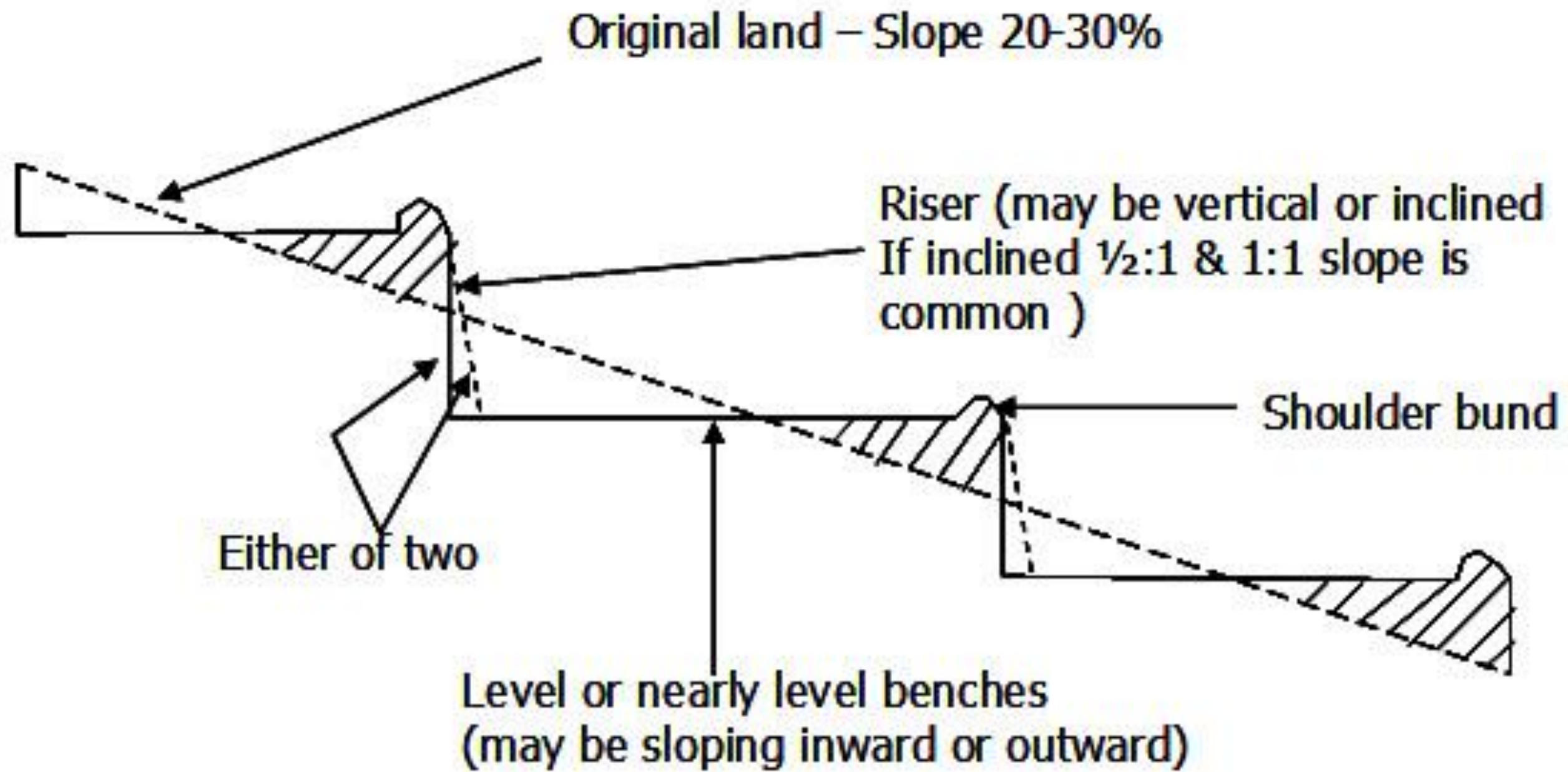
- To decrease the length of the hillside slope , thereby reducing sheet and rill erosion.
- Preventing formation of gullies and retaining runoff in areas of inadequate precipitation.
- In dry regions such conservation of moisture is important in the control of wind erosion





- In India the terraces are classified in two major types, given as under:
 - Bench terraces and
 - Broad base terraces.

