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Power operated paddy seeder: A review

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Abstract

The power operated seeder is a device which is used for sowing the pre-germinated or wet or dry seeding. It is a substitute for other sowing methods in puddle conditions because of its main advantages of time saving, saving the transplanting cost, being easy to work, satisfying profit and a satisfactory yield in the paddy crop. Fabricating the paddy seeder unit can be useful in reducing the hard work of sowing in puddles or dragging of the manually drum seeder, besides other benefits of pre-germinated row sowing. Transplanting of rice seedlings is a tedious work for farmers, time-consuming and costly work needs to be done by direct seeding, decreasing the physical work of farmers require by more than 20 percent in terms of working hours. This seeder can be used save the seed; saving time and better yield production were comparable to the transplanted method and manual drum seeding, whereas they were better in comparison to the broadcasted method.

Keywords: Power operated paddy seeder, pre-germinated seed, metering device

Introduction

Paddy is a major and important cereal crop in India with a total approximately area of 44 Mha and a production of 111.76 million tons in the year 2021-22. (Source: Directorate of Economics and Statics Department of Agriculture & Farmers Welfare, Govt. of India). Directed seeded rice plays an important role in satisfying the rice grain requirement of the people of the world. For line sowing, many designs of manual paddy drum seeder and bullock drawn drum seeder have been fabricated, but pulling them on puddle fields involves drudgery problems and a very hard way. Direct dry sowing is an important method for the rain-fed plot area. In the monsoon season, friable field conditions, soil is available for limited. In rains continue, the soil becomes saturated. Under such conventional sowing implements, it becomes not easy to operate due to blocking and a chock-full of furrow opener. Therefore, to have a machine which can be used in the boths conditions dry and wet seeding. The developed the power operated paddy seeder unit could be useful in eliminating drudgery in transplanting or pulling of manual drum seeder besides other advantages of pre-germinated line seeding.

Power operated paddy seeder

Gupta and Herwanto (1992) ^[4] constructed a two-wheel tractor operator with direct paddy seeder for control of high pressure stress and hard work in the transplanting sowing method. The seeding machine has a working breadth of 200 cm row length. For each line, the seeding machine has the seed box, 6-fluted roller metering devices and a dual disc opener. There are two Wheels with lug moving the metering devices connected to the shaft. Every one fluted in a metering device could picked up 3 to 5 paddy seeds and drop the seed a furrow through seed guided at desired of 2 to 7 cm. The seed rate can range from about 15-20 kg ha^{-1} . The field capacity of the seeding machine was found about 0.5 ha h^{-1} at a forward speed of 0.81 msec $^{-1}$. The field efficiency of the machine was found to be 78%. Damage due to metering device was zero. It was not found for soak seed and 3% of germinated paddy seeds.

Sahoo *et al.* (1994) ^[8] constructed a six-row power tiller operated for pr-germinate rice seeders at Odisha University of Agriculture and Technology, Bhubaneswar. The actual field capacity of the seeding machine was found at 0.168 and 0.114 hah $^{-1}$ for 9.9 cm and 25.3 cm hard pan depth respectively. Inter row spacing was 20 cm and hill to hill spacing was 9.95 cm with 3-5 seeds per hill. The capacity of the hopper was 40 kg. The Size of a metering device of a cup type of disc, diameter 0.8 cm and 0.6 cm depth were design so as to pick up 3-5 seeds per hill. The operational cost of the seeding machine was found to be Rs. 173/ha. The seed rate can be adjusted to the range 75-85 kg ha^{-1} for different varieties of paddy. The specifications of the machine are presented in Table 1.

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Table 1: Specifications of the machine

Name of Machine	Six row power tiller operated pre-germinated rice seeder
Overall size, cm	140 x 88 x 61.7 cm
No. of row	Six
Row spacing, cm	20
Hill-hill space	9.95 cm with 3 to 5 seeds per hill
Working breadth, cm	100 cm
Total capacity of seed box	40 kg
Actual field capacity, hah ⁻¹	0.168
Field efficiency, percentage	77.18%

Jinfu and Ma (1997) [7] constructed a new machine fabricated on direct paddy seeder for wet seeding field conditions at the Department of Agricultural Engineering, Huazhong Agricultural University. This machine has many features; small power, steel slide board, wheel-driven feed roller, top delivery fluted feeder. The working breadth of the seeding machine was 300 cm and fourteen rows. The seed can be fed in a hopper quantity from 30-150 kg ha⁻¹. The damage rate due to metering devices was found at 0.045 percentages. The field capacity and fuel consumption of the machine was found at 0.67- 0.8 ha h⁻¹ and 1.2-1.54 lha⁻¹. As compared with the mechanical transplanting method, the manual broadcasting method and the manual transplanting method, the seeding machine was found to have increased higher yields grains by 12.72-14.48%, decreasing the production cost 1.0- 15%, saving increasing the manpower's 27.0-484.5 men days hha⁻¹ and increase the net income. The specifications of machine are shown in Table 2.

Table 2: Specifications of machine

Name of machine	New direct paddy seeder for wet field condition
Overall size, cm	230 x 299 x 135 cm
Structural weight, kg	180
Number of rows	14
Row spacing, cm	20
Row spacing of irrigation furrow, cm	30
Number of seed/meters	14
Working width, cm	300 cm
Total capacity of box, kg	104
Diameter of driving wheel, cm	70
Power, kW	3.3
Minimum turning radius, cm	303
Range of feed quantity, kgha ⁻¹	30-150
Field capacity, ha h ⁻¹	0.67-0.8
Fuel consumption, lha ⁻¹	1.2-1.5

Dhalin *et al.* (2005) [3] constructed a machine check valve mechanism system as the power tiller worked a cup feed seeding machine at the Department of Machinery Tamil Nadu Agricultural University. The field capacity of the seeding machine was found at 0.06 ha h⁻¹. The field efficiency of the seeding machine was found to be 70-75%.

