Gully plugging: Gullies should be controlled as soon as they are observed for they can ruin a field in 15 to 20 years. It is far more easy to control them when they are small than when they form deep ravines. Gullies can be plugged in with stones and cut out earth. Growing of grass, obstructing running water by dams, logs, stones, or concrete will break the force of water and aid the deposition of silt.

The above methods adopted according to the needs of the locality will help to maximise crop production. There is a lot to be done by our farmers themselves by co-operatively performing the necessary operations such as the construction of waste weirs, rivetments, digging of common drains, bunding of nallas, deepening ponds and tanks for holding water and silt, and contour bunding and terracing and tree planting. All these require propaganda and and demonstration.

The gradual denudation of the soil of the country is the real economic drain in India. Unless this denudation is stopped and the fine soil is retained, it is clear that the provision of improved varieties of crops, of irrigation facilities, of improved credit, of better cattle and good implements and manures, will not yield their full results. So let us "Save the soil and save all". We shall "arise, awake, and stop not" till our goal of "Maximisation of Crop Production" is reached.

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Usefulness of Water and Soil Conservation by Bunding Lands in Low Rainfall Areas

By

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Introduction: Out of the long list of nature's gifts to man none is perhaps so essential to human life as soil. And the top soil is the most vital part of the soil. Lying at an average depth of about 7 or 8 inches over the land, this upper layer of the soil is the principal feeding zone of the plant, which provides food for human or livestock consumption, fibre for clothing and timber for shelter. Soil constitutes the physical basis of our agricultural enterprises. Under many conditions, however it is the most unstable of all major natural resources.

What is Soil Erosion: Water or wind, in moving across the ground surface exerts an abrasive force which picks up soil particles and carries them away in suspension. In a natural, undisturbed environments, the dense cover of vegetation retards this surface transposition of soil. Where the land surface is devoid of protective vegetation as it must be under cultivation, the soil is exposed directly to the abrasive action of the elements. Transposition process of an extremely rapid order is set in motion. Stripped of the protective cover that normally anchors soil to the landscape, this indispensable material is moved a thousand times faster than under natural conditions. This accelerated soil removal is known as "Soil Erosion". Unless steps are taken to check its progress, it becomes the most potent single factor in the deterioration of productive land.

Evil Effects of Soil Erosion. In nature where there is vegetation and much of vegetative debris, there is an equilibrium between the losses in the soil and the recuperation. When man enters the scene this norm is disturbed the losses being more than the recuperation, soil erosion takes place the plant materials in the soil are removed and finally the "crumb" structure of the soil is disturbed. If the balance is to be restored and the productive capacity of the soil maintained, it is imperative to adopt soil conservation methods at a sufficently early stage.

Apart from the damages to or deterioration of cultivated land, soil erosion also causes severe losses to the community by the silting up of natural drianage channels, harbours, irrigation canals, power and water supply reservoirs. There is also a close relationship between the soil erosion and mounting high flood levels of the bigger rivers. The decline and disappearance of many a great civilisation of antiquity are closely connected with the gradual clogging up of the great irrigation and navigation systems on which they depended for their prosperity.

Estimate of Soil and Water Losses by Erosion. The rain is generally spent (1) by surface runoff (2) by evaporation (3) by underground drainage and (4) by plant growth. A sound system of agricultural economy is directed towards maximising the use of rainfall under plant growth. Ordinarily it will be difficult or impossible to prevent losses under evaporation and drainage while it is possible to prevent or reduce surface runoff and thereby increase water availability for growth of the plant. From the results of the experiments conducted at the Sholapur Dry farming Research Station it is seen that about 20% of total rainfall is lost by runoff which erodes away 35 tons of soil per acre per annum in the Bombay-Deccan tract. In other words 1/6" of soil is lost per annum by erosion or 1" of soil is 6 years. In light soil where the depth of soil will not exceed 6" the entire soil will be lost by erosion in about 36 years leaving the hard subsoil bare and unfit for any crop. The

enormity of the losses can be comprehended only when it is realised that geologically it takes 1,000 years for nature to convert rock into soil 1 ft. deep fit for cultivation while it is completely eroded and lost in less than 100 years. The conditions in the Madras-Deccan tract are not much different from those of Bombay-Deccan and the results can be taken to apply with equal force to similar areas in our province also.