- **BENCH TERRACES**
- Bench terraces are the platform like construction which are constructed along the contour of the sloping land.
- This type of terraces are generally constructed on the land of 6 to 33% slope.
- Bench terraces play a significant role to make the hilly land suitable for cultivation.
- In this system the hilly land is modified in the form of several steps, which intercept the flowing water through the soil surface.
- These steps are also used for cultivation purposes. Generally tea, coffee, sugarcane etc. are successfully grown on these terraces, depending upon the climatic factors such as rainfall etc.





Bench terraces



Bench terrace



Bench terraces are again classified into following three types (Bali, 1978) based on the purpose of their use.

- Hill type bench terraces
 - Irrigated type bench terraces and
 - Orchard type bench terraces.
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- Hill type bench terraces are generally used in those hilly areas which have reverse land slope towards the hill.
 - Irrigated type bench terraces are also known as level bench terrace and are generally adopted in irrigated conditions.
 - Orchard type bench terraces are constructed in the form of narrow strips and are widely used for orchard purposes.



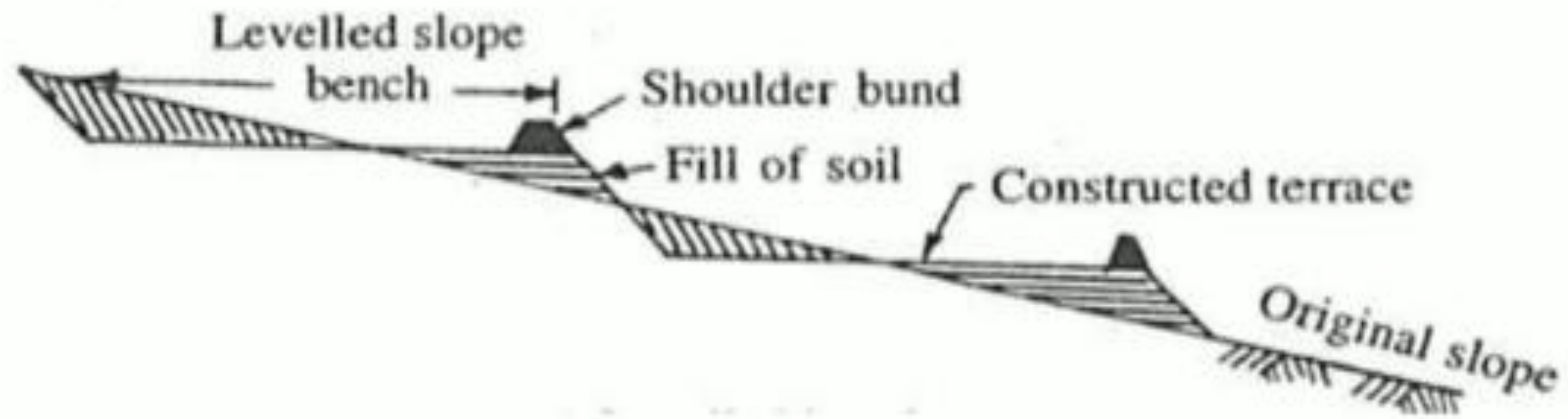


Rama Rao (1974) has also classified the bench terraces on the basis of the slope of bench, given as under :

- Level bench terrace
- Bench terrace sloping outward, and
- Bench terrace sloping inward.