Mathankar *et al.* (2006) [5] constructed a machine self-propelled rice ridge seeder for germinated seeding for wet field conditions at CIAE, ICAR Bhopal. The specifications of the Self propelled rice ridge seeder are given in Table 3. The yield of this seeding machine was 5.3 tha⁻¹ as compared to manual transplanted (5.7 t ha⁻¹) and manual drum seeder (5.1 t ha⁻¹). It was higher than manual broadcasting 4.4 t ha⁻¹. The net return was higher by Rs. 3,093 ha⁻¹ for crop sown by the rice ridge seeder in comparison to transplanting.

Table 3: Specifications of the machine

Name of machine	Self propelled rice ridge seeder
Overall size, cm	300 x 220 x 150
Power source, hp	4.5 diesel engine
Turning radius, cm	300
Field speed, km/h	1.8 and 2.2
Traction wheel	67 cm diameter, lug spacing 24 ⁰
Suitable seed	Pre-germinated seeds

Sharma and Reddy (2006) [9] constructed a self-propelled ten row paddy seeder at Central Institute of Agricultural Engineering Bhopal. The specifications of the machine are given in Table 4. The performance evaluation of the machine's actual field capacity was found to be 0.25 ha h⁻¹. The seeding machine has a working breadth of 200 cm row length. The metering device of the seeding machine was drum type. The inter-row spacing was 20 cm and hill to hill spacing was 10 cm with 4 to 6 seeds per hill. The total amount of seeds that could be capacity of seed hopper was 30 kg. The operational cost of the seeding machine was found to be Rs. 500 ha⁻¹.

Table 4: Specifications of the machine

Name of machine	Self propelled 10 row paddy seeder
Overall size, cm	285 x 250 x 130
Power source, kW	3.7 kW Diesel engine
Working breadth, cm	200
Row to row spacing, cm	20
No. of row	10
Capacity of each seed drum, kg	3 kg
Seed dropping mechanism	2 set holes provided on the periphery of drum
Seeder drum	Cylindrical shape

Thiyagarajan and tajuddin (2013) [10] constructed a machine of self-propelled wet land direct paddy seeder for sowing pre-germinate paddy seeds in puddle conditions at Agricultural Engineering College and Research Institute Kumulur, Tamilnadu. The performance evaluation of the seeding machine of actual field capacity was found 1.92 ha day⁻¹. There was available a metering device of drum type. The row to row spacing between the seed drums can be adjusted from 25 cm to 30 cm. The operational cost of the seeding machine was found to be Rs. 635 ha⁻¹.

Bangale *et al.* (2019) [1] constructed a machine self propelled direct seeding rice planter at SV College of Agricultural Engineering & Technology, Faculty of Agricultural Engineering, IGKV Raipur, C.G. collaborating with CRIDA Hyderabad. The main components of the machine are an inclined plate metering mechanism for seed, cup type metering for fertilizer, ground wheel, inverted T type furrow openers, 5 horse power engine as a prime mover adjustable handle levers and a rigid main supporting frame to attach all the parts and wheels. The specifications of the machine are given in Table 5. The performance evaluation of the machine in the field condition of depth of placement was found 2.5-4.0 cm. The average number of seeds per hill was found: 2-3 seeds. The actual field capacity of the paddy seeder was found at 0.115hah⁻¹. The field efficiency of the paddy seeder was found to be 82.5%.

Table 5: Specifications of machine

Name of Machine	Self propel direct seeded rice planter
Overall size, cm	121 x 105.5 x 68.1 cm
Total weight, kg	110
No. of rows	03
Row to row spacing, cm	20 (adjustable 20-25 cm for 3 row)
Hill to hill spacing, cm	15 cm
Power, hp	5

Dhruw *et al.* (2020) ^[2] constructed a power operated paddy seeding machine at SV, College of Agricultural Engineering and Technology, Faculty of Agricultural Engineering, IGKV Raipur (CG). The main components of the machines were a 5 hp engine, seed hopper, cup type metering device, lugged wheel, float, gear box, universal coupling from the main shaft to the planting gear box mounted in the float etc. A Funnel and seed disc with cup feed was placed inside the seed box for effective dropping of seeds from the seed box to the field. The spacing between the cup type metering devices was 20 cm. The brief specifications of the machine are shown in Table 6. The actual field capacity of the seeding machine was found at 0.23-0.25 hah⁻¹. The field efficiency of the seeding machine in dry condition was 77.67% and in wet condition it is 71.88%.

Table 6: Specifications of the machine

Name of machine	Self propelled paddy seeding machine
Power source	2.9 kW (4 hp)
Overall size, cm	253 x 181 x 99.9 cm
Rated, rpm	2600
Number of rows	08
Row to row spacing, cm	20
Seed metering	Cup feed type
Float for wet field	Stainless steel
Furrow opener for dry field	Hoe type

Conclusion

All the above review papers are concern about the paddy seeder including the power tiller operated, tractor operated, two-wheel tractor operated and self-operated paddy seeder machine. A self-propelled or power operator or other power operated paddy seeder can be an appropriate use in sowing of the puddle condition. These types of machines can eliminate the reduction of hard work in a manual transplanting sowing method. It is in conclusion that better results of power operated paddy seeder as compared to both broadcasted rice and transplanted rice.

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