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THE SOIL... OUR BASIC ASSET



WATER EROSION CONTROL—2

By L. C. LIGHTFOOT, B.Sc. Agric., Assistant Commissioner of Soil Conservation

EARTHWORKS are frequently used to help to control or prevent soil erosion where the adjustment of farming methods—as discussed in the March-April issue—is unlikely to be sufficient. Contour earthworks have proved extremely valuable in many cases and incidentally have caused much less inconvenience than most farmers anticipated. Landowners in need of advice on contour earthworks should get in touch with the Soil Conservation Service, Department of Agriculture, Perth, and arrangements will be made for an officer to visit their properties.

CONTOUR PRACTICES

Soil type and slope make some land unsafe for permanent cultivation without more protection than is given by the agronomic measures already suggested.

Unfortunately, farmers are sometimes forced by circumstances, such as lack of labour, machinery, superphosphate, feed, or finance, to do things they know are unsuitable. Consideration must then be given to using contour practices, (banks, furrows, and diversion drains as

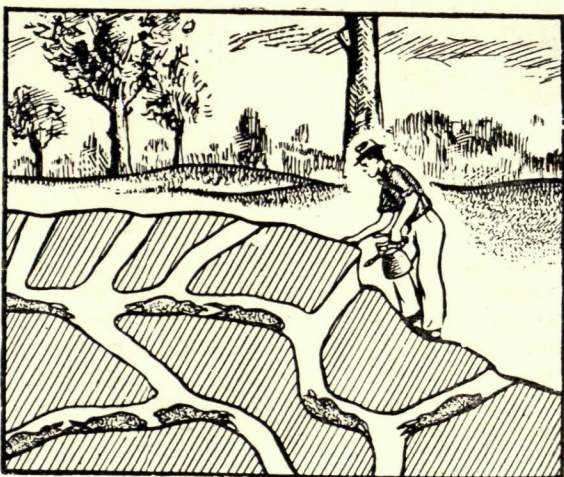
well as contour working) to give enough support to their agronomic programme to conserve the soil effectively against erosion.

Contour Working.—Contour working means working across the slope on the contour, that is along level lines. Machines of course are tilted by the slope of the ground, but they work along lines joining points of equal level. Contour lines from three to ten chains apart are marked out and the area between

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Fig. 1.—Soil erosion due to uncontrolled run-off when 90 points of rain fell in 20 minutes on this fallowed hillside. Contour banks across this slope would allow water not absorbed to run downhill for only two or three chains before leading it to a safe discharge point. The land also needs a few years under sub-clover pasture to improve fertility and increase the rate at which it can absorb water.

—Photo G. H. Burvil.

each pair of lines is worked round and round as a “land.” Sometimes contour working may be enough support to suitable land management to conserve the soil effectively. Where contour working is not enough the other contour practices must be used as needed.

Contour working is likely to be worthwhile on nearly all sloping land on which arable crops are grown or cultivation for pasture renovation purposes is needed. Increased water absorption with better crop and pasture growth is likely to be as important as preventing soil erosion by run-off.

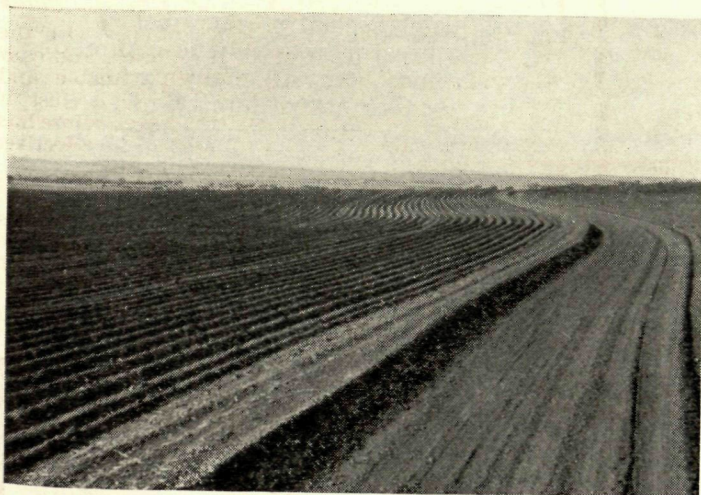


Fig. 2.—Contour working makes every cultivation ridge a miniature dam. This gives the soil a longer time to absorb water during heavy rain. Working along the level uses less power and has proved less inconvenient than expected.

—Photo L. C. Lightfoot.

