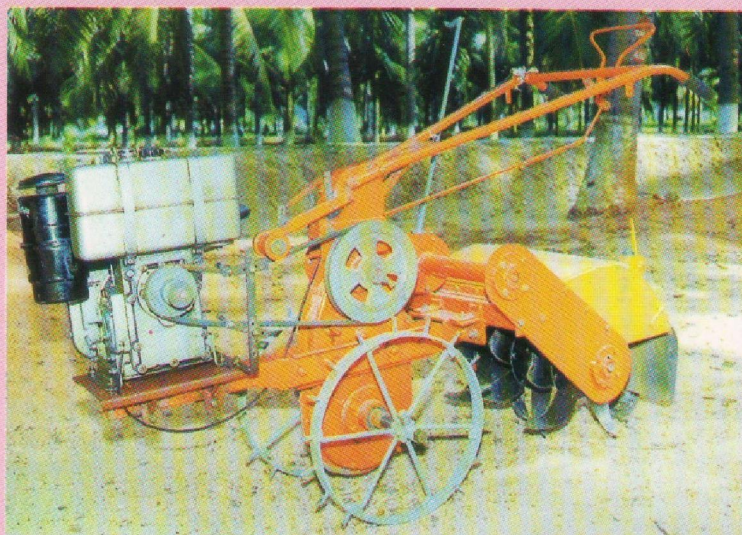


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ROTARY POWER WEEDER

A SUCCESS STORY



**ALL INDIA COORDINATED RESEARCH PROJECT ON
FARM IMPLEMENTS AND MACHINERY**
CENTRAL INSTITUTE OF AGRICULTURAL ENGINEERING
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ROTARY POWER WEEDER

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Introduction

Weeds cause major problems in agriculture reducing the yield and quality of crops by competing with them for water, nutrients and sunlight. Extensive research into crop yield losses indicate that upto 10 per cent loss of agricultural produce can be attributed to weeds. One of the pernicious habits of weeds is their vigorous growth and under certain conditions loss in yield of crops may range upto 75 per cent.

Weed management has become an integral part of agriculture. Keeping the weeds under control is very important both from economy as well as ecological points of view. Weed control is achieved by creating disturbance either physical, ecological or biological to their growth. All these forms of disturbances result in survival and selection of various processes in the crop system.

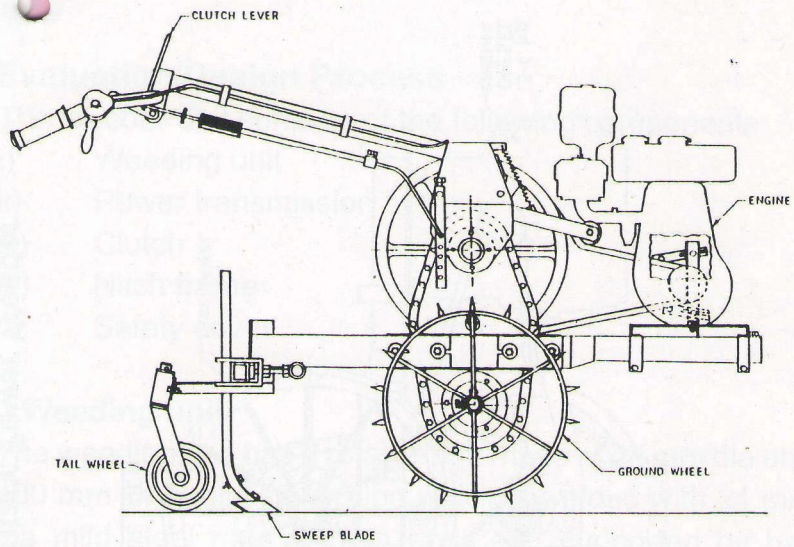
Traditional Practices and Necessity for Development

Hand/manual weeding is the most common practice adopted by the farmers. Manually operated weeders are available, but their capacity is only 400-800 m² per day. Therefore, timely weeding is not possible in large farms by using these weeders. In order to complete the weeding operation within the available period of time, farmers have to engage more labour and hence it leads to labour scarcity and increased cost. A power weeder has been developed

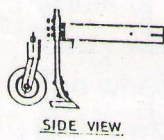
and evaluated to have the benefits of timely weeding, minimizing labour and removal of drudgery.

Salient Features of Machine

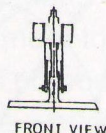
The equipment consists of a 4 kW 34 kg light weight diesel engine mounted on the frame. Engine power is transmitted to the gear box and then to the ground wheels and rotary weeder as shown in Figs.1 and 2. There is provision to adjust the wheel settings according to the row to row spacing of the crop. A clutch with lever from the operators' handle actuates the simple idler pulley to engage or disengage the ground wheels. Another clutch provided between the gear box and the rotary weeder permits engaging or disengaging power to the rotary weeder. The rotary weeder consists of three rows of discs mounted with 6 number of curved blades in opposite directions alternatively in each disc. These rotating blades enable cutting the weeds and integrating it into the soil. The width of coverage of the rotary weeder is 350 mm and the depth of operation can be adjusted. In addition to the rotary weeder, sweep type blades, junior hoe or cultivator and ridger can be fitted to the unit in place of rotary weeder easily (Figs.1 & 2). The cost of the weeder with attachments is Rs. 50,000 /-. The cost of operation is Rs. 770/ha with rotating blades and varies with different attachments.



