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RESEARCH ARTICLE

DEVELOPMENT OF A POWER WEEDER FOR LINE TRANSPLANTED AND LINE SOWN PADDY

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ABSTRACT

Now a days Govt. is giving more emphasize on line sowing. Govt. of Odisha provide 75% subsidy on seed drills and rice transplanters to increase production and productivity. But weeding is a major problem in line sown paddy crop. There are many types of mechanical weeders available for vegetable crops with wide working width. These are not suitable for line sown paddy field. Hence it is highly essential to develop a suitable power weeder for DSR condition. Though SRI power weeders are available for line transplanted paddy, these are not suitable for upland line sown crop. There is no such power weeder available which can work in both wet land and dry land condition. To eradicate these problems one power weeder was developed. The petrol engine of 1.33 kW with speed reduction of 34:1 was taken for fabrication of the weeder. Hatched type of blade was developed to see the performance. These set of blade was fitted with the weeder and evaluated in line sown paddy in dry land as well as in transplanted paddy in wet land by attaching a suitable float and compared with the conventional weeding method. The highest weeding efficiency of hatched type blade was found to be 84.30% in wet land and 82.280 % in dry land respectively. The performance index of hatched shape blade was observed to be 186.49 wet land and 190.81 in dry land at 14.5% moisture content. At the same moisture content i.e.14.5%, plant damage of 4.0% was observed with hatchet type blade. The increase in heart rate (ΔHR) of 18.667 bpm was achieved in hatchet type blade at the same speed. It is concluded that the developed weeder with hatched type blade is suitable for weeding in both wetland as well as dry land line sown paddy field. The cost of operation of the developed weeder was found to be Rs 177.10/h and Rs 4997/ha.

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INTRODUCTION

The weeds are unessential any plants which grows where it is unwanted. The weed can be thought of any plant growing in the wrong place at the wrong time and doing more harm than good (Parish, 1990). It is a plant that competes with crops for water, nutrients and light. This can reduce crops production. Some weeds have beneficial uses but not usually when they are growing among crops. Weeds decrease the value of land, particularly perennial weeds which tend to accumulate on long fallows, increase cost of cleaning and drying crops (where drying is necessary). Weed, waste excessive proportions of farmers time, thereby acting as a brake on development (Lavabre, 1991)A comparative study has been made to control the weeds in the crop by chemical methods in savanna zone west arfrica.it was reported that the use of herbicides was not profitable in upland rice and only slightly profitable in rain fed lowland rice.

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The complete hand pulling of row weeds in upland rice required 89d/hr. and are not profitable (Remington and Posner,1994). Manual weeding requires huge labour force and accounts for about 25 per cent of the total labour requirement which is usually 900 to 1200 man-hours/ hectare (Nag and Dutt, 1979). In India, this operation is mostly performed manually with cono weeder, drum weeder and mandwa weeder that require high labour input, very tedious and it is a time-consuming process. Hence the present study has been undertaken to develop a power weeder that can be used both in DSR in dry land as well as in transplanted rice in wet land condition.

MATERIALS AND METHODS

Experimental Site

The field experiments were conducted in the Agronomy main research farm, OUAT, Bhubaneswar in the district of Khurda, Orissa. The farm is located at 27 ^{0} 17′ N latitude and 85 ^{0} 45′ E longitude at an elevation of 35.0 m above mean sea level.

Selection of prime mover

1.33 kW petrol engine with 6500 rated rpm having a gear reduction of 34:1 (190 rotor shaft rpm) was selected for the weeder.

Table 1. Specifications of Power weeder

Sl No	Specifications	Values
1.	Type of machine	Engine operated
2.	Dimensions in cm	
	Length	141.00
	Width	58.00
	Height	21.00
3.	Power	1.78 hp 2-stroke petrol engine (Maruyama, Japan),6500 rpm
4.	Weight, kg	20.4
5.	Type of float	PVC float (Sharp Garuda make)
6.	Number of rows	2
7.	Row spacing, cm	20
8.	Handle	
9.	Material and size	MS pipe, 25 mm dia.
10.	Position	Front of weeder
11.	Spacing between two handle, mm	580

Design of Blades

The interaction between soil and machines takes placeat the blades thus by improving their geometry the power required and the size of machine will reduce.

- Blades are attached to a flange mounted on a rotating shaft usually by nuts & bolts.
- Hatchet- Shaped Blades are fabricated.

