# THE CORRECT USE OF IMPLEMENTS ON THE CANE FARM

## WITH SPECIAL REFERENCE TO A PLOUGH AND A CANE PLANTER

By W. L. FIELDING and R. M. HALL.

Instruction and practice are necessary before a human being can be expected to become skilful in the operation of even so commonplace an item as a motor car. The motor car is merely a method of transport. When a piece of machinery is used as a vehicle on which to transport a mechanism which during traction is performing an agricultural operation, it is obvious that skill in the use of such a device must be acquired before proper results can be expected.

In England, the ploughing match is an example of popular contest, particularly amongst enthusiasts of the Young Farmers' Clubs, where the participants vie with one another to perform the most skilful job. It does not matter what the implement is; if it is worth using at all, it is worth learning to use properly.

There is a tendency for farmers to lack patience in the employment of implements. These should be of foolproof and hardy construction, but it is always necessary to learn their correct use. Too often a piece of farm equipment is doomed to stand discarded and exposed to the elements until its wooden parts rot and its metal rusts away. A valuable piece, purchased in a moment of enthusiasm at an agricultural show, is cast on the scrap-heap because the farmer just couldn't bother to study its practical use.

For the purpose of this discussion two pieces of cane farm equipment have been selected—a hillside plough and a planting machine.

### The Reversible Plough.

There are various types of reversible or one-way plough in existence. In general agriculture their advantages are :—

(*a*) They save the trouble of setting ridges.

(*b*) They save time in turning and reduce the trampling on headlands.

(*c*) They dispense with open furrows, which either involve labour in levelling over, or waste ground, complicate work of planting machinery and form potential starting points of gulley erosion in tropical countries.

(*d*) They are useful for strip cultivation.

(*e*) Ploughing on hillsides is facilitated by turning all the furrows downhill.

(*f*) There is almost 100 per cent. saving of the time lost, running light, where a fixed plough is used on one face of a hill.

Obviously, the provision of a satisfactory reversible plough for the Natal cane belt is important.

At the Mechanisation Committee "field day" at Mount Edgecombe, 26th October, 1948, two reversible ploughs of interest to the average grower were demonstrated. One was the 16-inch mouldboard, single-furrow Lindeman reversible plough, operated by the tractor-driver via the hydraulic mechanism of the 23.9 h.p. wheel-type Ferguson tractor. Where conditions permit ploughing with a wheel tractor this plough works well and is simply operated by one man. The other reversible plough was the Ransome's "Magic" No. 5 reversible two-furrow disc-plough, hauled by the tractor with which its purchasers intended it to work, a D.2 caterpillar.

Experiences with this plough at the Experimental Farm, Chakas Kraal, have been interesting. At first results were disappointing, even though good results had previously been obtained with the older model of this plough, which weighed 250 lbs. less and was animal-drawn.


Ransome's "Magic" No. 5 reversible disc plough. Adjustable stop above A in photograph. Background is ploughed-out ratoons.

Since October, however, a considerable acreage has been ploughed with this implement. The ground ploughed has been old ratoons cut in 1948, but which carried a fair amount of new growth; the trash mat was heavy and the stand of healthy stools continuous. In the background, behind the plough in the illustration, can be seen a hillside which was very successfully ploughed with this two-furrow disc plough, to a depth of 8 to 10 inches. This ploughing outfit, the track-type tractor and one-way disc plough is now

used with confidence for ploughing all kinds of terrain and surface conditions. The furrows produced at the first ploughing are regular and even compared with the extremely irregular jobs which one so frequently observes in the cane belt.

These are the main points to observe to achieve proper results :—

(*a*) When using a tractor, run the tractor with its near track or wheel just in the open furrow left by the last passage of the plough. This assists in maintaining correct line of draught. If the near track is run above the open furrow, on unploughed land, then it is not possible to work satisfactorily with the reversible plough, because the necessary offset on reversing is too great.