POWER WEEDER



SIDE VIEW



FRONT VIEW

SWEEP BLADE

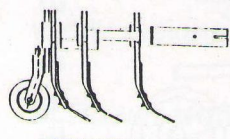


SIDE VIEW

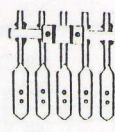


FRONT VIEW

BOSE PLOUGH

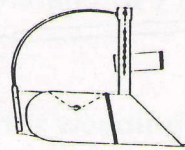


SIDE VIEW



FRONT VIEW

CULTIVATOR



SIDE VIEW



FRONT VIEW

RIDGER

Fig. 1: Schematic drawings of Power Weeder with attachment

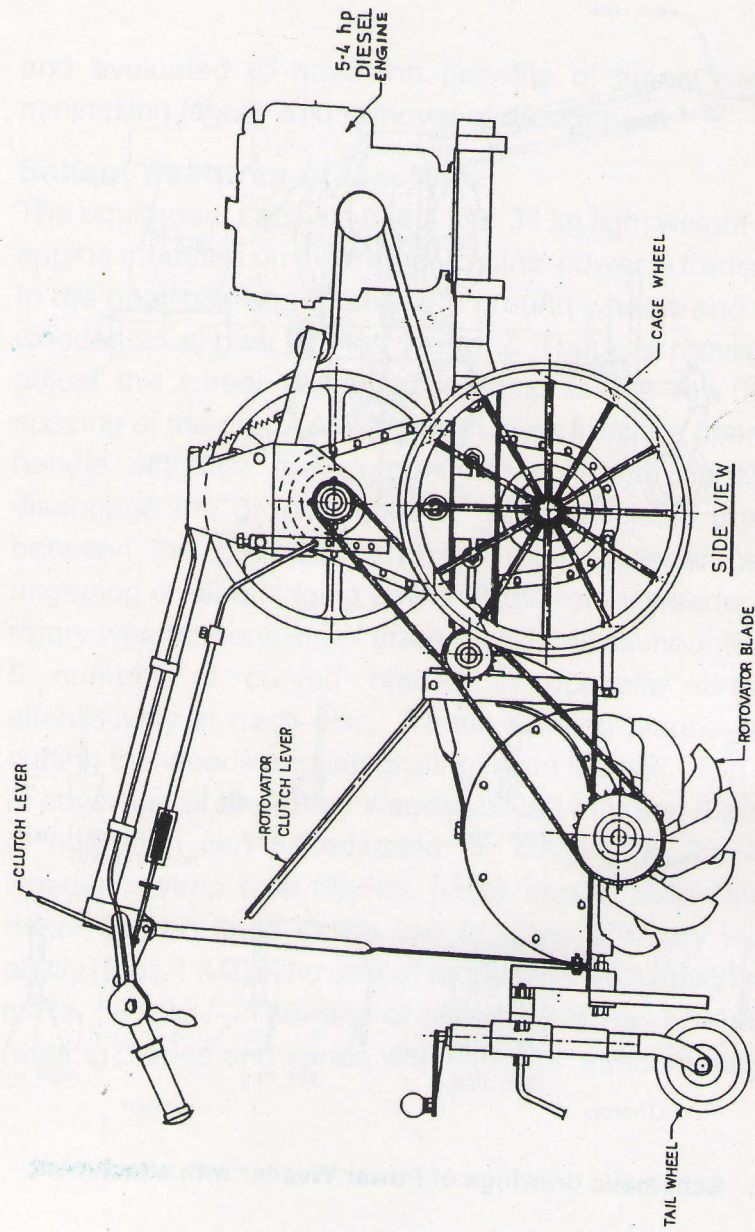


Fig. 2: Schematic drawing of Rotary Power Weeder

Evaluation/Design Process

The weeder unit consists of the following components:

- i) Weeding unit
- ii) Power transmission system
- iii) Clutch
- iv) Hitch frame
- v) Safety cover

i) Weeding unit

The weeding unit has a rotary shaft made of 48 mm dia and 400 mm long mild steel pipe which is welded with 24 mm dia mild steel rods at both ends and supported by ball bearings. The rotary blades are fitted in 3 mild steel discs which are bolted to the shaft at 125 mm spacing. Six blades are fitted on each disc in a staggered manner. A tail wheel of 200 mm diameter is attached at the rear of the rotary weeder attachment to control the depth of weeding. The wheel frame has number of holes at the top for raising and lowering the tail wheel so as to alter the depth of weeding by the rotary blades. The weeding unit of 680 x 720 x 660 mm overall dimensions and 370 mm working width, weighs 49 kg.

