legislation, if necessary, thereby improving the existing facilities to have mechanised agriculture on a co-operative basis. It is a sure method to have the maximum benefit from the prevailing weather conditions. The Ceded Districts may perhaps be the suitable locality for putting this suggestion of introducing mechanisation in agriculture in actual practice.

Though it is not a suggestion to modify weather, it has to be mentioned that the farmers of the different localities must be posted with all details, based on facts, as to what are the different types of adverse weather conditions and how they are likely to affect the crops under cultivation. Steps in this direction are already taken by the Director, Agricultural Meteorology, Poona and 'Crop Weather Calenders' will soon be published in all the regional languages. With these calenders and advance weather information the farmer will certainly be able to minimise the loss due to unfavourable weather conditions.

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Soil Conservation and Maximisation of Crop Production

By

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One of the main factors for the present set-back in crop production is soil erosion. Our countrv is one among the many where soil erosion has become a menace in recent years. As far as our own State is concerned, erosion is certainly doing great havoc though it is insidious, particularly in regions subjected to the effects of monsoonic rains.

The rapid drain on soil fertility caused by erosion would not be so alarming if the lost plant food could be replaced by the application of fertilisers. But the trouble is that erosion not only removes the plant food materials but carries away the soil itself. When the fine top soil is removed, along with it are removed all the humus, the micro-organisms and the fine clay and silt material essential for the proper retention of soil moisture. The physical and chemical nature of the soil is changed, affecting the water holding capacity, the underground drainage, and the underground water supply etc. to the detriment of crop growth.

As far as our State is concerned instances of both wind and water erosion are sufficiently common and quite serious enough, to merit a greater degree of concern and attention than is evident at present. Wind is responsible for blowing away of the fine soil particles from the cultivated fields and indirectly for wave erosion along the shore lines of oceans and lakes. Hence there is an imperative need for the protection of soil. Any scheme for the maximisation of crop production is bound to be defeated if attention is not paid to the conservation of the soil.

Experiments conducted at the Dry Farming Station, Hagari show (vide table I below) that 40% of the Mungari rains and 25% of the total rainfall is lost every year from a gradient of 1 in 80. It carries away 8 to 10 cartloads of rich fertile silt from every acre of the control plot. The experiments at the Agricultural Research Station, Nanjanad show that the loss (vide table No. II) from a gradient of one in ten is 17·74% of the rainfall, and 1·09 tons of soil per acre. The lower amount of run off at Nanjanad is due to the nature of the soil of the experimental plots. The soil is a light brown loam, which is quick to absorb water. The rainfall is more evenly distributed and hence the intensity is less. However when the gradient of of the run-off plots was increased to 1 in 5 th elosses shot up by over 5 times. Thus with the same intensity of rainfail the soil and water losses assume different proportions according to nature of the soil and the slope.

TABLE No. I

Data on Surface Run-off at The Agricultural Research Station, Hagari

Black soil—gradient 1 in 80.

	1938–'39		1939–'40*		1940–'41	
	(a)	(b)	(a)	(b)	(a)	(b)
Number of days when there was run-off	13	10	16	10	11	5
Rain-fall on days when there was run-off	15·66	15·66	8·36	8·36	7·63	7·63
Rain water lost in inches ...	7·52	3·29	2·73	1·34	2·81	1·63
Rain water lost expressed as per cent on rain-fall received ...	48·01	21·01	32·66	16·03	36·50	21·36
Silt lost in tons per acre ...	9·86	3·60	2·69	1·82	1·83	0·98

*Exclusive of 2 days when there was overflow of the cisterns due to heavy rain-fall of 3·82" on 10—8—1939 and 2·61" on 25—10—1939.

(a) Control; (b) Scooped.

TABLE No. II

Run-off data at the Agricultural Reseasch Station, Nanjanad

Soil—Brown loam

	1943 Gradient 1 in 10				1944 Gradient 1 in 5			
	A	B	C	D	A	B	C	D
Number of days when there was run-off	66	66	66	66	68	68	68	68
Total rain-fall on days when there was run-off	43·38	43·38	43·38	43·38	45·02	45·02	45·02	45·02
Rain water lost in inches ...	3·21	3·49	1·28	6·95	10·69	14·59	1·04	35·42
Rain water lost expressed as per-centage of rain water received ...	8·46	8·81	2·94	17·74	28·16	35·11	2·45	81·57
Silt washed off in tons per acre ...	0·51	0·61	0·23	1·09	1·81	2·84	0·14	6·09

A—Farm Method; B—Ryots' Method; C—Grass cover; D—Fallow.