LEVEL BENCH TERRACES

- This type of bench terraces consist of level top surface.
- **Level bench terraces are generally used in the areas which receive medium rainfall and have highly permeable soils.** Since the soils are highly permeable, therefore it is expected that most of flowing surface runoff passing through these terraces are absorbed by the soil and remaining portion is drained into the drain.
- **The level bench terraces are also known as irrigated bench terraces provided that they must be under irrigation.**
- Sometimes level bench terraces are also called as table top or paddy terraces, because such terraces have level top surface that can be easily impounded with water and plantation of paddy crop can be performed. The level bench terraces used for paddy cultivation, the bench slope is kept as mild as 1%, so that uniform water impounding over them can be easily made.

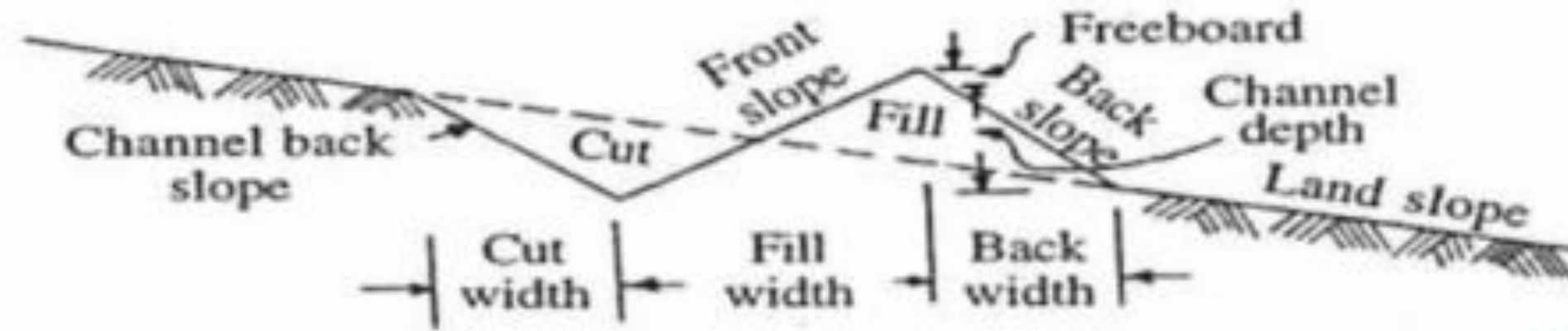


Leveled bench terrace. (Source: Das, Ghanshyam., 2002)

