J. of Agril. Mech. & Mech. 1 (1), 1994 : 1-6

DEVELOPMENT OF A MULTICROP SEEDER

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ABSTRACT

The IJO-BARI seeder has been extensively tested and modified. The seeder could be used for wheat, jute, paddy, pulses and oil seeds. The orifice-agitator type metering device has been fitted with a modified frame suitable to operate manually. A seed covering device has also been incorporated to the facility. The performance of the improved seeder called IJO-BARI seeder (BAU model) was better than that of IJO-BARI seeder. The fabrication cost, weight and draft forces required that cost of sowing were found to be less than the IJO-BARI seeder.

Key words : Seed drill, Orifice, Agitator, Seed Rate, Cost

INTRODUCTION

Though the agricultural scientists have established the improved method of sowing of seed contribute more yield at lower cost, the farmers of Bangladesh are still using traditional method of broadcasting of paddy, wheat, jute, oil seeds and pulses. The line sowing by mechanical means offers uniform placement of seeds with proper spacing at correct depth. It also provides better germination, more seedling emergence and assists to achieve optimum plant population, thereby reducing costs of intercultural operation. On the other hand, over or under plant population, non-uniform growth have been observed in the fields with traditionally broadcasted seed.

Alam (1990) reported that a seeder of good performance can reduce jute seed requirement by about 50% and increase fibre yield by about 15%. Several researchers and organisations also developed multicrop seed-drills suitable for sowing paddy, wheat etc. However, various modification are needed to use the drill in field condition. The Farm Machinery and Post-harvest Process Engineering Division of Bangladesh Agricultural Research Institute (BARI) has developed a multi crop seeder (called IJO-BARI seeder) with the financial support of the International Jute Organisation (IJO). Howevar, further improvement of the IJO-BARI seeder is needed to make the device operational so that the potential users may use it.

Considering the above fact, a research project has been under taken with the full financial support of the International Jute Organisation to achieve the following objectives :

1. To collect different types of seeder for study the seed metering devices.

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2. To modify and fabricate different types of seed metering devices based on their performances.
3. To test the modified metering devices in laboratory and in field with different types of seeds.
4. To recommend the best metering device on the basis of cost and performance.
5. To develop a suitable multicrop seeder frame and to fix the metering device with it.

METHODOLOGY

Information about a dozen of seed drill/seed metering devices were collected from various organisations. The following criteria were considered in selecting the best seed metering device and seeder frame; a) simplicity of fabrication, b) field performance, c) portability, and d) cost of seeder and cost of sowing. Based on these criteria, the seed metering unit as well as seeder frame of IJO-BARI seeder was found satisfactory. Accordingly, 3 units of the metering device of IJO-BARI seeds were collected and tested in laboratory condition. Two sizes of seeds were used during laboratory test. Wheat (kanchan) seed as large size and jute (capsularis) seed as small were selected. Seed rate was calibrated at different speed of sowing, orifice size and orifice agitator clearance. Seed distribution in rows were also studied with two types of seeds at different orifice sizes and clearances. However, seed rate of mustard was also investigated. The necessary further improvement of the metering unit as well as the seeder were done.

Modification of IJO-BARI Seeder

Experience gathered during the field test of IJO-BARI seeder, the following modification were done (Fig. 1).

1. Scale down of seed hopper for sowing small plot of land with small amount of jute seed.
2. Incorporation of furrow closer and compactor.
3. Removal of rear wheel shaft to reduce weight as well as cost of seeder, and to adjust the furrow openers easily.
4. Power taken from front wheel through V-belt-pully system to get better performance of the seed drill.
5. Fitting of rear wheels with seeder frame through bush-pinion for simplicity of fabrication/mechanism.
6. Scale down of 4-row seeder to 3 row seeder for easy operation in sowing other crops.