It is further known, from agricultural experiments that about 400 lb. of water are required for every 1 lb. of dry matter produced. In order to produce a cholam crop of 500 lb. grain and 600 lb. straw yield about (500 plus 600) x 400 lb. or 200 tons or 2" of water per acre is adequate. Therefore it is possible to produce a good dry crop of cholam only if 2" of rain can be retained in the soil and made available for the crop in the proper season. Allowing surface runoff it should be possible to produce good crops even with a scanty rainfall of 10" to 15" per annum.

This leads us to the problem in the dry tracts of our State, especially Madras-Deccan, of overcoming surface run-off and conserving soil and moisture for increased crop production. Surface run off and soil erosion are taking place every time there is a rain. These are the enemies of dryland cultivation, resulting in frequent famines. Hence combating them should be considered as a national problem and remedial measures adopted on a wide scale.

Soil Conservation Practices: There are various methods of soil and water conservation which can be broadly classified as (1) cultural (2) vegetative and (3) mechanical methods.

In areas of low rainfall, special cultural methods have been evolved which are known as dry-farming practices. Among vegetative methods are included crop rotation, strip-cropping, ley farming (growing permanent cover grasses) green manuring etc. A sound system of crop husbandry with special emphasis on strip-cropping is considered to be an effective answer to soil erosion problems in slopes up to 1·5%, while the emphasis shifts to ley (grass) farming in slopes exceeding 5%.

Bunding: Mechanical methods are most successful in slopes of 1·5% to 5%. Contour bunding and trenching are the main mechanical treatments, to help in the greatest possible conservation of rainfall and to reduce soil losses by erosion. Contour-bunding is the construction of small bunds across the slope of the land, along the contour lines.

In areas where the rainfall is low, ill-distributed or precarious, this method of bunding the cultivable lands conserves the available moisture in the soil and helps to give an assured crop. The size and

shape of the bund, the distance between the bunds, the provision of waste weirs etc., are matters to be worked out on the spot, taking into consideration the nature of the soil, rainfall data and other factors. The rainfall intensity, duration and frequency coupled with the length and steepness of ground slopes constitute the chief eroding factors while the resisting power is determined largely by the infiltration and absorbing capacity of the soil, its inherent resistance to dislodgement and the nature of vegetation covering the surface. Contour bunding aids the "resisting forces".

However, bunding in itself is not a cure-all for all the ills of soil erosion. Bunding cannot be economically justified on lands (below 1·5% and above 5% slope) that can be adequately protected by proper tillage and other agronomic measures like strip-cropping, rotation, ley-farming etc. But where erodable soils, long slopes and high rain-fall intensities are encountered and where a large percentage of erosion-permitting crops must be used in rotation to provide a profitable farm income, the applicable agronomic control measures may give only partial control and must then be reinforced with bunding before adequate protection from erosion can be assured. Bunding should always be supplemented with the best possible cropping practices because bunding in itself does not improve soil fertility but serves only as a basis for soil improvement and other conservation practices.

Conservation of soil and water, in a national sense, requires the adoption of sound principles and practices. The attainment of this objective includes the wide-spread use of physical measures of land defence and the adjustment of certain economic and special forces tending to encourage exploitation of soil. The responsibility for such a national programme falls upon both the nation and the individual. National responsibility involves the protection of society's interest in a natural resource of vital importance to the whole people. Equally strong, however, is the interest of the individual in the "Good Earth" that he lives upon. National action may be led and aided by the Government but the soil must be conserved ultimately by those who till the land and live by its products. Without a widespread recognition of this responsibility, any governmental programme of soil conservation must be doomed to eventual failure.