

Mechanized Preparatory Tillage of Paddy Land at Hingurakgoda Farm

H. P. B. ELLEGALA

Ploughing

THE only mechanised operation in paddy cultivation hitherto practised successfully in Ceylon has been the ploughing of fields. The first tractor that was used for this purpose was a Caterpillar D4 with mould-board plough; subsequently the disc plough was found to be superior. This was followed by lighter machines such as the international TD6, T6, and W9 tractors, all with trailed implements. Then came a quick change of both tractors and implements. The rubber-tyred Ferguson tractor was the first in the field with power lift implements. Fordson Major tractors and several others came soon after. The last to come were the Australian Government's gift tractors—the Farmalls.

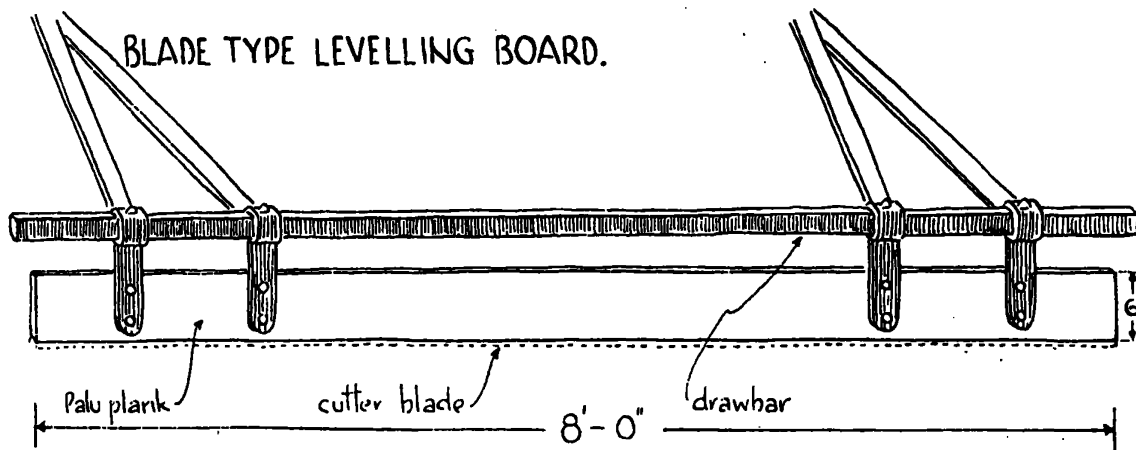
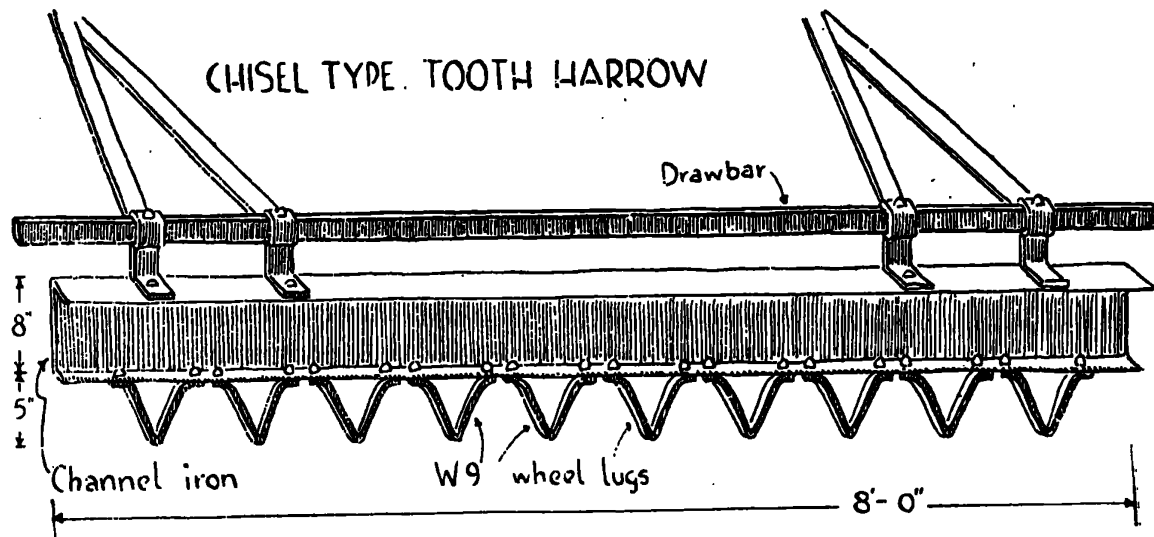
All these tractors did a satisfactory job of ploughing under reasonably good conditions. Ploughing was difficult when the land was too dry or too wet. Under the former conditions the plough skims over without a sufficient cut, and under the latter the tractor gets bogged down. However, with careful planning it is possible to get through ploughing within the time available, and if one or two crawler types of tractors with trailed disc ploughs are at hand, ploughing will not be normally a problem.

