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ANIMAL DRAWN JYOTI MULTICROP PLANTER



A SUCCESS STORY



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**ANIMAL DRAWN JYOTI MULTICROP
PLANTER**

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Introduction

In Maharashtra, besides cereal crops like wheat, several oilseed and pulse crops are also grown. There is no bullock operated seeder available which can sow all the crops satisfactorily. The traditional seed drills are only suitable for some of the crops like wheat and *jowar*. Thus it was felt that a bullock drawn multicrop planter cum fertilizer drill would be useful to the farmers. Since most of the farmers are small and marginal, a bullock drawn planter cum fertilizer drill was developed. This machine can be used to plant seeds of *jowar*, wheat, pigeon pea, redgram, maize, sunflower, safflower, soybean, groundnut and gram and can apply granular fertilizer in a band of 5 cm to the side and deeper than the seeds.

Traditional Sowing Practices

In traditional method, dibbling is done manually for crops like groundnut, maize, cotton etc. Other crops are drilled by using a two bowl seed drill or other traditional seed drills. The labour requirement for dibbling for some of the crops are shown in Table-1. As seen from table, the labour requirement is high. During sowing season there is a peak demand for labour and therefore, it becomes costlier. It is also difficult to complete the operation in time.

In traditional method by using seed drills, plant to plant distance is not maintained. Similarly costly fertilizer is not properly applied in required quantity. Due to variation in row to row and plant to plant spacing, various crops require different seed drills/planters which result in increased investment.

Table-1: Labour Requirement for Dibbling of some Crops in Maharashtra

Sl. No.	Crop	Row spacing x Plant spacing, cm	Labour requirement per hectare, man-h/ha
1.	Groundnut	30x15 30x10	35-40
2.	<i>Jowar</i>	45x15	25
3.	Maize	75x15	15
4.	Cotton	45x22.5 60x30	15-20

It was therefore, felt necessary to develop the planter which can be used for sowing of different crops with different crop geometry and also apply fertilizer with band placement .

Salient Features of the Machine Developed

The frame of the planter is made of G.I. pipe of 5 cm diameter. Holes are drilled to fix furrow openers to obtain row spacing of 22.5cm, 30cm, 37.5 and 45cm. Separate furrow openers are provided for seed and fertilizer. An angle iron frame is welded to the main frame for connecting beam to it.

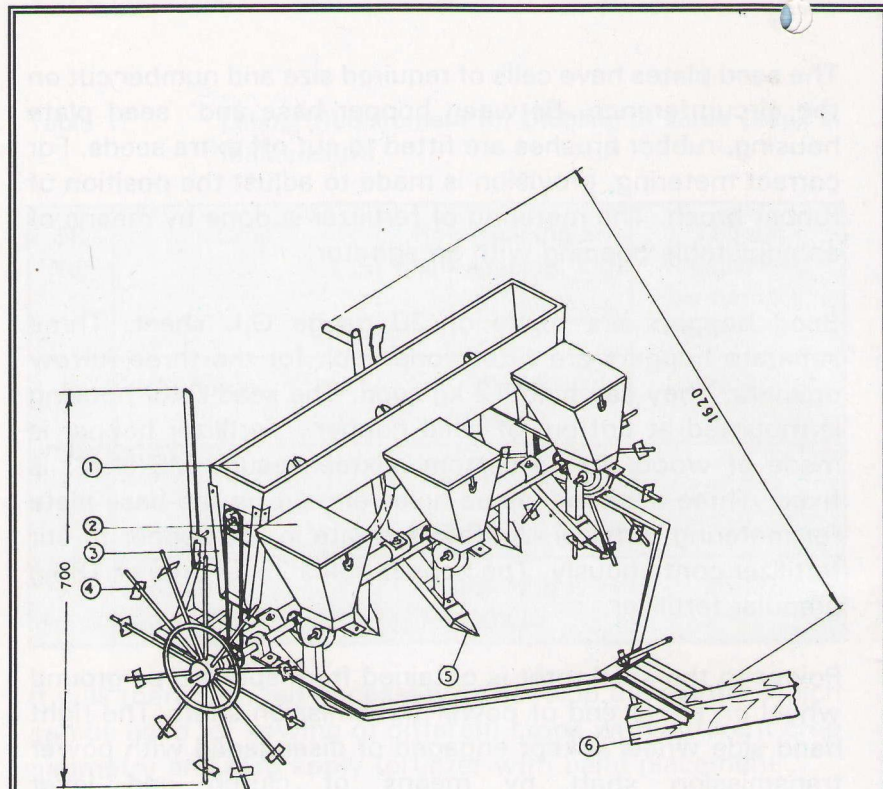
The metering system used in the planter consists of an aluminium seed plate 12 mm thick and 102 mm in diameter. For different seeds, different plates are used. The seed plates are fixed in the central housing made of aluminium casting.

