

TRACTOR DRAWN SEMI AUTOMATIC BELT TYPE POTATO PLANTER RIDGER



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Introduction

Potato is an important crop of eastern Uttar Pradesh besides, rice, wheat, sugarcane, oilseeds and pulses grown in 1.35 lakh hectare. Planting of potato is done manually which requires 216 man-days/ha (planting to irrigation). Thus, it was felt that tractor drawn potato planter ridger would be very useful to the farmers of this region. Since the machines were available in Punjab, Haryana and Western Uttar Pradesh, feasibility trials and front line demonstrations of potato planter ridger were conducted at farmer's fields.

Traditional method of planting

In traditional method of potato planting two practices are common (i) The tubers are placed manually on the surface of soil at the spacing of 150 to 300 mm by hand. Then earthing is done with the help of spade (Broad edge hand tool). The application of fertilizer is done by manual broadcasting. In this system total about 208 man-days/ha are required. In second method of planting the placement of tubers are done as in first case but the ridges are formed by *Kudali* (Narrow edge tool). Also the earthing is done after germination and one intercultural operation with the first irrigation.

Table 1 Labour requirement for planting and earthing and irrigation of potato by three methods in eastern Uttar Pradesh

Sl. No.	Method of planting	Row spacing x tuber spacing, cm	Labour requirement seeding to irrigation, man-h/ha	Labour requirement field preparation to harvest, m-h/ha
1	Manually by spade	50.0-70.0 15.0-30.0	1500	1668
2	Manually by Kudali	50.0-70.0 150.0-30.0	1668	2142
3	Tractor mounted two row semi-automatic belt type potato planter ridger	60.0 17.5	85	544

Salient features of machine

It consists of two sets of ridgers mounted on a mild steel frame, seed and fertilizer boxes, two sets of Nylon belts on fitted rubber cups, shovels, chain and sprockets, fertilizer placement device with metering system and cup-belt pulley system for seed metering (Fig. 1). Power to the metering device is obtained from the ground wheel. Two wooden platform each of size 920 x 250 mm are fixed on both sides of seed box for seating two persons to check the proper placement of tubers in the rows.



Fig. 1. Semi - automatic potato planter

Performance of machine

The equipment was tested in laboratory to check the tuber dropping pattern, filling of tubers in the cups, tuber flow from the hopper to the cups, slippage of belts. It was observed that tubers in 5% cups were missing. There was bridging of cut tubers at the opening of hopper. Two persons are employed to regulate the flow and fill the missing

cups. The calibration for fertilizer was also done before taking the machine to field.

The tractor mounted potato planter ridger was tested (Fig. 2) in the field condition and compared with the traditional methods of potato planting. The comparative performance of three methods of planting is shown in Table 2 and 3.



Fig. 2. Semi-automatic potato planter in operation

Table 2 Performance results of tractor mounted two-row potato planter ridger and local methods.

Sl. No.	Particulars	Tractor drawn potato planter ridger	Manual planting and earthing by spade	Manual planting and earthing twice by Kudali
1	Effective working wide, mm	1200	One row	One row
2	Traveling speed, kmph	2.15	--	--
3	Effective field capacity, ha/h	0.2	--	--

Sl. No.	Particulars	Tractor drawn potato planter ridger	Manual planting and earthing by spade	Manual planting and earthing twice by Kudali
4	Depth of planting from ridge top, mm	213	58	74
5	Distance between tubers, mm	175	203	203
6	Height of ridge, mm	312	197	213
7	Base width of ridge, mm	288	215	236
8	Depth of fertilizer placement, mm	54	Mixed in the soil	
9	Manpower required in planting only, man-h/ha	16	1248	1672
10	Total labour required upto irrigation, man-h/ha	85	1500	1740
11	Total manpower required from field preparation to harvesting, man-h/ha	544	1668	2142

Table 3: Comparative data of yield and yield attributes

Sl. No.	Particulars	Tractor drawn potato planter ridger	Manual planting and earthing by spade	Manual planting and earthing twice by Kudali
1	Germination count 25 DAS, Number of plants / meter length – row	11.5	9.5	9.5
2	Number of tuber roots / plant	6.8	5.1	5.8
3	Plant height at maturity, mm	450	435	485
4	Average tubers / plant	5.4	4.2	4.6
5	Average fresh weight of tuber (g/tuber)	85.7	74.5	78.6
6	Average weight of tubers / plant, g	350.8	261.6	222.9
7	Potato yield, q/ha	303.84	238.54	248.53
8	Percentage of green potato, %	2.204	9.417	6.052

Table 4: Comparison of three methods of planting at farmer's fields

Sl. No.	Particulars	Tractor drawn potato planter ridger	Manual planting and earthing by spade	Manual planting and earthing twice by Kudali
1	Labour saving in machine with respect to traditional, m-h/ha	1598	--	--
2	Percent labour saving with third, %	74.60	22.2	--
3	Cost of labour saving, Rs/ha	6061.0	1859.0	--
4	Increase in yield with spade, q/ha	65.30	--	9.99
5	Green potato, %	2.204	9.417	6.052
6	Total input, Rs/ha	33885.0	37947.0	40296.0
7	Total output, Rs/ha	60768.0	47708.0	49706.0
8	Net profit, Rs/ha	26883.0	9761.0	9410.0
9	Output to input ratio	1:1.8	1:1.26	1:1.23

Status of Technology

The tractor mounted two-row semi-automatic belt type potato planter ridger is replacing the manual planting. The data in Appendix III shows the status of area covered by this machine in the last six years (1998-2004) after the introduction of this machine in eastern Uttar Pradesh under AICRP on FIM project. The machine is now also used for sugarcane planting and vegetable crops planted on ridges and furrows during summer. The tractor owners are custom hiring the machines at Rs 2000/ha.