Puddling and Levelling

Ploughing is only the first operation in paddy cultivation. The other operations that follow are more difficult and less suited for mechanized operation. These are the puddling and levelling of ploughed land—never been previously done in the Island with mechanical aid. It is the experience of every paddy cultivator that unless paddy soil is thoroughly puddled or churned and then properly levelled, the resultant crop is generally poor, due to heavy weed growth competing with the rice.

We have hitherto done puddling or mudding with what is commonly called a “Burmese Harrow”—a six-foot long, six to eight inch thick round log, fitted with wooden spikes and drawn by buffaloes or bullocks—which breaks up the moist clods, buries the weeds and creates a bed of soft mud six to twelve inches deep. This operation is followed by levelling. An animal-drawn levelling board called the “poruwa” is used and the finishing touches are given by hand levelling boards just before sowing.

It is inevitable, therefore, that with the advent of tractors for ploughing paddy land, some mechanized device should be introduced to do puddling and levelling as well, to replace slow animal draught which loses the advantage gained by early ploughing.



It was this that led me to design an implement to be used with tractors. 500 acres of ploughed land at Hingurakgoda Farm were awaiting puddling, and as there was very little time left before sowing, I decided to try a tractor. I used a Farmall AM, without any implements, in a wet field. It moved freely where there was plenty of water but got bogged down in other places. I then learnt the secret. Where there was plenty of water the grooves of the rubber tyres were washed clean and the tyres were able to get a grip on the undisturbed sub-soil and so make the wheels move. In places where there was

only mud, the space between grooves was filled with mud and the surface of the tyres made smooth and movement impeded. Thereafter I had all the fields flooded. This was easy, as there was plenty of irrigation water and rain.

Normally, after the rains set in, it is usual for the tractors to be put under cover. All operations in paddy cultivation thereafter proceed with animal draught and manual labour, but with this discovery I was able to use all my tractors in the fields. After I had seen that the tractors were able to move freely in flooded fields, I invented certain implements which I knew should

work satisfactorily when fitted to the tool bars of the tractors. The principle is the same as that of the "Burmese Harrow" and the levelling board drawn by animals.

Chisel Type Harrow and Blade Levelling Board

Wheel lugs from W9 tractor were fitted to an eight-inch wide channel iron frame to form the harrow.

A levelling board was made of two-inch thick "palu" timber, six inches wide and eight feet long. A cutter blade was fitted at the bottom to prevent wear on the plank.

Two cutter blades of a bull-dozer may also be converted into a very useful levelling board.

Five of these harrows and levelling boards were turned out and were fitted to the tool-bars of the Farmall AM tractors. It is of interest to note that due to the long reach of the tool-bar in Farmall tractors these implements can work right behind the rear wheels, obliterating the wheel tracks, unlike the short-reach tool-bars of other types of tractors.

These tool-bars are worked by a hydraulic lift arrangement and hence can be lifted off ground and dropped when required while on the move. The depth of harrowing and levelling too can be adjusted by the "lift" lever. Thus high spots can be levelled off and low spots filled in with ease.

Suitable Field Conditions

The following conditions should obtain for operating with rubber-tyred tractors:—

- (1) There should be plenty of water in the ploughed field.

- (2) The depth of mud should not be more than 1½ to 2 ft., i.e., shallow.

- (3) The sub-soil should be either gravel or sand to permit a grip on the tyres.