Contour Banks.—Contour banks are ridges or banks of soil built at intervals across the slope. (See Fig. 3.) They may be on the true contour where absorption is the main purpose, or may be given a small grade, usually increasing towards the outlet, to carry run-off slowly across the slope into a safe discharge area. These are the drainage type of bank most commonly used, and they serve to break up a long slope into short sections. Each pair of banks serve as permanent markers for contour working.



Fig. 3.—Contour banks are often needed to control erosion on sloping land. They break up a long slope into a number of short slopes so that when run-off does occur, the water runs downhill a short distance only before being carried slowly across the slope to a safe waterway. Soil fertility and plant cover must be maintained because earthworks alone are not enough to prevent erosion.

—Photo B. a'B. Marsh.

To protect the soil adequately, many areas will require contour banks as further support for all appropriate good land management practices and contour working. Areas needing contour banks may be listed:—

- (1) Sloping lands already moderately damaged by erosion.
- (2) Most steeper land on which arable cropping will be continued, say slopes between 5% and 10% (a slope is 10% if there is a fall of 10 feet in 100 feet along the ground straight downhill).
- (3) Lands of more than 2% or 3% slope used for orchards, vineyards, intertilled row crops, or for any arable crops on soils which erode easily.

It would probably be better not to use land steeper than 8% slope for arable crops, but certainly 10% with odd patches steeper, should be the steepest

land regularly cultivated for crops in Western Australia except in special cases and using special precautions.

Pasture furrows on true contour but sometimes on a slight grade, are ploughed in steep country to help the soil absorb rainwater near where it falls instead of running off. Big absorption banks are used for the same purpose where needed, and big diversion drains, which have a fall to carry water from high land to a safe discharge so that it will not erode lower slopes, are sometimes used.

CONTOUR PRACTICES CAN'T DO THE JOB ALONE

Obviously soil erosion due to water, is caused mostly by the uncontrolled run-off of rainwater not absorbed by the soil. Improved pastures give plant cover and fertility. More careful grazing, less frequent cropping and cultivation, and less fallow where feasible.

all promote water absorption and lessen run-off, and resist the soil scouring effect of run-off when it does occur.

When all these things are considered inadequate, officers of the Soil Conservation Service advise the use of contour practices deemed appropriate to each area of land big enough to be treated separately. But it must be remembered that more than 150 years' experience in United States of America of using contour practices without appropriate adjustment of cultivation and crop rotation have shown that contouring and earthworks alone, cannot conserve the soil and its fertility.

PRACTICES SHOULD SUPPORT EACH OTHER

It will be seen that no one practice alone, is likely to achieve effective soil conservation. The successful establishment of a complete tree cover, or a complete grass cover, are probable exceptions.

Even then all the methods needed to maintain a healthy forest or healthy pastures would need to be used. Tree planting may be of limited use but does not seem likely to be of general value for big areas.

Pasture improvement has very great possibilities and is indeed the most important single soil conserving practice for much of our agricultural land. But mostly it is desirable to use an arable crop, usually one of the cereals, to give a rotation, to renovate the pasture, and to give flexibility to the farm programme. If wheat, or any other crop the

farmer can handle with his equipment becomes particularly attractive financially, it is obviously desirable to increase the cropped area for a few years if this can be done without exhausting soil fertility unduly or increasing the erosion hazard too much.

The farmer who normally uses fertility-building legumes for pasture and fodder crops with arable crops on a wide rotation, and also uses whatever contour practices are desirable on his land to give a complete soil conserving plan using every measure appropriate to his land and climate, will be able to do this safely. When the incentive for more cropping passes the conservation farmer will revert to more pasture and stock as they become relatively more profitable. In this way soil fertility will be rapidly restored and heavier cropping again safely practised when the incentive comes once more.

MAINTENANCE

Land management or agronomic soil conserving measures must always be considered and practised; every day, every week, and every season.



Fig. 4.—Pasture furrows on contour are used on sloping land too steep or too stony for arable crops. The extra water absorbed usually improves pasture growth and this helps to protect lower land. Many of our mallee hills need pasture furrows.

—Photo B. a'B. Marsh.



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Contour earthworks must be watched and maintained. **Fire hazard** is increased by a programme using more cover and fire precautions become more important.

EFFICIENCY OF SOIL CONSERVING METHODS

This varies with conditions and management. Where all appropriate measures and maintenance are used, efficiency is practically 100%.

But contour earthworks are expensive and it is usual to build earthworks which are likely to need repairing every few years. This keeps both first cost and working costs down. If earthworks big enough to stand up to all rains are desired, they must be very big and close together and this makes paddock work unduly awkward. Considerable risks of earthworks being inadequate, are normally taken during the early years of soil conservation work on any area while increasing cover and soil fertility and absorptive rate gradually give more support to the earthworks.