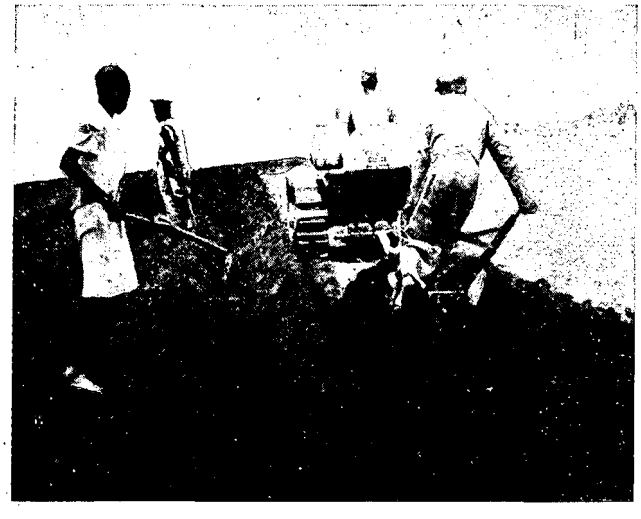
(*b*) Where there is a thick trash mat, pre-treat the trash by running over it with a tandem cover crop disc harrow or similar implement.

(*c*) Study the setting of the adjustable stop (A in illustration) fitted to the front bearing to enable the angle of entry of the discs to be altered. It is on the exact setting of this stop that successful operation depends, and changes must be made in the setting when a general change in angle of slope occurs.

(*d*) Keep the discs sharp by frequent grinding.

(*e*) Use the lever-controlled drawbar, which assists in obtaining the correct line of draught when working on hillsides.

(*f*) The attachment of wheel weights (240 lbs.) to the rear wheel greatly assists penetration and brings the total weight of the plough up to 1,490 lbs., making it more suitable for use behind a 35 h.p. tractor such sa the Caterpillar D2.



Making a normal furrow with tractor-drawn ridging plough.

One tractor driver and one ploughman do a good, rapid job if the above points have been attended to. Though if the trash mat is excessively thick it may be necessary to have a couple of natives with sticks helping wads of trash into parts of the open furrow before the plough runs by again. The wide discs (front 28 ins., rear 26 ins.) make an excellent job of cutting up old cane roots and turning in trash and thick weed growth.

Patient study of the correct method of operation of this implement has been amply repaid.

### The Cane Planting Machine.

Lloyd[1] gives interesting data regarding the deployment of the 129 mechanical planters known to have been purchased by growers by the end of 1948. These are mainly machines manufactured in South Africa on the "Don" (Australia) model. More than half of them are owned by growers having less than 500 acres under cane, and the terrain on which the machines are working by no means excludes hillsides.

The fact that the machines are known to be on these farms is, however, no assurance that the owners have mastered their operation and are satisfied with the performance. In a number of instances encountered there is definitely a suggestion that the machines have been, for the moment, relegated to the "of doubtful use" class. The instances of their successful use on many estates, however, shows that once again there is a need for study of the operation of a machine and for patient tuition of the operators.

In early 1948 the first single-furrow "Don" planter to be imported from Australia was purchased by the South African Sugar Association for the small cost of £49. It had no mouldboard attachments to the furrower cheek, being intended for light animal draught. First reaction to the machine was considerable doubt as to its practical use, so that one can understand that growers who have purchased a planting machine, and used it a little, rather diffidently enquire of the Experiment Station staff, "What do you think of these planting machines ?" And, as the story unfolds, one finds the main complaints are unevenness of germination, poor depth control, uneven fertilizer distribution, mechanical breakdowns, particularly in the depth control mechanism and the fertilizer agitator mechanism.

The machine mentioned above was studied and modified, at the Experimental Farm, Chakas Kraal, and the following notes detail the changes made and lessons learned in achieving successful operation.

(*a*) Although it was found that the machine could be hauled more or less satisfactorily by mules, it was decided that the steady traction provided by a tractor would be preferable. The chassis as supplied ran on three wheels, like a tricycle. The front wheel was removed and the tow-bar shortened to give a close hitch-up to the tractor draw-bar.

(*b*) Distance markers were fixed to both sides of the machine, to enable the tractor operator to plant equidistant lines.

(*c*) Considerable time was devoted to the instruction of two natives in rhythmic, regular feeding of setts down the planter chute. The drop-type planting machine is only semi-mechanical and the labour of feeding is physically exhausting. If, therefore, one has two operators trained, they can take turns, one going off to a lighter job elsewhere on the farm while the other takes a turn at feeding. Encouragement of the competitive spirit between these two is a great help; this is an example of the important art of knowing how to handle and encourage labour. There can be great rivalry as to which operator's strips of field germinate best. In this way bad stands due to uneven feeding have been avoided.