In deep mud or where there is an insufficiency of water to wash the grooves of the tyres the tendency is for the tractors to bog down.

About three-quarters of the dry zone paddy soils are shallow, with an average depth of about 1½ feet of top soil over gravel or sandy sub-soil. It is only in gulleys or water-logged low-lying areas that deep mud is found. Such fields have to be worked by buffaloes or in some cases manotied by hand as even animals cannot get in. Thus it can be safely assumed that about 500,000 acres in Ceylon out of a million acres of paddy land (approximately) can be mechanically prepared from ploughing up to the time of sowing.

At present these operations take 6 pairs of buffaloes per acre at a tediously slow rate, permitting the cultivation of only a limited extent as compared with 4 acres per Farmall per day. The cost of mechanical cultivation is thus about one-fourth that incurred by animal draught. These Farmall AM tractors are not only used for ploughing, puddling and levelling on this farm but are also used for threshing paddy, haulage and power take-off work for threshers, winnowers, and saw benches.

Wear on the Tractors

There is one disadvantage in working these tractors in mud, which is of some importance. Small particles of sand in the mud creep through the grease seals and wear out both the grease seals and front wheel razors. If a device to lock

these grease seals and razors can be made the wear on these parts could be considerably reduced. It has been found that a set of grease seals and razors will last one season (45 to 60 days), and for the next season a new set of these has to be fitted. However, the cost of a complete new set not being too high (about Rs. 50) seasonal replacement is not uneconomic. It works out to about

25 cents per acre or Re. 1 per working day.

Operation Costs

The following figures give the costs of operation of a Farmall AM tractor on an 8-hour working shift including costs of fuel, operator's wages and depreciation.

	<i>Rs.</i>	<i>c.</i>
(a) Kerosene oil $1\frac{1}{2}$ gallons per hour for 8 hours at Re. 1.10 per gallon ..	13	20
(b) Petrol $\frac{1}{2}$ gallon per day at Rs. 2.60 per gallon ..	1	30
(c) Engine oil $1\frac{1}{2}$ bottles per day at Re. 1.50 per bottle ..	2	25
(d) Grease, gear oil, distilled water, &c. ..	1	25
(e) Wages of operator at Rs. 5 per day ..	5	0
(f) Depreciation of Tractor and Implements (valued at Rs. 20,000) at Rs. 2 per hour for 8 hours ..	16	0
(g) Incidental expenditure per day ..	1	0
	40	0

Assuming that 4 acres are ploughed under suitable conditions (the D4 Caterpillar and TD6 Tractors can do a bigger extent for the same cost) the cost per acre of ploughing paddy land is Rs. 10. Puddling and levelling (both operations combined) at 4 acres per day

cost Rs. 10 per acre. Thus the total cost of ploughing, puddling and levelling paddy land up to sowing, if mechanically done, is Rs. 20 per acre.

