

Development of Planting Hand Hoe for Sugarcane

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ABSTRACT

Two planting hand hoes (No. 1 and No. 2) for sugarcane were developed in the Agricultural Engineering Workshop of Sugarcane Research & Training Institute (SRTI), Ishurdi and investigated the performances in the field. The performances were compared with that of a conventional hand hoe. Both the planting hand hoes were proved effective in removing loose soil and breaking large clods in furrow and making small pits in furrow bottom. But using No. 2 planting hand hoe, 25% more seedlings over conventional hand hoe and 9% more seedlings over No. 1 hand hoe were planted. No. 2 planting hand hoe required 45 man-days for planting one hectare of land which was 21.05% less than that required by conventional hand hoe.

INTRODUCTION

In Bangladesh sugarcane plantation is done by putting sugarcane setts in furrows made by bullock drawn country plough or tractor drawn ridger. During planting sugarcane setts in furrows, loose soil or clods are taken out from furrows to put the setts in furrow bottom and then the setts are covered by soil. These two operations, removing loose soil from furrow bottom and covering setts by soil, are done manually using naked hand or some times using conventional hand hoe which is not effective and efficient.

On the other hand in spaced transplanting (STP) method pregerminated sugarcane settlings (polybag or soil bed) of usually 30–60 d old are transplanted in the main field in furrow making small pit in the furrow bottom. Since transplantation is done manually it is very labour intensive and about 74 labours (20% of total labours required from planting to harvest) are required for this operation alone (Ali *et al.* 1989). Presently traditional hand hoe (Figure 3) is used for making pits in the furrow. But these are inefficient for this purpose. For removing loose soil or making pits in the furrow bed there is no suitable implement or tool in Bangladesh. Hence, an attempt was made to develop a suitable planting hand hoe to make pits and handle loose soil in furrow effectively and efficiently so as to minimize labour cost in transplanting operation.

MATERIALS AND METHODS

Considering the nature of work, two planting hand hoe No. 1 (Figure 1) and No. 2 (Figure 2) of different specifications (Table 1) were fabricated in the workshop of

Agricultural Engineering Division of Sugarcane Research & Training Institute (SRTI). The detail design of No. 2 planting hand hoe is shown in the Figure 4. The materials used for fabrication of the planting hand hoes were M. S. Sheet (16 BWG), M. S. rod (10 mm & 12 mm dia), GI pipe (20 mm dia) and wood (30 mm dia). The materials required for No. 1 & No. 2 hand hoes are given in the Table 2 with their dimension and cost involved.

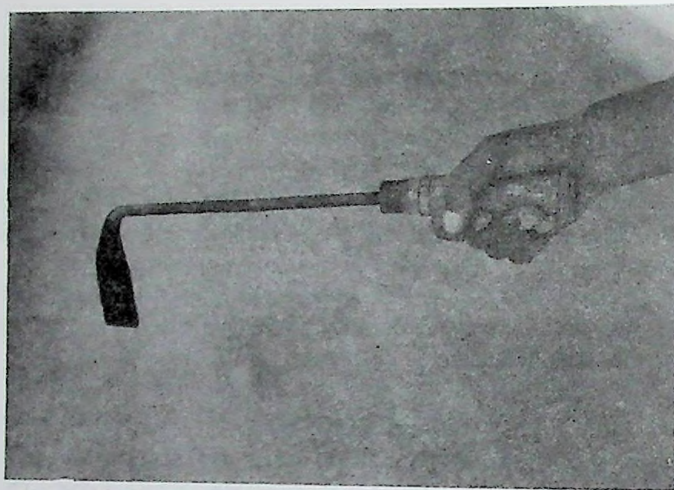


Figure 1. No. 1 sugarcane planting hand hoe.

