

**General remarks.** It is seen from the above review that the results of cultivation in dry areas are influenced largely by seasonal conditions, especially the distribution of rainfall. In years of low rainfall, increased cultivation does not appear to enhance crop yields. On the other hand, if the rainfall is well distributed, as occurs in Guntur, the maximum cultivation gave the highest returns. Similarly with regard to interculture, intercultivation as a necessary operation for the removal of weeds is desirable. It has not, however, been possible, to fix definitely the number of intercultures to be given to crops, as this is dependent largely on the conditions obtaining during the particular season. As weeding is absolutely necessary for most crops, interculturing cannot be dispensed with. It may also be considered as part of the spare time operations of the cultivator.

Regular cultivation of coconuts has given higher yield of nuts. Green manuring and puddling in the case of paddy and bed planting in the case of sugarcane gave good results. In addition to the use of iron ploughs, "The Burmese Settum" and the puddler were found to be very useful in preparing the land for paddy at Aduthurai.

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### **Contour Embankments in Dry Lands.**

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Dry lands situated in low rainfall areas, can be permanently improved by providing contour embankments. During rains a good deal of the water runs off the land carrying with it large quantities of silt. Much of this water if impounded on the land, will increase the moisture content of the soil, especially in low rainfall areas where it is badly wanted and result in the production of larger yields of crops. In addition to this, if the water is held the soil also is not removed. When the soil is retained, it stops deterioration by erosion.

Much care is taken by the cultivators of wet lands and garden lands to level and terrace the lands for irrigation. If levelling is done, the maximum benefits of rainfall and the least losses from soil erosion occur. Generally speaking such areas are not extensive as compared to the dry lands. The population in the area is large, the area of each holding is small and the economic position of the cultivators is much more favourable when compared to the dry land cultivators. Terracing the extensive dry lands is out of question owing to the magnitude of the work. It is unremunerative when applied to dry lands where the value of crop yields is low. But, it

has long been recognised by the cultivators that some thing should be done to prevent deterioration of the land caused by the loss of much rain water and soil. It is a common sight in some of the richer dry lands to see a huge single embankment at the toe of large and extensive fields with a big weir. It is also common to see the weir quite intact and a large vent down the bund through which rain water finds a frequent discharge. This system of bunding is inefficient and does not serve the purpose for which it is intended. This only concentrates the stagnation of rain water in one place and has no effect on the land above it beyond a certain limit.

Contour embankments provide the best distribution of rain-water throughout the entire land, the bunds being on level. As the bunds are at frequent intervals of say 300 or 400 feet, the rain water is held in various places and at various levels in the catchment and the water thus held naturally soaks down into the soil for the benefit of the crops. Thus contour bunds, properly made achieve the double object of utilising larger quantities of rain water for increased crop production and of holding the silt in the land itself instead of its being carried away.

The advantages of contour embankments are:—

1. In areas of low rainfall, where it is necessary to conserve rain water as much as possible, these embankments help to hold rain water for the benefit of the land and thereby increase crop production from these dry lands.

2. In years of low rainfall, as all the water is held on the land, it will be possible to produce good crops in the embanked areas whereas in areas not embanked, the low rainfall results in partial or complete failure of crops. In other words the embankments counteract and correct the adverse effects of low rainfall.

3. Soil is held instead of its being washed away and soil erosion is minimised.

4. In non-embanked dry lands, it is common to see pellets of manure being washed away from the land either to the lower fields or streams still lower down. When the field is protected by these embankments, the manure is held in the field itself and the proper response from the manure is obtained, resulting in heavier crop yields.

5. In these dry lands, when the lands are ploughed and there is heavy rain soon after, the soil is washed away quickly resulting in loss of soil constituents. This is evident to every one who has looked at the colour of the flowing water from the fields. It is cloudy and muddy from ploughed fields and fairly clear from undisturbed fields and grass land. Therefore when the contour embankments are put up, ploughing can be taken up, where ever possible, without fear of soil waste, i e., intensive cultivation by ploughing and manuring with good effect will become possible.

6. Contour embankments help in raising the water level of the wells situated lower down and will also help in the formation of better springs.

7. Contour trenching, i. e. trenches dug on the contour, in uncultivable waste lands in the margins of hill slopes, hold rain water which is otherwise lost. Trees are planted on the margin of these trenches and they will grow by the help of this water. This is one way of solving the fuel problem of villages and release the cow dung cakes for being utilised properly as manure.