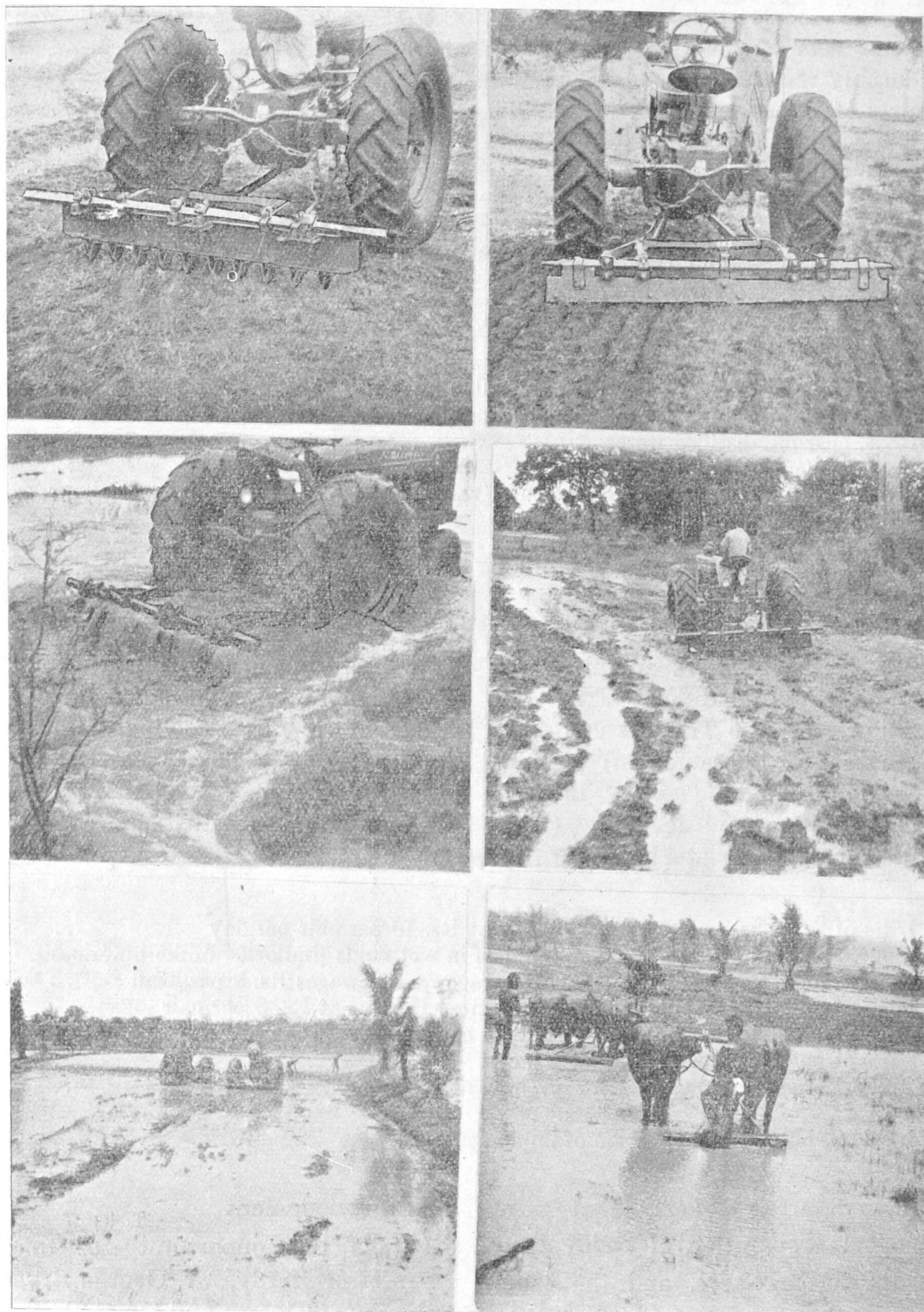
Compare this with the cost of animal draught.

	<i>Rs.</i>	<i>c.</i>
(a) 2 pairs of bullocks per acre for ploughing at Rs. 10 per pair per day ..	20	0
2 ploughmen and 2 helpers to lead animals in wet fields (bullocks unlike buffaloes do not move freely in paddy lands) average rate of wages Rs. 3 per head ..	12	0
(b) 2 pairs of buffaloes for puddling with Burmese Harrow at Rs. 8 per pair and 2 ploughmen for harrowing at Rs. 4 each ..	16	0
(c) 2 pairs of buffaloes for levelling at Rs. 8 and experienced ploughmen for levelling at Rs. 4 each ..	8	0
Total (without any depreciation of implements) ..	80	0

These figures reveal that the mechanical preparation of paddy land costs Rs. 20 per acre, and the same operations by animal draught, Rs. 80 per acre. Thus, costs are reduced to one-fourth and speed increased four times.

Acknowledgment

I take this opportunity of thanking Professor Hardy, Mr. George Bryce (of the F. A. O. team) and Mr. C. R. Karunaratne, Agricultural Officer, Dry Farming for the encouragement given me and the Assistant Farm Manager, Mr. S. Thambiyah, for his co-operation and support.



(*Top Left*) Chisel type tooth harrow fitted to tool bar of tractor. (*Top Right*) Blade levelling board fitted to tool bar of tractor. (*Middle Left*) Reducing high spots in the field with levelling board. (*Middle Right*) Puddling the field with the harrow. (*Bottom Left*) Final stage of levelling. (*Bottom Right*) The old method of puddling with animal drawn harrow.