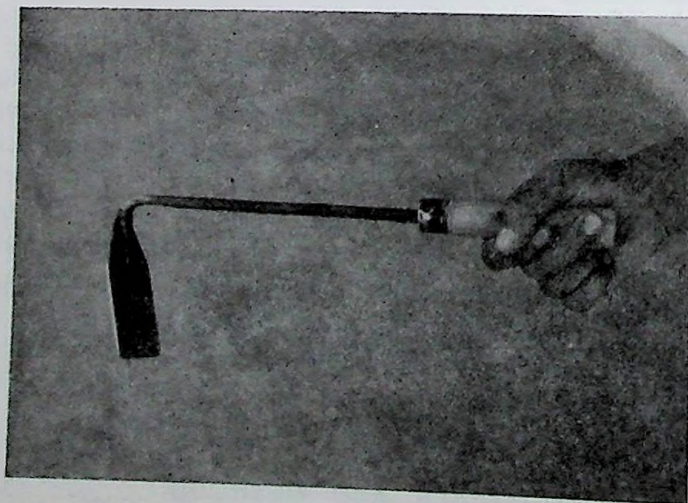


Figure 2. No. 2 sugarcane planting hand hoe.

Table 1. Specification of No. 1 & No. 2 planting hand hoes.

No. of hand hoe	Cutting blade (mm)		Link rod (mm)		Handle (mm)		Handle griper (mm)	
	Length	Width	Length	Dia	Length	Dia	Length	Dia
No. 1	100	50	250	10	120	25	15	15
No. 2	110	60	250	12	120	25	15	15

Table 2. Materials required and cost involvement for fabrication of developed planting hand hoe and conventional hand hoe.

Name of part	Dimension			Type of materials	Cost of No. 1 (Tk)	Cost of No. 2 (Tk)	Cost of conventional (Tk)
	Dia (mm)	Width (mm)	Length (mm)				
Cutting blade	—	60	110	M.S. Plate 16 BWG	4.00	5.00	
Link rod	12	—	280	M.S. rod	4.00	4.00	
Handle	30	—	120	Wood	2.00	2.00	
Handle griper	15	—	150	G.I. pipe	1.00	1.00	
Making charge	—	—	—	—	10.00	10.00	
Total	—	—	—	—	21.00	22.00	25.00

* Local market price in Pabna district, Bangladesh.

Besides two developed planting hand hoes one conventional hand hoe, No. 3 (Figure 3) was used in the present investigation. Three similar male labourers were selected from SRTI farm, and each of labourers was given with all three hand hoes (No. 1, No. 2 & No. 3) to plant polybag settlings in the field. The data against each hand hoe with each of the labourers worked for one hour with 3 replications were recorded and computed.

The planting rate, hectare capacity, ease of operation and fabrication cost of the developed planting hand hoes were determined and compared with that of conventional hand hoe. The operational easiness of the developed and conventional hand hoes were examined from the following five points.

1. To remove loose soil and cover setts,
2. To make pits and cover seedlings,
3. To break large clods in the furrow,
4. To remove poly bag from the plant,
5. Any damage to plant during planting.

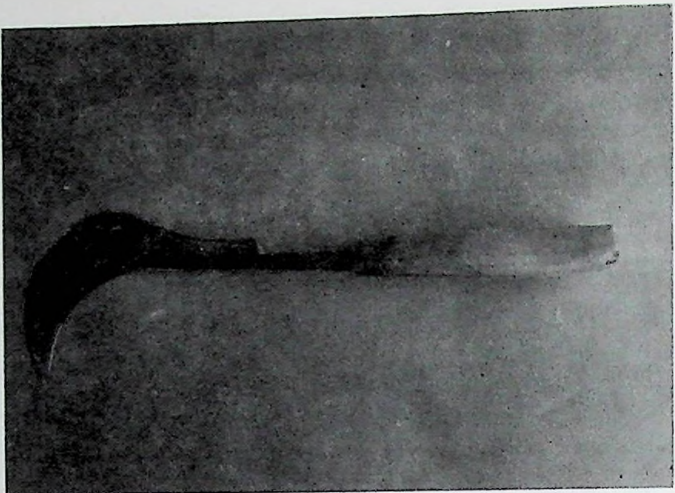


Figure 3. Conventional hand hoe presently used in transplanting of sugarcane seedlings.