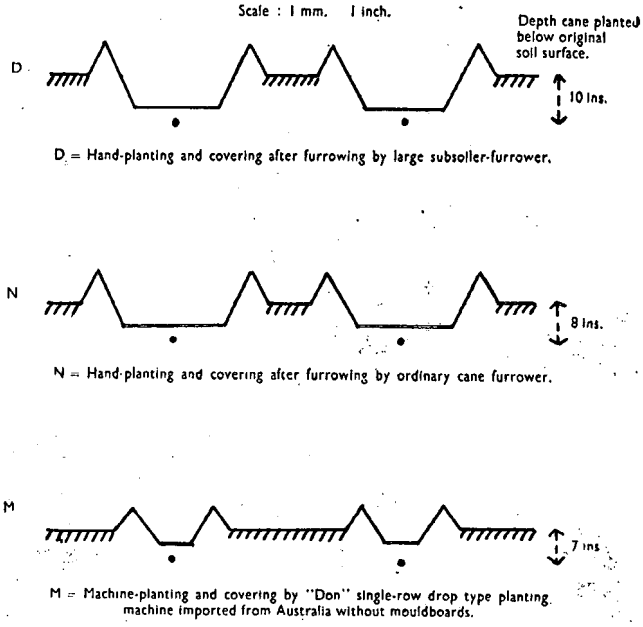
Of course, mechanical cutting, fungicide dipping and feeding of cane setts is the ideal and the ultimate goal. Means of achieving these operations are being studied, but they will all add complication (potential spots of mechanical breakdown) and cost to a simple device which, properly used, is already a great labour saver. At Chakas Kraal and Mount Edgecombe experiments are in progress to investigate questions of spacing between stools in the line. Should these show that spacing of setts in the furrow, as opposed to "continuous stick," has potential advantages, then the perfection of automatic feeding would be of enhanced importance. Experience has shown that attempts to vary seed rate when feeding by human hand may lead to an uneven stand.


Covering setts with the hoe in the bottom of the furrow (B).

(*d*) Controversy developed because this machine had no mouldboards and the passage of the furrower cheeks (D) preceded by the plough point (E) (in the close-up illustration) left only a shallow furrow after planting. Criticisms were that this "ridgeless, shallow" planting would result in soil erosion and decreased yields from ratoon cane in drought years. A useful subject for investigation presented itself and a method-of-planting experiment, involving three treatments and seven replications, was set out at the Experimental Farm, Chakas Kraal. It will be some years before we have concrete results, but examination of the different methods revealed some points of immediate interest.

The depths of planting and shape of ridge achieved with the three methods (see fig. 1) reveals that actual

Fig. 1.—SECTIONS OF SOIL CONFORMATION RESULTING FROM PLANTING BY DIFFERENT METHODS.