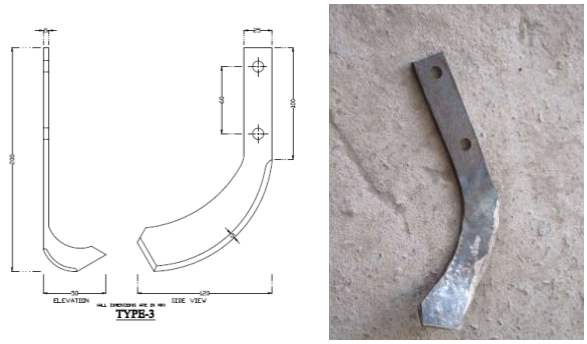

Fig. 1. Hatchet type blade

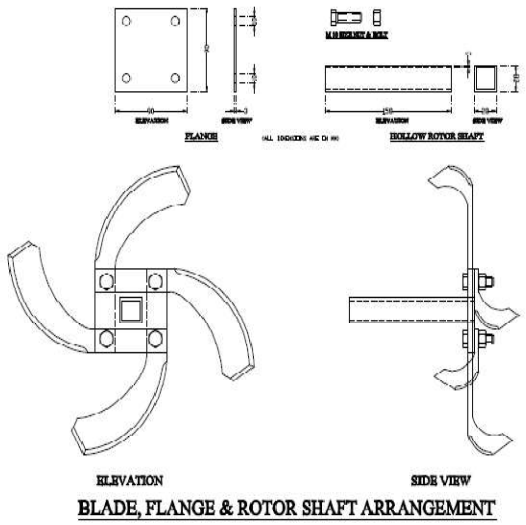

Fig. 2. Rotor blade

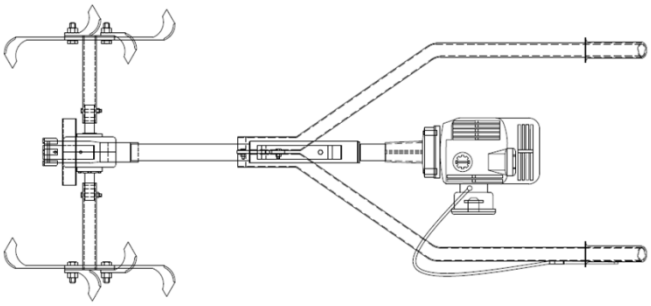

Fig. 3. Top view of the developed power weeder

Performance Evaluation

Prototype of power weeder was tested under: Both the field conditions i.e. dry land as well as wet land in sandy loam soil for its performance evaluation with different combinations of soil-machine parameters. A field was divided into three equal block sizes according to randomized complete block design. The power weeder was tested for 2 h in the field at each level of soil moisture content. The following performance indicators were calculated using the observed data in the field:

Weeding efficiency

Weeding efficiency is a ratio of the number of weeds removed by a weeder and the number present in unit area and is expressed as:

Weeding efficiency, (%)

$$e = \frac{W1-W2}{W1} \times 100 \ldots (3)$$

Where,
W1 = Number of weeds before weeding, and
W2 = Number of weeds after weeding.

Plant damage

The percentage of plant damage that were caused due to operation of different weeders was determined by counting the no. of uprooted or damaged plants in a row and by using the relation

$$D = \frac{Q1-Q2}{Q1} X100. \ldots\ldots (4)$$

Where,
Q1=no of plants in 10 m row length before weeding
Q2=no of plants in 10 m row length after weeding

Field capacity

Field capacity (ha/h) was computed by recording the area weeded during each trial run in a given time interval. With the help of stopwatch, time was recorded for respective trial run along with area covered.

$$TFC = \frac{\text{Width(W) mX Speed(V)km/h}}{10} \text{ (ha/h)} \ldots\ldots (5)$$

Performance index

The performance index of the weeder can be calculated by multiplying field capacity, weeding efficiency, plant damage

percentage and dividing the result with the power input of the weeder.

$$P.I. = \frac{a \times q \times e}{P} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where,

PI = Performance Index
a = Field Capacity of weeder, ha/h
e = Weeding efficiency, per cent
q= Plant damage factor = (100-% plant damage)
P = Power input, hp

RESULTS AND DISCUSSION

Performance of weeder in line transplanted paddy field: The developed weeder was evaluated at central farm OUAT during Rabi 2015.Hatched blade was fitted with the weeder and was operated in the field .The weeder was operated at three levels of speed. i.e. 1.42,1.62,1.78km/h for each set of blade. The parameters like actual field capacity, speed of operation, weeding index, plant damage, depth of operation, and change in heart rate of the operator were recorded and performance index were determined for three levels of working speed.