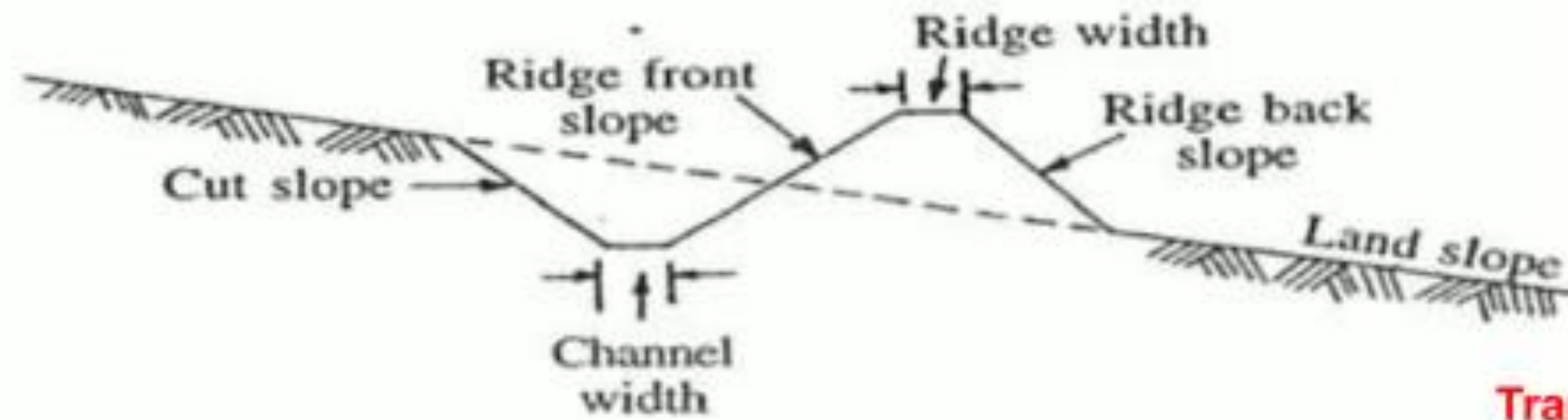


BROAD BASE TERRACE

- A broad base terrace is defined as a surface channel or embankment type construction, which is formed across the land slope.
- Broad base terraces may be classified in two types, based on their primary functions i.e. to retain or remove the runoff water. These two types are as:
 - Graded terrace and
 - Level terrace.
- **Graded Terrace:** This terrace is also known as channel-type terrace.
- To drain excess runoff water from the land, is the primary objective of this terrace.
- It is constructed by digging a shallow channel on the uphill side and putting the excavated soil to build the embankment, beside the channel. Generally, the side slope of channel as well as embankment is kept as flat as possible to facilitate cultivation activities.
- Graded terrace also reduces the length of slope and thereby the soil erosion as well as soil loss both are reduced. Similarly, it also removes the surface runoff with a non-erosive velocity and drains into the outlet.



Triangular design



Trapezoidal design

Cross sectional view of a broad-base terrace. (Source: Das, 2002)





Level Terrace

- Level terraces are constructed for conserving the moisture and controlling the soil erosion.
- These terraces are most suitable in low to moderate rainfall regions because they trap and hold the rain water on their top, which gets infiltrated into the lower soil profile.
- Such terraces may also be used on permeable soils for the same purpose.
- Embankment of this terrace is constructed with the help of excavated soil from the earthwork of channel by keeping them both sides of the channel. The height of embankment should be such that the runoff water cannot overtop it.
- **This type of terrace is also known as conservation terrace.** The conservation terraces are normally found most suitable, where:
 - Rainfall is low.
 - Rainfall intensities are not excessive.
 - Land slope is less than 6%.
 - Infiltration as well as soil permeability are enough to absorb the water.





BUNDING

- Bunds are simply embankment like structures, constructed across the land slope, used for retaining the water, creating obstruction and thus to control erosion.
- When they are constructed on the contour of the area called as contour bund and when a grade is provided to them, then they are known as graded bund.
- By bunding practice, the entire area is divided into several small parts, thereby the effective slope length of the area is reduced. The reduction of slope length causes not only to reduce the soil erosion but also retain the runoff water in the surrounded area of the bund.
- Contour bunds are generally used in relatively low rainfall areas (<600mm per year) for the purpose to control the soil erosion and to store the rain water, while graded bunds are constructed in relatively medium to high rainfall areas (>700mm year) for the same purpose as the contour bunds.
- Generally, bunding practice is found most suitable for the land having the slope, ranges from 2 to 8 percent. However, it can also be used beyond 8 percent land slope but there must be required to provide a close spacing of bund, which results high cost of construction.
- The bunding is reasonably successful in the shallow and medium- deep soils. Black soils are not suitable for bund construction.





CLASSIFICATION OF BUNDING SYSTEM

The bunding systems are divided according to their function, which they perform. It is given as under:

- **Contour Bunding**

- Narrow based
- Broad based

- **Graded Bunding**

- Narrow based
- Broad based

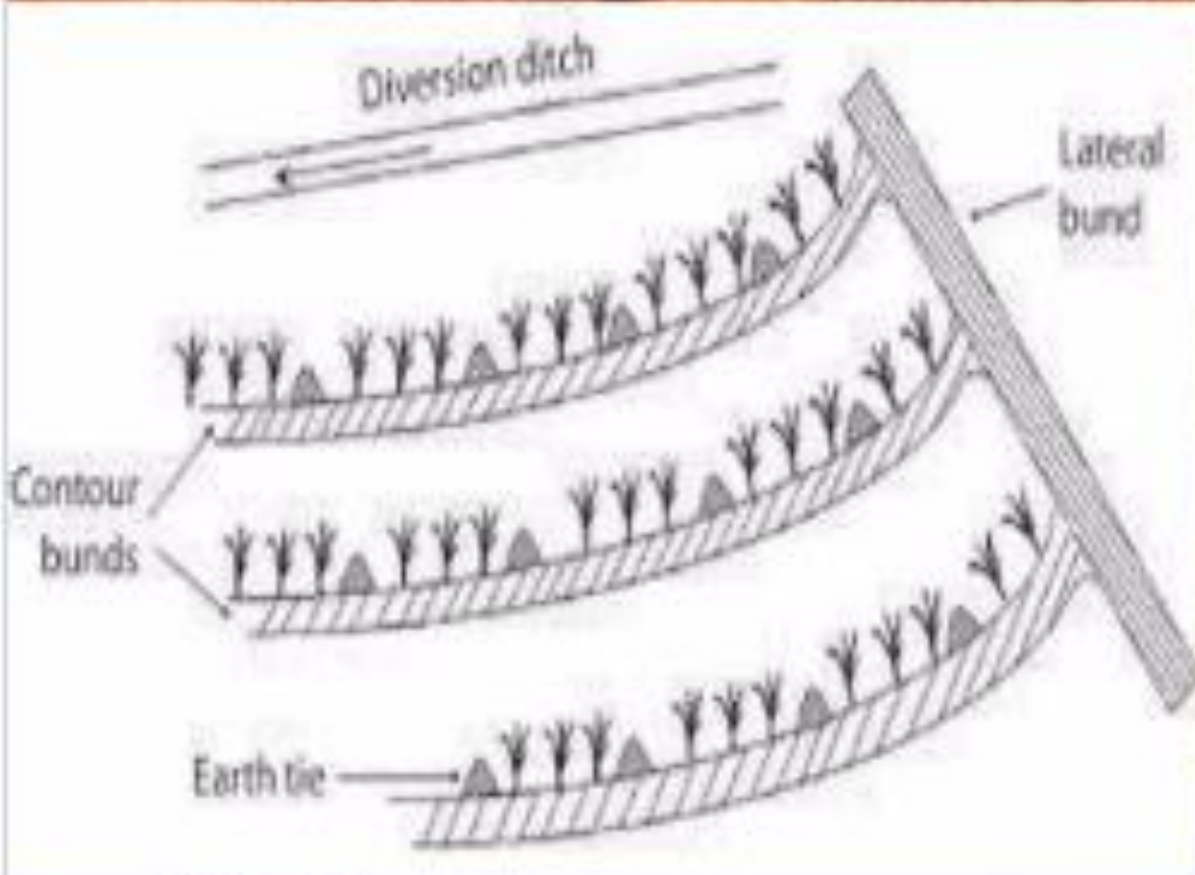
- **Contour Bunding**

- The formation of bunds passing through the points of equal elevation (i.e. on contour) of the land, is defined as contour bunding. The contour bunds and level terraces are the synonymous term. Therefore, sometimes contour bunding is also denoted as level terrace.





contour bounding





2) Graded bunding

- ❖ In this bunding system, some grade is provided to the channel behind the bund (0.2 to 0.3%). Graded bunding is used in areas that have average annual rainfall greater than 700mm. However, it can also be used on areas of lesser average annual rainfall if the soil is of heavy texture (clayey).
- ❖ The functions of graded bunds are:
 - ❖ to reduce soil erosion
 - ❖ To dispose surplus rain water safely to a suitable outlet, the system may require grassed waterway.
- ❖ Graded bunding is not recommended on land slopes less than 2% or greater than 8%