The seed plates have cells of required size and number cut on the circumference. Between hopper base and seed plate housing, rubber brushes are fitted to cut off extra seeds. For correct metering, provision is made to adjust the position of rubber brush. The metering of fertilizer is done by means of an adjustable opening with an agitator.

Seed hoppers are made of 20 gauge G.I. sheet. Three separate hoppers are fitted, one each for the three furrow openers. They can hold 12 kg seed. The seed rotor housing is mounted at bottom of seed hopper. Fertilizer hopper is made of wood. At its bottom, sixteen gauge MS sheet is fixed. Three diamond shape holes are cut on the base plate for metering fertilizer. Agitators rotate in the hopper to stir fertilizer continuously. The hopper holds 25 kg urea or 18 kg granular fertilizer.

Power to the seed rotor is obtained from spoke type ground wheel on either end of power transmission shaft. The right hand side wheel is kept engaged or disengaged with power transmission shaft by means of clutch and lever arrangement. The left hand side wheel is kept free to rotate on the shaft. While turning at the end of the field, the power transmission shaft is disengaged by operating the clutch.

From the power transmission shaft, power is transferred to seed rotor by pair of gears. Three pairs of gears are used, one for each plate. Power is transmitted to the fertilizer metering mechanism through chain and sprocket drive. (Fig.1).



(All Dimensions are in mm)

- | | | | |
|-----|-------------------|-----|--------------|
| (1) | FERTILIZER HOPPER | (2) | SEED HOPPER |
| (3) | FRAME | (4) | GROUND WHEEL |
| (5) | FURROW OPENER | (6) | BEAM |

Fig.1: Schematic Diagram of Animal Drawn Jyoti Multicrop Planter

The depth of operation of the furrow openers can be adjusted between 3 to 10cm by adjusting the length of the tie-rod provided at junction of the frame and wooden beam.

Evolution of the Design

Work on development of the planter was started in 1976. The machine was designed developed and a prototype was fabricated. Laboratory trials were carried out to determine seed rate and seed damage. This was followed by field performance tests with different crops. A comparative evaluation of the planter with traditional method was carried out and cost economics of the planter assessed.

During 1977 extensive evaluation was carried out on farmer's fields. Based on feedback modifications were incorporated in the machine.

Performance of the Machine

The Jyoti planter was tested in laboratory for seed damage and also calibration of fertilizer application rate. The seed damage was within 1.2%.

The Jyoti Planter was tested extensively in the field with groundnut, sunflower, soybean, gram and pigeon-pea crops. Comparative performance of Jyoti planter with the local seed drill is shown in Tables 2 and 3. It is seen from the tables that in general the draft of Jyoti planter was higher than local seed drill. However field capacity and field efficiency were higher for Jyoti planter.

Table-2: Results of Performance Evaluation of Jyoti Multicrop Planter and Local Seed Drill for Groundnut, Sunflower and Soybean Crops

SI No.	Item	Crop					
		Groundnut		Sunflower		SoybeanJ	
		J	L	J	L	J	L
1.	Row spacing, cm	30	30	45	45	45	45
2.	Average depth of sowing, cm	5.70	5.20	5.80	5.00	5.40	5.40
3.	width of operation, cm	90	120	135	135	90	120
4.	Speed of operation, Km/h	2.85	2.80	2.60	2.60	2.80	2.85
5.	Draft, kgf	72	56	72	53	73	54
6.	Seed rate, kg/ha	93 to 99	90 to 104	7.7 to 9.7	8.80 to 13.20	70.8 to 73.7	76.5 to 78.5
7.	Recommended seed rate, kg/ha	100	100	10	10	70 to 80	70 to 80
8.	Field capacity, ha/day	1.51 to 1.55	1.44 to 1.50	2.03 to 2.18	1.75 to 1.78	1.46 to 1.62	1.38 to 1.60
9.	Field efficiency, %	73 to 76	56 to 69	72 to 75	62 to 63	72 to 77	53 to 67
10.	Plant population, No/m ²	33.4 to 34.5	28 to 36	7.8 to 10	9.5 to 10.0	61.8 to 79.4	53.2 to 56.2