Performance of Hatched Type Blade: Performance of the weeder with hatched types of blade was evaluated. Weeding efficiency was recorded for hatchet-type blade (84.30%), and the weeding efficiency of hatchet type blade may be due to the higher soil mass handling as well as cutting and burying of weeds in soil. Plant damage was 1.80 % hatchet-type weeder. The minimum plant damage of hatchet type blade may be due to stable operation of the weeder because of its higher depth of cut and handling of more soil mass while the maximum plant damage. The weeder with hatched type of blade was operated by a healthy person aged about 28 years without any prehistory of diseases. The ΔHR in case of hatchet type blade is minimum may be due to its lower vibration. The performance index of hatched shape weeder was observed to be 186.49 in wet land.

Performance of weeder in line sown paddy field (Dry land): The performance of the weeder was studied at three levels of moisture content ranging from 9.8 to 14.5%. Speed of the operation was kept constant (1.62km/h) during the operation. In general the percentage of weeding index increases with increase in moisture content (14.5%).The weeding index was achieved 82.280% for hatchet type blade. The weeding index of hatchet type blade may be due to higher soil mass handling as well as cutting and burying of weeds in soil. The percent of plant damage decreases with increase in moisture content for hatched type of blade and the same moisture content (highest moisture content i.e.14.5%,) the plant damage of 4.0% was observed with hatchet type blade. The minimum plant damage of hatchet type blade may be due to stable operation of the weeder because of its higher depth of cut and handling of more soil mass. The increase in heart rate (ΔHR) 5.000 bpm was achieved in hatchet type blade. The lowest ΔHR in case of hatchet type blade may be due to its lower vibration. Generally the percentage of ΔHR decreases with increase in moisture content for hatchettypes of blade. This is may be due to that the blades penetrate in to the soft soil more easily that give less vibration resulting more comfort to the worker.The performance index (190.81) was achieved in hatchet type blade. The field capacity (0.043 ha/h) was achieved in hatched type blade.

Conclusion

A manually operated multipurpose power weeder operated by a1.33 kW engine and weighing 20.4 kg was designed and developed for weeding with minimum plant damage and power requirement for both wet land and dry land paddy filed. Hatchet-type of blades (length, cutting width and thickness of 200 mm, 50 mm and 5 mm, respectively) operated by rotor shaft was found to be satisfactory having weeding efficiency (83.40%) for wet land and 82.280% for dry land with minimal plant damage (4.03%) for wet land and 4% for dry land. Machine performance in sandy loam soil indicated that with soil moisture increasing from 9.8 to 14.5 % (w.b), weeding efficiency increased from 78.17 to 82.28 per cent for hatchet type blade. The performance index of hatched shape was observed to be 186.49in wet land and 190.81 in dry land at 14.5% moisture content respectively. The increase in heart rate (ΔHR) of 18.667 bpm was achieved in hatchet type blade. It is concluded that the developed weeder with hatchet type blade is suitable for weeding in both wetland as well as dry land line sown paddy field. The cost of operation of the developed weeder was found to be Rs 177.10/h and Rs 4997/ha.

REFERENCES

Nag P.K. and Dutt, P. 1979. Effective of some simple Agricultural weeders with reference to physiological responses, *Journal of Human Ergonomics*; 13-2.

Olaoye, J.O. and T.A. Adekanye. "Development and Evaluation of a rotary power weeder." *Tillage for agricultural productivity and environmental sustainability – conference, held in Ilorin, Nigeria,* 21 – 23 February 2011, PP. 129-141.

Olawale, J.O. and Guntunde, P.O. 2006. Design of power weeder. Conference on International Agricultural Research and Development "Tropentag 2006" University of Bonn Germany.

Rangasamy KM, Balasubramanium and Swaminathan KR.1993. Evaluation of power weeder performance. *Agricultural Mechanisation in Asia*, Africa and Latin America, Vol(24) No(4): 16-18.

Tajuddin A, Karunanidhi R and Swaminathan KR.1991. Design development and testing of an engine operated blade harrow for weeding. *Indian Journal of Agricultural Engineering*. 1(2) 137-140.

Tajuddin A. 2006. Design, Development and Testing of Engine Operated Weeder. *Agricultural Engineering Today*.30 (5) 25-29.

Tewari VK, Datta RK and Murthy AS.1991. Evaluation of three manually operated weeding devices. *Applied Ergonomics*. 22(2) 3-6.

Tewari VK, Datta RK and Murthy AS.1993. Field performance of weeding blades of a manually operated Push-Pull weeder. *Journal of Agricultural Engineering Research*, 55 2.

Umar B. 2003. Comparison of manual and manual-cum-mechanical energy uses in groundnut production in a semi-arid environment". *Agricultural Engineering International: the CIGR Journal of Scientific Research and Development* Manuscript EE 03 003 May 2003 1-11.

Varma MR, Tiwari RC and Agrawal A. 1991. Adoption and field evaluation of improved equipment to power tiller for sugarcane cultivation. *Journal of Agricultural Engineering* 48(9) 154-157.

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