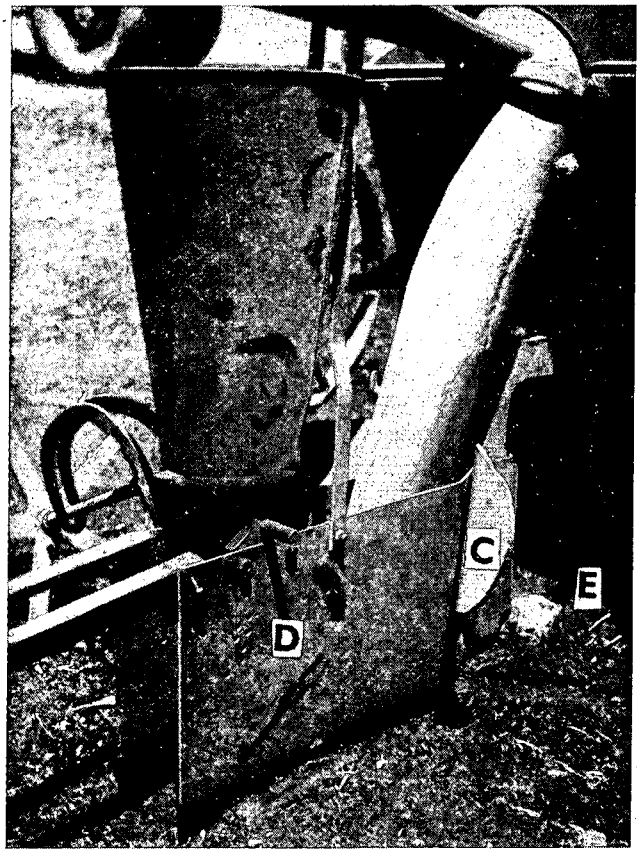

depth of sett placement below the soil surface was one inch less with this machine—method M—than with the ordinary type of furrowing plough (method N) used by so many growers. It is obvious from the diagram that the mouldboards of the ordinary furrower give width of furrow more than depth of planting. The larger subsoiler furrower (method D) produced a furrow of about the same width as the ordinary furrower, but after hand cleaning of the groove made by the subsoiler point resulted in the setts being placed three inches deeper below the soil surface than by the planting machine.

This experiment was planted in a field of excellent tilth such as is normally achieved at the Experimental Farm after a green manure crop and proper ploughing and discing. A 20-h.p. wheel tractor would doubtless provide sufficiently powerful traction for this light-draught planting machine (light by virtue of its build and absence of mouldboards) when working in such properly prepared soil. Although it is lightly constructed, no disadvantages from this have emerged after the planting of 30 acres with a D.2 caterpillar providing the traction.

(*e*) Examination revealed that whereas with treatments D and N, which were hand-planted and covered by hand-hoeing with two or three inches of

soil (as at B in illustration) the planting machine, even with covering tines removed, allowed four or five inches of soil to fall in on top of the setts. This resulted in slower emergence of shoots with planting method M than with D and N. Whether this is a disadvantage or not is a controversial point which is being investigated by careful, periodic recording of tillers for eventual correlation with yield.

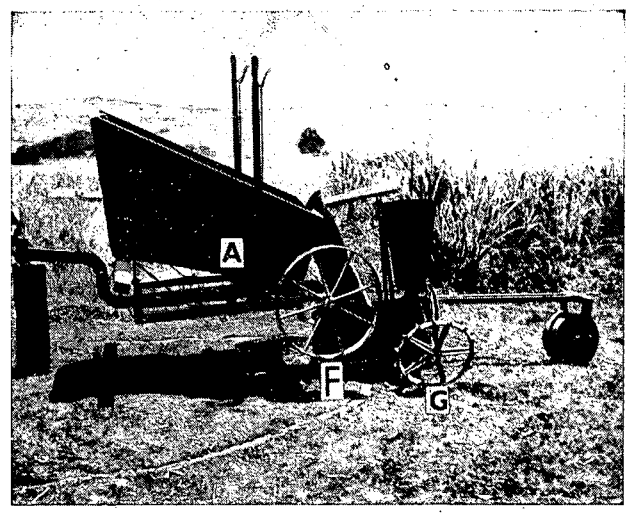
However, to prevent this heavy covering, small wings or mouldboards (C in close-up illustration) were fitted. These had the effect of producing a




Close-up view of planting machine. (C) Wing of small mouldboard attachment. (D) Furrower. (E) Plough point.

more pronounced furrow and providing a small furrow ridge on which the fertilizer distributor actuating wheel (G in general side view) runs so smoothly and certainly that a distinct improvement in continuity of the fertilizer ribbon resulted. The fertilizer delivery pipe, by the way, can be so adjusted as to place the fertilizer satisfactorily beneath the sett.

This furrow, though more pronounced than that produced without the aid of wings, may still be criticised by those who favour deep, wide furrows, on the ground that small furrows are ineffectual from the soil conservation point of view. This is a matter for wide comparative observation. A possible criticism of the wide, deep furrow is that with a greater mass of soil loosened and thrown up the danger from erosive elements such as wind and rain is greater;




General side view of planting machine. (A) Ratchets for depth control are just below this letter. (F) Wheel on each side of machine runs on top of ground while furrower sinks in. (G) Wheel which actuates fertilizer in distributor.

and where a heavy rain falls in ridges traversing a dip of land, flooded conditions may develop with an eventual bursting of furrows and serious erosion.

(*f*) Advantages of planting machines in general may be summarised as follows :—

(i) Saving in labour depends on conditions and organisation; these are early days to give definite figures, because we are still learning how best to operate the machines. But an overall reduction by two-thirds of units required for all planting operations (including fertilizing of plant cane) seems a reasonable estimate.