Methods of conservation may be broadly classified as (1) mechanical and (2) biological,

Mechanical methods like bunding, scooping, levelling, basin listing are all tried and proved methods of soil conservation. Experiments conducted at Hagari, Sholapur and in the Punjab have proved that bundiug helps to conserve more moisture in the soil. The effect is felt especially in years of poor rainfall. But yet this method is not practised as widely as it ought to be. Bunding at Hagari was done by tke bund-formeer which forms bunds of about 7" high. These are temporary and are washed away in years of heavy rainfall. The Bombay bunds are of a permanent nature and are 3' high, 2' wide at the bottom and 10" wide at the top. Bunding has helped to increase the yields by 50% in the Punjab, 40% in Bombay and 25% in Hagari and about 45% in the ryots' fields (vide table No. 3 and 4). If such high crop yields could be had by such a simple method as mere bunding, failure to adopt this is simply criminal.

TABLE No. III

Control Vs. Bunding Experiment—Dry Farming Station, Hagari

Field No. 5—Plot area—Gross 0 55 acres. Net 0·33 acres

5th October, 1935 to 14th February, 1936—T. 1 Jonna—replications 4.

	Grain Yield				Straw Yield			
	A	B	C	D	A	B	C	D
Control ...	181·0	170·5	183·0	165·5	384·9	362·4	361·4	421·3
Bunded ...	255·5	257·5	234·3	201·0	531·1	571·5	462 3	426 7
	Significant t=5·38, t from tables for n=3 and P— 05=3 182				Not significant t = 2 69			

TABLE No. IV

Ryots' field—Bevinahalli--Bellary.

Crop	Control		Bunded		% increase over control	
	Grain lb.	Straw lb.	Grain lb.	Straw lb.	Grain	Straw
Jonna ...	102	602	156	920	51%	52·8%
Cotton—Jonna Kapas	64		91			42·3%
mixture ...	43	106	61	153	42%	44 %

TABLE No. V.

Scooping Trials—Dry Farming Station—Hagari—

Moisture Percentage on dry basis.

26-7-1940—Initial Moisture; 15-10-1940—Moisture at sowing time of cholam.

Depth	(A)		(B)		(C)		Difference in moisture % between the two dates			Rainfall absorbed in inches		
	26-7-40	15-10-40	26-7-40	15-10-40	26-7-40	15-10-40	(A)	(B)	(C)	(A)	(B)	(C)
0- 6"	14·8	25·4	15·5	28·8	15·5	28·8	10·6	13·3	12·7	0·85	1 06	1·02
6-12"	25 8	29 1	24·3	31·5	25 7	30 4	3·3	7·2	4.7	0·26	0 57	0·39
12·24"	22·2	24·3	21·0	30·7	23·0	30 7	2·1	9 7	7 7	0·33	1 55	1·23
24 36"	17·5	19·9	22·5	25·1	24 6	25·8	2·4	2·6	1·2	0·38	0·42	0 19
0·36"	20 0	23 8	21·1	28·6	22·7	28·6	3·8	7·5	5·9	1·82	3·60	2·83

(A) Control; (B) Bunded; (C) Scooped with Danthis and Bunded.

The Goverment has undertaken an exteusive scheme of contour bunding in the Ceded Districts, but the utility of this will be made null and void if the farmers do not realise the need for putting up the smaller 7" bunds in all their independent holdings.

Scooping: This is forming small basins with either the Basin lister or with "Danthis". When the Basin lister moves on the field a depression is caused to a distance of about 3 ft. and then the tyne gets raised so there is an elevation and again a depression. Experiments at Hagari show that the moisture conservation due to scooping with danthis was 2·83" when the non-scooped control plot had conserved only 1·82" (vide table No. V). Resort to this method will go a long way in the maximisation of crop production.

Contour cultivation: On the Hills the crops should as far as possible be sown across the main slopes. Contour embankments and contour cultivation should be practised. The local ryot's method of growing potatoes along the slope with the contour drains may be satisfactory on moderate slopes up to 1 in 10 but for steeper gradients contour cultivation is the only remedy. This not only conserves the soil but in the long run will tend to minimise the manurial bill.

Crop rotation; Crop production can be increased and the soil conserved by adopting a suitable form of rotation. The principle here is to see that the soil is kept protected by some sort of plant cover for as long a period as possible. Cotton, groundnuts, and cholam or potatoes, lupins and rye can very well be included in such a system of crop rotation. In addition to legumes, other plants like rye, buckwheat in the hills, and Setaria, calotropis and Euphorbias can all be used as green manure. Soil erosion can be prevented to a great extent by the application of silt, farmyard manure, composts, green manure etc. to increase the humus content of the soil. Liming heavy clay soils flocculates the clay and makes it settle down quickly and prevents run off.

Terracing: Cutting a steep slope into two bits of flat ground is terracing. The process is rather costly and may be resorted to wherever necessary. This is practised to a great extent in the West Coast where paddy is cultivated but it is not so common on the Nilgiris.

Mulch culture: Spreading any available trash on the soil and producting it from the beating rains is mulch culture. This could be practised with advantage both in the plains as well as on the hills. Any coarse organic material may be used. On the hills about four cartloads per acre of twings leaves, shrubs and trash will be necessary. Experiments are in progress at Nanjanad and the results show that the run-off is minimised and crops come up well.

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

MIRZA ANSER BAIG

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.