8. It may be considered that contour bunding in the dry lands, of low rainfall in areas like Coimbatore, Ceded Districts, North Vizagapatam etc, is the threshold for further development of these areas. Bunding when followed up by intensive cultivation will result in better crops, better cattle, a more self-sufficient agriculture and will help in raising the standard of living of the dry land cultivator.

**How to put up contour embankments.** The land-scape consists of several ups and downs which are called water-sheds or catchments. Levels are taken starting with the "ridge point", i. e. highest point in the catchment. The successive falls are decided, say if bunds are to be put at a fall of every 3 feet, these drops in level are bench-marked and the lines of the same level are marked on the ground at each successive fall. The bunds are put up by digging earth from the sides. The bunds are about 3 feet in height and their basal width varies with the nature of the soil. Waste water weirs will have to be provided in certain types of land. The fall between 2 successive bunds depends upon the slope of the land: In slopes which are about 1%, a three-foot fall is convenient. The distance between any two bunds will be decided by (1) the width necessary for cultivation of dry land and (2) the slope of the land. Generally in a 1% slope, a width of 300 feet between 2 bunds is practicable. The size of the bund varies with the soil. In deep black soils the height of the bund will have to be 3 feet while the base should be sufficient to give the proper angle of repose and also allow for natural shrinkage and settlement. It may vary from 8 feet to 15 feet according to requirements. In red soils and loamy soils the size of the bunds can be smaller than in black soils, because owing to better percolation the volume of water dealt with is smaller and the bunds made up from this soil are also stronger. Waste weirs will have to be provided in stiff black soils where water percolates into the soil only with difficulty.

Contour embankments were put up in cultivator's fields near the Hagari Farm in an area of 75 acres (in 1942) as an experimental measure to see their effects on crop yields. Equal areas were left side by side in the same catchment and the yields were recorded for 2 years now. The year 1942 was a famine year in Bellary owing to failure of rains. The embankment work was started by employing famine labourers. The area was surveyed, block levels were taken and contour lines marked at 3 feet falls by the authors of this note. The sharp curves of the contours were smoothed to a certain extent to facilitate easy cultivation. Famine labour was employed for digging and putting up the bunds in 1943 a further area was added and the work was done on contract labour, under supervision.

The results of two years are now available, on the effect of embankments on crop yields in this area and these are given in the following table.

**Results of experimental contour bunding at Hagari (Bellary District) 1944 & 1945.**

Crop.	Embanked area		Non-embanked area		Increased yield per acre.		Percentage increase in yield.	
	Acre yield in lbs.		Acre yield in lbs.		1944	1945	1944	1945
	1944	1945	1944	1945				
<i>M. 47-3 Jonna</i> ( <i>cholan</i> )								
Grain	295	415	263	352	32	63	12	18
Straw	1371	1175	708	983	663	192	93	20
<i>H. 1 Cotton</i>	240	303	190	275	50	28	26	10

Notes:—Rainfall in 1943-44=13.98 inches.

„ „ 1944-45=26.08 „

It will be seen that contour embankments have resulted in increased yields both in the year of low rainfall 1943-44 and in the year of high rainfall 1944-45. In addition to this, the bunds have yielded an additional produce of vegetables like Gourds and Castor, which were planted on them in the rainy season. The cultivators of this tract who have seen these embankments and crops, are convinced about the efficacy of these bunds in increasing crop yields.

It will be seen from what has been written above, that this kind of bunding cannot be taken up by individual cultivators. To get the best results, the whole catchment should be the unit. In a catchment several hundreds of cultivators and their fields are involved. The work also requires a certain amount of technical skill which is not possessed by the cultivators. The work has to be done as a collective effort or by the Government and the costs shared by the individuals. In the Bombay Presidency contour bunding started in the same famine year as Hagari, i.e. 1942. The work at Bombay has progressed by leaps and bounds and several lakhs of acres are now reported to have been bunded under the auspices of the Government, in the Bombay Deccan.

The object of this article is mainly to stimulate the interest of the dry-land agriculturists in this new kind of work which has not been tried in arable dry lands so far. Terracing has been done on the hill slopes. Contour cultivation has been extensively applied in America. (Contour cultivation gives some protection against soil erosion.) But it is only contour bunding that helps to retain larger quantities of rain water on the land which is so necessary in low rainfall areas and it is well suited to our local conditions of cultivation, extent of holdings, and economic position.

**Summary.** Contour embankments put up in the drylands of low rainfall areas have increased crop production. They have held rain water which is much needed and also held soil which would otherwise have been washed away. Deterioration of land under natural influences is arrested. A general account to stimulate interest in the work, is given.