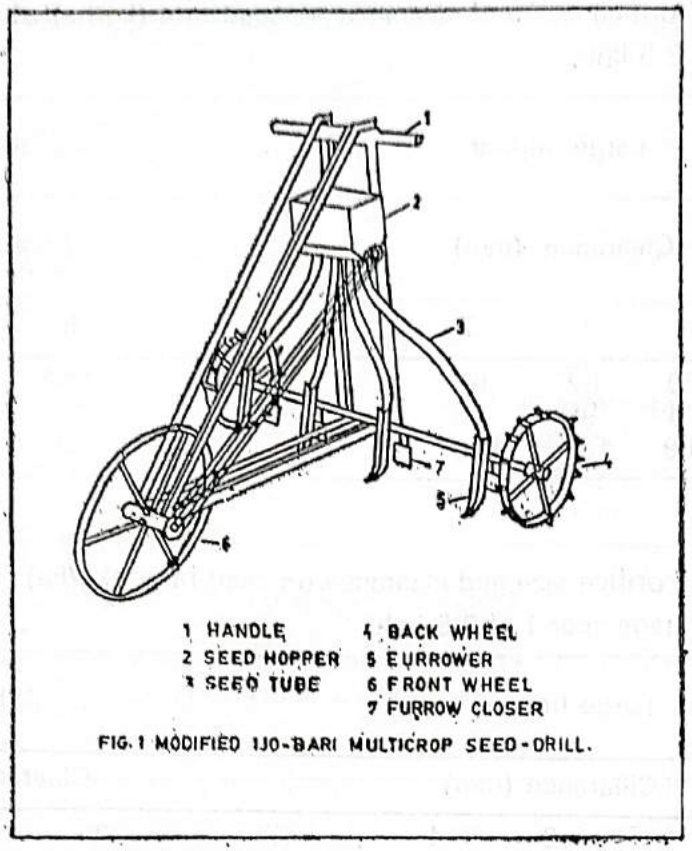

FIG. 1 MODIFIED IJO-BARI MULTICROP SEED-DRILL.

RESULTS AND DISCUSSION

The modified seeder has been tested extensively in the field with wheat, jute and mustard seed. It was observed that the different parameters of seed metering unit such as agitator clearance, orifice diameter as well as the speed of operation had a significant effect on seed rate. The effects of orifice size and agitator clearance on seed rate for wheat, jute and mustard are shown in Table 1 (a), Table 1 (b) and Table 1 (c), respectively. It reveals the fact that the seed rate increased with the increase of orifice diameter and decreased with the increase of agitator clearance.

The effects of orifice size and agitator clearance on population distribution for wheat (kanchan) and jute (capsularis) have been studied. About 97% wheat seed distribution occured for an orifice diameter of 10 mm and agitator clearance of 5 mm. The corresponding seed rate was obtained at 137 kg/ha at an average speed of 2.5 km/hr (Table 1 (a)). This indicates that the seeder should be operated at an average speed of 2.5 km/hr with an orifice diameter of 10 mm and agitator clearance of 5 mm. However, in case of jute, the seeder should be operated at an average speed of 2.5 km/hr with an orifice diameter of 3.5 mm and agitator clearance of 2 mm to obtain 92% of seed distri-

Table 1 (a) Effect of orifice size and clearance on seed rate (kg/ha) of wheat at an average speed of 2.5 kph,

Orifice dia (mm)	Large hopper			Small hopper		
	Clearance (mm)			Clearance (mm)		
	5	6	7	5	6	7
9.0	129	82	63	113	76	59
9.5	144	96	75	129	100	75
10.0	169	138	115	137	106	77

Table 1 (b) Effect of orifice size and clearance on seed rate (kg/ha) of jute (capsularis) at an average speed of 2.5 kph,

Orifice dia (mm)	Large hopper			Small hopper		
	Clearance (mm)			Clearance (mm)		
	2	3	4	2	3	4
3.0	—	—	—	2.5	—	—
3.5	6.81	6.20	4.36	6.16	4.5	3.9
4.0	14.31	13.63	8.87	12.00	10.00	5.5

Table 1 (c) Effect of orifice size and clearance on seed rate (kg/ha) of mustard seed at an average speed of 2.5 kph,

Orifice dia (mm)	Small hopper		
	Clearance (mm)		
	2	3	4
3.0	3.53	2.77	—
3.5	6.7	4.67	4.3
4.0	14.53	18.40	8.98

bution. The effects of orifice size and clarance on number of seed planted per meter have also been studied and the results of thc study are shown in Fig 2.

