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Observations on Deep Ploughing in the Black Soils of the Bellary District*

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In the black soil areas of the Bellary District, farmers do not as a rule plough their land very deep, except once in six or seven years. The conditions that influence the adoption of this practice at such long intervals are summarised below.

Deep ploughing cannot be given in the heavy black soils of this tract as and when the cultivator likes but has to be done only between the months of December to March. The period is determined by the rainfall of the tract and the nature of the soil. The normal distribution of rainfall in the tract is as below.

January	....	0·02 inches.
February	....	0·25 ,,
March	....	0·20 ,,
April	....	1·20 ,,
May	....	1·90 ,,
June	....	1·95 ,,
July	....	1·90 ,,
August	....	3·68 ,,
September	....	4·50 ,,
October	....	3·00 ,,
November	....	1·16 ,,
December	....	0·24 ,,
Total for the year	....	20·00 inches.

The rainfall is very low in the first half of the year. As such, deep ploughing has to be done early i. e. in January or February, so that sufficient time is available to get the land in proper tilth with the aid of the sporadic showers received in April and May. With the cessation of North East Monsoon rains the soil begins drying up from December onwards but sufficient moisture is retained in the soil to permit ploughing to a depth of 10 inches if necessary. After March, the soil would have dried up and become so hard that ploughing becomes impossible unless some rains are received. If, for some reason deep ploughing is delayed until May or June, the result is a loss of crop, if the rainfall in the subsequent months happens to be

* Condensed by the Editor.

below normal. As would be evident from the table above the main rainfall is received in this tract during the months of August, September and October. In case deep ploughing is delayed until June, the large clods that are thrown up by the heavy plough do not have sufficient time to get fully weathered by the subsequent rainfall and the soil does not get into good condition for sowing cotton by September, with the result that the yields are very poor.

The removal of troublesome perennial weeds like Hariali (Cynodon) is one of the problems of the tract particularly where lands are extensive and occupy the lower rigions of a catchment. In such regions the moisture content is higher thereby affording facilities for the rapid spread of such weeds. When extensive areas are infested by such weeds, hand weeding becomes too expensive an operation and the cultivator therefore goes in for deep ploughing with a heavy plough, drawn by five or six pairs of bullocks. As cattle too are not very plentiful in this tract, there appears to be a good scope for popularising the use of tractors for deep ploughing once in four or five years.

The ordinary cultivation practised in this area is of the extensive type. The blade harrow (Guntaka) is the only implement used for preparatory cultivation.

An attempt was made at the Agricultural Research Station Hagari, to see if deep ploughing was really essential in well-kept black soil fields free of weeds. The experiment was laid out in 1942 in a field where the soil was nearly four feet deep and the treatments were as follows:—

(A) Control — Guntaka (blade harrow) alone used.

(B) Shallow ploughing — by the wooden country plough.

(C) Shallow ploughing — by an improved type of light iron plough.

(D) Deep ploughing with a heavy iron plough to a depth of seven inches.

The four treatments were in randomised plots replicated six times. Three crops, two of cotton and one of sorghum were grown and the results are summarised below:—

Table I— Deep Ploughing Experiment—Summary of Results of Three years 1943 to 1945.

Treatment	1943—44 Cotton	1944—45 Sorghum. Grain	1944—45 Sorghum. Straw	1945—46 Cotton
A. No ploughing — working Guntaka alone	313	764	3071	227
B. Light ploughing with country plough before cotton	318	641	2822	310
C. Light ploughing with a small iron plough before cotton	290	715	3099	305
D. Deep ploughing— with a heavy iron plough (in 1942)....	299	730	3157	239
General Mean	305	712·5	3037·3	270·0
Standard Error	13·95	27·2	123·3	16·3
Significant or not by "Z" test	No	Yes	No	Yes
Critical difference	—	82	—	49

Conclusions:

1943—44—Cotton—Treatment differences not significant.
1944—45—Sorghum—grain—A, D, C, B.
1945—46—Cotton—B, C, D, A.

It will be seen from the above data that in all three years the yields from deep ploughed plots are more or less equal to those from plots not ploughed at all, indicating that there is no real necessity for deep ploughing in the black soils of this tract. At the Research Station, the fields are invariably kept clean of weeds and under such conditions there is no need to give any deep ploughing. Deep ploughing would become necessary only as an economical weeding operation, when the land becomes choked up with deep rooted perennial weeds like *hariali.*

The primary object of ploughing being to expose unweathered subsoil from the lower levels and thus maintain soil fertility it is likely to be useful only on soils where the texture and composition vary considerably between the top and lower layers.

The black soils of the Bellary district are remarkably uniform in texture and composition between the different layers (see table 2) and it is not surprising that deep ploughing failed to induce any increase in yields as compared to mere surface harrowing.

Table II. Mechanical Analysis of Black Soil at the Hagari Farm to a Depth of three Feet.

	First Foot	Second foot	Third Foot
Clay	46·2 %	48·2 %	47·8 %
Silt	25·1 %	23·5 %	24·8 %
Fine sand	18·2 %	17·6 %	17·8 %

Note:— Analysis made by Dr. A. Subba Rao, Soil Physicist.

It is remarkable that the black soils of this trac (except those foul with weeds) do not require any deep ploughing. In this connection it may not be out of place to quote a local saying " that black soils plough themselves ". These soils begins to develop cracks towards the middle of January and as the soil dries up with the advancing summer months the cracks become deep and extensive so as to honey comb the soil mass to its entire depth. Such opening up of the soil due to natural agencies appears to provide the necessary aeration and weathering which could otherwise be secured by ploughing only.

Summary:

In the black soils of Bellary District (situated in a low rainfall area) deep ploughing is not commonly done. It is resorted to as an economical device for eradicating weeds when the land becomes foul with deep rooted perennial weeds. If deep ploughing is necessary it must be given in January—February so that there is sufficient time for the big clods turned over to weather before the sowing time in September. In a three year experiment conducted on the Agricultural Research Station, Hagari to see weather deep ploughing was really essential in well kept black soils it was observed that the yields obtained from the deep ploughed plots were equal to other treatments like shallow ploughing or working the blade harrow. These soils develop heavy cracks during summer and the necessary aeration and weathering appear to be obtained thereby. Further the soil profile is uniform in texture and composition throughout its depth and as the lower layers are practically the same as upper layers there is no need to adopt deep ploughing as a routine operation in these soils.