J- Jyoti Multicrop planter
L- Local Seed Drill

Table-3: Results of Performance Evaluation of Jyoti Multicrop Planter and Local Seed Drill for Gram and Pigeonpea crop

Sl. No.	Variables	Gram		Pigeonpea	
		J	L	J	L
1.	Row spacing, cm	30	30	30	30
2.	Average depth of sowing, cm	6.2	5.7	5.20	4.50
3.	Width of operation, cm	90	120	90	90
4.	Speed of operation, km/h	2.57	2.90	2.76	2.90
5.	Draft, kgf	80.75	56.6	73.95	52.50
6.	Seed rate obtained, kg/ha	64.70	69.0	14.39	16.30
7.	Recommended seed rate, kg/ha	60-65	60-65	15	15
8.	Average field capacity, ha/day	1.62	1.60	1.93	1.52
9.	Field efficiency, %	82	54	86	49
10.	Average plant population No/m ²	34.75	39.70	2.20	2.30

J- Jyoti Multicrop Planter
L- Local seed drill

On an average, the cost of operation with Jyoti planter worked out to Rs 151.16/ha as compared to Rs 171.34/ha with local seed drill. Saving of time with the Jyoti planter over the local seed drill was 3.72 h/ha.

Status of Technology

The Jyoti planter has proved to be a very useful implement for small and marginal farmers. Due to improved seed distribution and placement of fertilizer at proper depth, the yields of crop increased. Data for increase of yield is shown in Table-4.

Table-4: Comparative Yield data for crops sown with Jyoti planter and local seed drill

Sl. No.	Crop	Average Yield, q/ha		Increase in yield, %
		Jyoti Planter	Local Seed drill	
1.	Groundnut	18.43	15.3	20.46
2.	Sunflower	9.43	7.5	25.73
3.	Soybean	19.62	16.38	19.84
4.	Gram	13.87	11.89	16.15
5.	Pigeonpea	19.75	17.60	12.21

Recently the centre has improved the planter with certain modifications. The number of furrow openers has been increased from 3 to 4 for planting of crop having row spacing of 22.5 and 30 cm. In addition to the bullock operated Jyoti multicrop planter, the planters operated by tractor and power tiller have also been developed and are in use.

5. Ground wheel drive

- (i) No. of wheel : Two
- (ii) Type of wheel : Spoke wheel
- (iii) Method of transmission : On axle of spoke wheel three pair of gears are provided to transmit power to seed metering mechanism. On same axle sprockets are mounted to transmit power to fertilizer metering roller through chain and sprocket drive.

6. Seed metering Mechanism

- (a) Type : Seed rotor
- (b) Method of changing seed rate : By changing seed rotor and adjusting rubber band position for seed cut off.
- (c) Provision for stopping seed flow : By operating discharge clutch fitted on main shaft.

7. Fertilizer metering machanism

- (a) Type : Adjustable opening with agitator
- (b) Type of agitator: Disc type

(c) Method of fertilizer rate control : By operating a lever to increase or reduce size of diamond shaped opening.

8. Furrow openers

- (a) Number of openers : Six
- (b) Row spacing : 22.5, 30, 37.5 and 45cm
- (c) Depth control : By changing angle of furrow opener, by changing fulcrum of beam.
- (d) Fertilizer placement: On side of seed and 5cm deeper than seed

9. For further details : Principle Investigator, Agril. Engg. Res. Centre, College of Agriculture (MPKV), Pune - 411 005 (Maharashtra)

Appendix-II

List of Manufacturers and their Volume of Production

Sl.No.	Name of Manufacturer	Quantity fabricated since 1992
1.	M/s R.R. Engineers, Vadgaun Sheri, Pune	8 Nos
2.	M/s Tejas Polymers and Engineers, Bhosari, Pune	8 Nos
3.	M/s Chintamani Enterprises, Aundh, Pune-7	25 Nos
Total		41 Nos

The MPKV Pune centre of AICRP on FIM has also fabricated and supplied 81 units of the Jyoti Multicrop Planter.