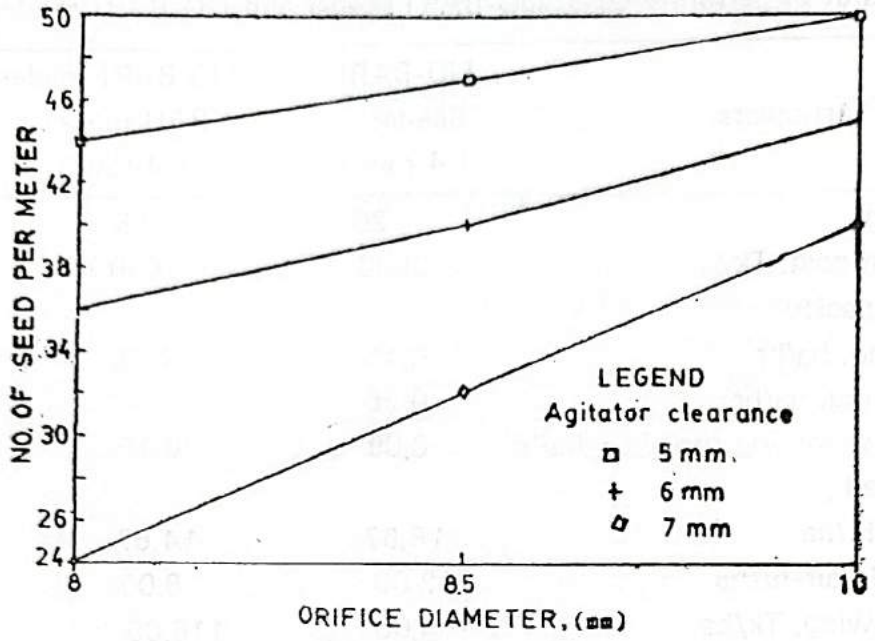

Fig. 2 (a) Effect of orifice size and aginist clearance on no. wheat seed per meter at a speed of 2,5 KPH

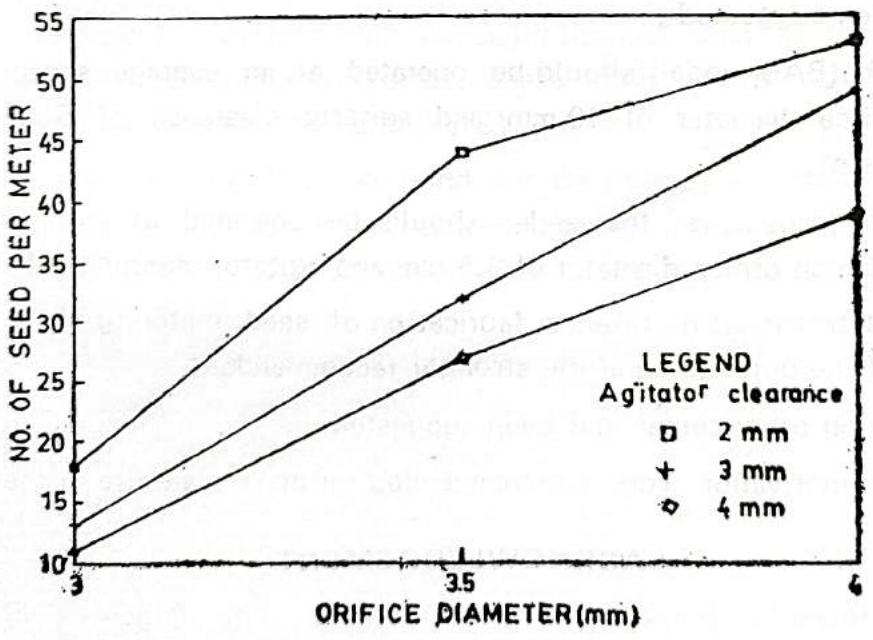

Fig. 2 (b) Effect of orifice size and agitator clearance on no. juut seed per meter at a speed of 2.5 KPH

The modified IJO-BARI seeder reduced the weight by about 25% as well as cost by about 36%. The modification increased the effective sowing capacity of the seeder to about 67%. Time required as well as cost of sowing has been reduced to about 25% (Table 2).

Table 2 Comparative performance of IJO-BARI seeder and IJO-BARI seeder (BAU model)

Sl. No.	Particulars	IJO-BARI Seeder (4 row)	IJO-BARI seeder (BAU model) (4 row)	Remarks
1.	Weight kg	20	15	25% less
2.	Febrication cost. Tk	2500	1600	36% less
3.	Sowing capacity :			
	a) Sowing. ha/hr	0,15	0.15	—
	b) Laddering. ha/hr	0,26	—	—
	c) Effective sowing capacity, ha/hr	0,09	0.15	67% high
4.	Time required ,			
	a) Man—hr/ha	18,67	14,67	21% less
	b) Animal pair-hr/ha	12 00	8,00	33% less
5.	Cost of sowing. Tk/ha	155,00	116.00	25% less

The IJO-BARI seeder (BAU model) has been intensively tested in the laboratory and in the field with jute, wheat and musard seed. The following conclusion and recommendation have been suggested :

1. The IJO-BARI (BAU model) should be operated at an average speed of 2,5 km/hr with an oriffce diameter of 10 mm and agitator clearance of 5 mm, in case of wheat (kanchan),
2. In case of jute (capsularis), the seeder should be operated at an average speed of 2,5 km/hr with an orifice diameter of 3.5 mm and agitator clearance of 2 mm.
3. Careful attentation must be taken in fabrication of seed metering unit. Very precise machining of the unit is, therefore, strongly recommended.
4. Further study on other cereals has been suggested.
5. Extension and motivation work is recommended for mass scale use in the field.

ACKNOWLEDGEMENT

The full financial support from International Jute Organisation is greatfully acknowleged,

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