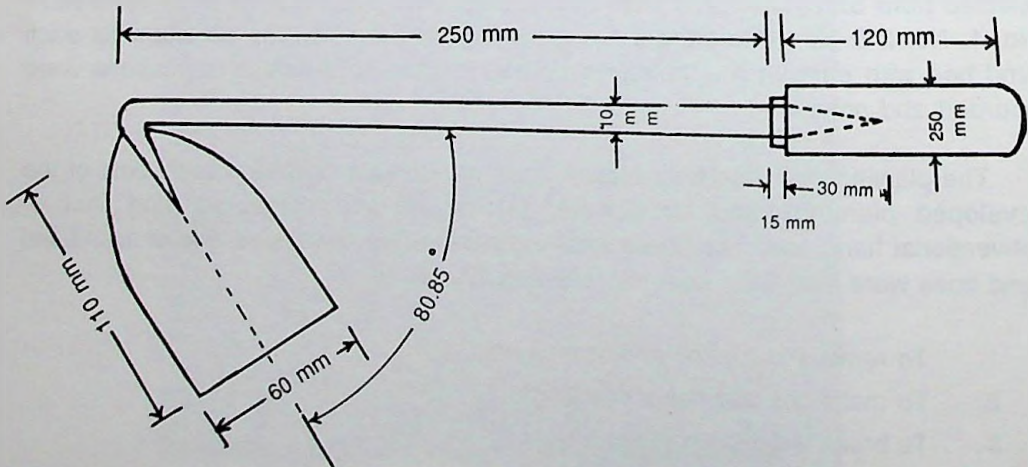


Figure 4. Illustration of developed sugarcane planting hand hoe.

RESULTS AND DISCUSSION

The results obtained from the investigation are presented in the Table 3.

Table 3. Time and man-days required for planting by developed and conventional planting hand hoes.

Hand hoe	Duration of work (hr)	Average No. of settling planted/h	Time & manday required/ha
No. 1	1	202	118 h (49 man-days)*
No. 2	1	220	108 h (45 man-days)*
Conventional	1	176	136 h (57 man-days)*

* Considering 50% time is spent in gathering and carrying plant in the field; working hour as 8 h and labour efficiency as 60%.

Rate of Planting : From Table 3 it is seen that the number of settlings planted per hour by No. 1, No. 2 and No. 3 hand hoes were 202, 220 & 176 settlings respectively. It is evident that by No. 2 hand hoe more settlings i. e. 25% higher over conventional hand hoe and 9% higher over No. 1 hand hoe were planted.

Hectare Capacity : Considering 23960 plants per hectare, total man-days required for planting one hectare land were 49 by No. 1 hand hoe, 45 by No. 2 hand hoe and 57 by No. 3 hand hoe. By No. 2 hand hoe less man-days were required per hectare i. e. 21.05% less man-days than the conventional hand hoe and 10.2% less man-days than the No. 1 hand hoe.

Ease of Operation : Planting hand hoe No. 1 and No. 2 were found more suitable for removing loose soil, making pits and transplanting in the furrow bed over the conventional hand hoe. But hand hoe No. 2 showed better performance over hand hoe No. 1 in making pits and covering them. Hand hoe No. 1 and No. 2 were found equally suitable for removing loose soil and breaking the large clods in the furrows over the conventional hand hoe. Planting hand hoe No. 1 & No. 2 were found equally suitable over conventional hand hoe for removing the polybags from the plants without disturbing the roots and Soil. No plant damage was found during transplanting with developed planting hand hoes and conventional hand hoe.

Fabrication cost : The fabrication cost of No. 1 and No. 2 planting hand hoes were estimated as Tk 26.00 and Tk 27.00 respectively, and that of the conventional hand hoe was Tk 25.00 to Tk 30.00 (local market price). In fact, if these are produced

commercially, the fabrication cost of the newly developed planting hand hoes and conventional hand hoe would be almost same. The developed planting hand hoe may be easily fabricated in the village black-smith shop like conventional hand hoe with less afford.

Planting hand hoe No. 2 (Figure 2) provided better performance over No. 1 (Figure 1) and conventional hand hoe (Figure 3). Planting hand hoe No. 2 may be recommended for the sugarcane growers to be used in transplanting sugarcane settlings in the field.

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