RESULTS OF FIELD WORK OF THE CONTROL AND PREVENTION OF SOIL EROSION BY WATER IN W.A. FROM EARLY 1947 TO EARLY 1952.

During this period, and considering only those cases where contour prac-

tices have been recommended to support suitable land management adjustments, farmers and Soil Conservation Officers have co-operated in treating about 100 areas of eroded soil from Northampton to Gnowangerup. Although these have not been fully tested, they have given good results generally and have mostly started to pay their way in the first season. Farmers therefore have the opportunity to control water erosion of the soil where it exists

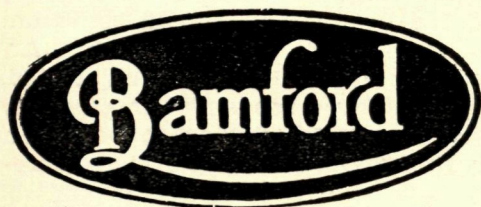


Fig. 5.—Improved pastures give fertility, enable soils to absorb water more quickly, and provide plant cover. These combine to make soil resist the scouring effect of run-off when it does occur. When 337 points of rain fell on this sub-clover paddock in two hours there was practically no evidence of soil loss. The darker patches are heaps of pasture.

—Photo G. H. Burvill.

and prevent further erosion by working in co-operation with the Soil Conservation Service using methods which will soon pay for themselves and show a profit. Exhausted and moderately eroded soils can usually be economically restored and protected, but if water erosion is allowed to go too far, reclamation and control may become too costly. Prevention of soil erosion is better and cheaper than control and reclamation of eroded land.

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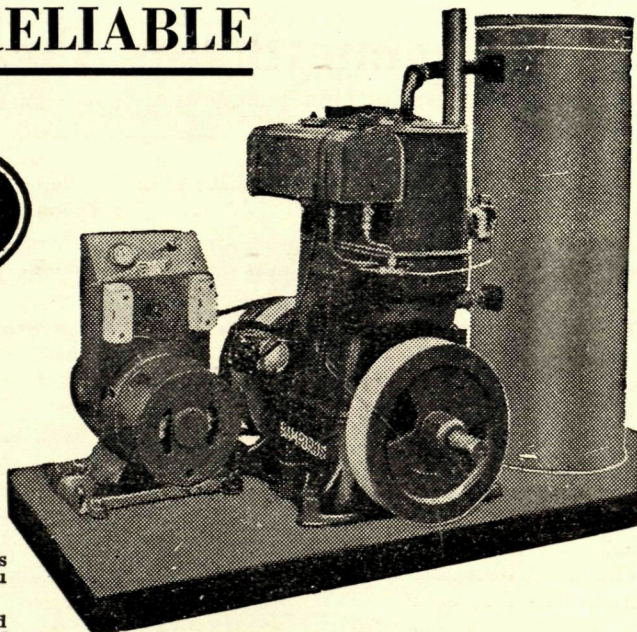
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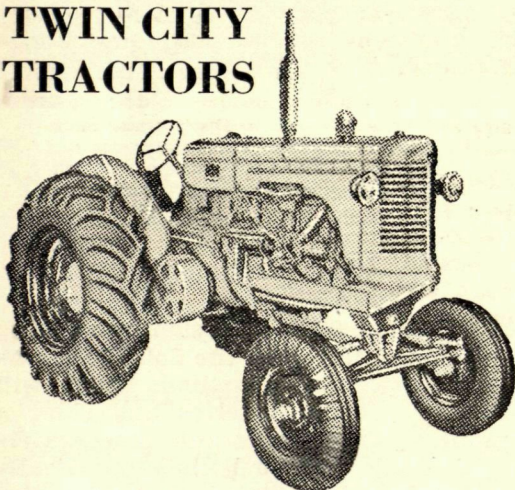
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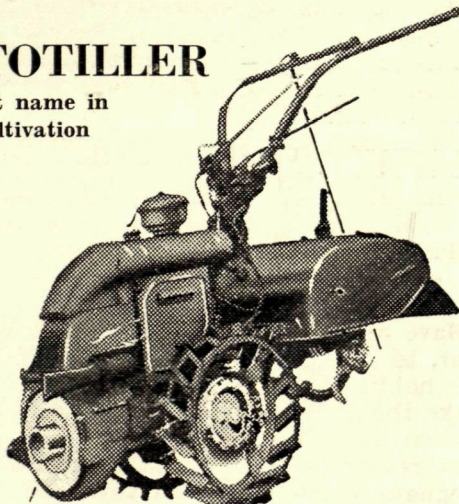
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