(ii) Planting can be speeded up and completed during the most favourable period, October—November.

(iii) As the furrow is opened and closed (after insertion of the sett) in one operation, moisture loss is reduced to a minimum. This, aided by the compression roller (see general side view illustration), assists rapid germination.

(*g*) Advantages of this particular mechanical planter are :—

(i) Very low capital cost.

(ii) Apparently sufficient strength for the smaller farm, despite light construction.

(iii) Very light draught, enabling the grower to use a light tractor and to economise in fuel consumption.

(iv) Because of the wider area of flat between the ridges (fig. 1, treatment N) the passage of implements in early cultivation is easier.

(v) Efficient fertilizer distributor mechanism.

(vi) Positive, trouble-free depth control (and balance adjustment on hillside) through levers operating ratchets (A in general side view).

**Conclusion.**

Thus, because these machines were carefully studied they have performed useful functions reasonably; good ploughing-out and good planting. Development and improvement must continue, and there will be constant need for experiment, modification and education in agro-mechanics, in order to achieve greater efficiency and lower costs. Meanwhile, there is much useful equipment available to the grower if he is prepared to learn to use it correctly.

**REFERENCE.**

[1] Lloyd, A. (1949) : S.A. Sugar Jnl. **33**, 81.

Experimental Farm,
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March, 1949.

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The PRESIDENT thought the particular planter described of great importance at the present time of rapid expansion of planting programmes. Planters who used a large machine might find that when the time came to do only sufficient planting to keep their output at a steady level, there would be too great a lock-up of capital in a big machine which must necessarily be idle for the greater part of the year.

Dr. DODDS pointed out that in Queensland most of the cane was being planted by machines in 1935. We had the opportunity of profiting by the experience of other countries, although as conditions were different in this country, we would still have to work out our own salvation in many respects.

Mr. PALAIRET believed that many growers had found weaknesses in the "Don" planter. He had altered his machine with satisfactory results. After breaking the beam supplied, he had replaced it by a properly shaped curved boom. He had narrowed the lister or furrower from six inches to two-and-a-half inches, and this took the biggest diameter cane with a reduction in power requirements as well as reducing the likelihood of striking stones. Furthermore, he had removed the troublesome winch gear with its wire, and had substituted a simple lever. One labourer could lift the mechanism out of the ground without wasting time with cranks and so on. He was fitting an automatic feeding device as well, which would discharge the setts horizontally rather than vertically.

Mr. MOBERLY asked the author what would happen at the end of a century if in ploughing one continually turned the furrow downhill. Would it not mean that eventually one would have denuded a measurable area of the hilltops of top soil and have deposited it in the valleys?

With regard to the planter he suggested the possibility of combining psychology with mechanics in the training of operators in regular rythmic feeding of the machine. It might be seriously considered an advantage to have some mechanism strike a note or give a regular beat relative to the speed of the machine. The native labourer had rythm deep in his nature and this regular beat might help him to adjust the rythm of his work to the speed of operations in the field.

Mr POYNTON asked the reason for a hillside plough having to make the first furrow before the reversible plough could be put in.

Mr. HALL replied that he had found it much easier when ploughing on the contour to cut this first furrow as the wheel marked H in the illustration then rode in this and kept the ploughing regular.

Mr. FIELDING congratulated Mr. Palairet as being one of the observant growers who had studied his planter and worked on its improvement. He had not himself thought of narrowing the furrower but considered it worth trying. As yet he had experienced no trouble with the beam, probably because no serious stones had been struck, but plough points had given trouble. He had not found any difficulty with the winch mechanism, but the agents might well explore the possibility of fitting some new system. The new "Don" Planter was very much strengthened.

As far as Mr. Moberly's remarks about the shifting of the soil downhill were concerned, that was a point normally made in agricultural text books as being a disadvantage with the type of plough discussed. However, a cane planter ploughed a field only at six- or eight-year intervals, so that it would be a long time before the movement would have any great effect on hillsides in Natal. Furthermore, it was extremely difficult, if not impossible, to turn furrows uphill, so the effect would be caused by the ordinary type of plough in any case.

He thought the idea about a rythmic beat, in connection with feeding setts in the planting machine, worth investigating.