Annexure-I

Specification of Tractor mounted two-row semi-automatic belt type potato planter ridger

Sl. No.	Parameter	Specification
1	Power source	26.11 kW tractor
2	Overall dimensions:	
(a)	Length, mm	1450
(b)	Width, mm	1850
©	Height, mm	1370
(d)	Weight, kg	200
3	Furrow openers	Shovel type
4	Ridger maker:	
(a)	Type	Ridger
(b)	Size	
(i)	Length, mm	780.0
(ii)	Width of front, mm	60.0
(iii)	Width at rear, mm	500.0 (adjustable)
(iv)	Height, mm	360.0
5	Metering mechanism:	
(a)	Potato tuber	
(i)	Type	Conveyor belt with cups
(ii)	Size of conveyor belt pulley, mm	165
(iii)	Size of idler pulley, mm	55
(iv)	Spacing between two cups, mm	18
(b)	Fertilizer	
(i)	Type	Cell feed roller type
(ii)	Number of rollers / row	2
(iii)	Size and number of cells on each roller	100 mm with 10 cups
(iv)	Driver system	Chain and sprocket
(v)	Transmission ratio (drive wheel axle to metering shaft)	1:1.0 for seed 1:1.43 for fertilizer

Sl. No.	Parameter	Specification
6	Hopper:	
(a)	Potato box	
(i)	Capacity, kg	70.00
(ii)	Type of hopper	Rectangular with tapered base
(b)	Fertilizer box	
(i)	Capacity, kg	40.0
(ii)	Type of hopper	Trapezoidal
7	Ground drive wheel:	
(a)	Number	One
(b)	Type	Spiked type
©	Overall diameter, mm	480
(d)	Effective diameter, mm	445
8	Type of hitch	Three point linkage
9	Row to row spacing, mm	600
10	Number of row	Two
11	Tuber to tuber spacing at 5% slippage of drive wheel, mm	175

Present status of technology

Large scale popularization of equipment has been carried out by NDUAT centre in Faizabad, Gazipur, Barabanki, Jaunpur, Sultanpur, Mirzapur districts. The custom hiring of equipment was also promoted among progressive farmers and rural youth. In eastern Uttar Pradesh these machines are produced by 13 manufacturers in addition to direct supply from Punjab.

Annexure-II

List of Selected Manufacturers

1. M/s Ganga Engineering Works, Tanda, Ambedkar Nagar, Uttar Pradesh.
2. M/s Ram Kishor Lohar, Ramnagar, Hanswar, Ambedkar Nagar, Uttar Pradesh
3. M/s Govind Industries, Barabanki, Uttar Pradesh
4. M/s Sunlight, Barabanki, Uttar Pradesh
5. M/s Prasad Engineering, Akbarpur, Ambedkar Nagar, Uttar Pradesh
6. M/s Rama Kant Verma, Jalalpur, Ambedkar Nagar, Uttar Pradesh
7. M/s Ram Jeet Verma, Ram Nagar, Ambedkar Nagar, Uttar Pradesh
8. M/s Keshov Engineering Works, Rauja, Ghazipur, Uttar Pradesh
9. M/s Gupta Engineering Works, Rauja, Gazipur, Uttar Pradesh
10. M/s Anil Engineering Works, Jungipur, Ghazipur, Uttar Pradesh
11. M/s Vimal Engineering, Naka, Faizabad, Uttar Pradesh
12. M/s Punjab Engineers, Meerut, Uttar Pradesh
13. M/s Prem Engineering Works, Bhat Station, Ghazipur, Uttar Pradesh

Annexure-III

Area covered by Potato Planter Ridger during last six years.

Name of district	1988-99	1999-00	2000-01	2001-02	2002-03	2003-04
Faizabad	23.5	85.8	765.4	1452.0	2154.0	2397.0
Sultanpur	9.6	35.4	335.5	551.6	751.2	975.0
Jaunpur	8.4	48.6	553.7	851.4	1321.6	1562.0
Varanasi	--	15.7	392.8	628.3	778.5	972.0
Ballia	6.8	74.9	889.4	1231.8	1439.6	1668.0
Barabanki	43.2	225.7	1336.6	1874.5	2102.3	2388.0
Ghazipur	131.4	1651.5	6303.8	11154.6	13611.4	14492.0
Bahraich	5.4	23.3	65.6	252.4	326.6	488.0
Azamgarh	8.4	15.9	152.4	312.8	358.3	495.0
Ambedkar Nagar	45.3	448.4	3705.2	5524.6	6426.4	6930.0
Maharajganj	--	12.2	85.4	151.3	213.8	395.0
Mau	--	18.4	97.5	182.2	298.4	512.0
Gonda	--	6.5	5.0	195.5	288.0	492.0
Total	282.0	2662.3	14738.3	24363.0	30070.1	33766.0

Total area under potato in eastern Uttar Pradesh = 1.35 lakh ha

Percentage covered by Machine = 25%