ii) Power transmission system for weeding blades

The 4 kW hp diesel engine fitted with 100 mm dia pulley transmits power to a 300 mm dia pulley fitted on the power input shaft of transmission box. In the transmission box the speed gets reduced (14:1) in two stages by means of

sprockets and roller chains. The intermediate shaft drives the rotary weeder by means of a roller chain, and two identical 16 teeth sprockets.

iii) Clutch

A dog clutch assembly along lever was fitted in front of the rotary blade so as to disengage the power transmission from the engine to the rotary shaft.

iv) Hitch frame

The hitch frame of the weeding unit was fabricated using two flats of 70 x 6 mm welded to a channel section of 75 x 40 mm size. The weeder assembly was hitched to this frame using a 20 mm hitch pin and the sideways movements are arrested by means of two bolts and lock nuts provided at both the sides.

v) Safety cover

A safety cover made of 20 gauge MS sheet and supported by 25x25x3 mm angles has been provided to avoid cut materials being thrown on to the operator. The cover is fixed to the frame by means of four nuts and bolts. Another cover is provided to the power transmission system between the intermediate clutch shaft and rotary shaft. A mud flap is provided behind the rotary blade.

Earthing Unit

The earthing attachment was made with adjustable hinged double mould boards having a maximum wing to wing distance of 370 mm. A hitch bracket was made of a 200 x 170x75 mm size box. An adjustable share is provided in front, is between two mould boards. Overall dimensions of the ridger is 710 x 535 x 370 mm.

Performance of the machine

The power weeder with different weeding attachments was evaluated in the field. The performance of the machine was found to be satisfactory for weeding and interculture in tapioca, cotton and sugarcane (Table 1, 2 & 3). The power weeder was evaluated in comparison to long handled star type weeder and manual weeding.

Table 1: Comparison of power weeder (sweep blade) with long handled weeder and manual weeding in tapioca

Sl. No.	Method of weeding	Field Coverage m ²	Cost of operation Rs / ha
1	Manual weeding	44	1060
2	Long handled weeder	93	900
3	Power weeder	560	770

Table 2: Comparison of power weeder (Junior hoe) with long handled weeder and manual weeding in cotton crop

Sl. No.	Method of weeding	Weeding	Field coverage		Operational cost, ha/h
			m ²	ha/day	
1.	Manual weeding	First	50	0.04	1010
		Second	70	0.07	690
Total					1700
2.	Long handled weeder	First	100	0.08	780
		Second	150	0.12	710
Total					1490
3.	Power weeder	First	600	0.48	760
		Second	580	0.47	520
Total					1280

The effective field capacity of the rotary power weeder was found to be 0.06 ha/h and the weeding efficiency was 86 per cent at a field efficiency of 86 per cent.

Table 3: The performance of the rotary weeder in sugarcane

Sl. No.	Location	Panruti	Karur	Coimbatore
1	Forward speed, m / min	20.3	21.2	19.8
2	Effective width of cut in one run, mm	370	350	375
3	Per centage of width covered by the weeder to row spacing	51.4	49.4	25.9
4	Depth of cut, mm	83	80	75
5	Actual field capacity, ha / h	0.096	0.112	0.092
6	Weeding efficiency, %	87	85	89
7	Labour requirement	3	3	4
8	Plant damage, %	3	2	3
9	Wages of operator/day, Rs	54	50	60

Field test report of earthing attachment for sugarcane crop

The following field observations were made with earthing attachment in sugarcane crop (Fig. 3).

Distance between two mould boards	= 430 mm
Ridge to ridge distance formed	= 600 mm
Forward speed of operation	= 27 m/min
Effective field capacity	= 0.14 ha/h
Height of ridges formed	= 170 mm

Four field trials covering total area of 16 ha were conducted on farmer's field.



Fig. 3: Power Weeder with Ridger Attachment in Sugarcane Field

Status of Technology

The power weeder with different weeding tools/attachments viz, sweep, cultivator, rotary weeder and ridger was demonstrated and exhibited during different occasions to the farmers in different parts of Tamil Nadu. A large number of trials were conducted in sugarcane, maize, tapioca, coconut and banana fields in collaboration with sugar factories, regional research stations and before officials of the State Dept. of Agriculture. An area of more than 5 ha on research farms and 10 ha in farmers fields was covered during the trials. The weeder has been released by Tamil Nadu Agricultural University. More than 45 prototypes have been manufactured and sold to the farmers both by the FIM scheme and the local manufacturers.

Brief Specifications of Machine

Specifications of weeder

i. Overall dimensions (excluding traction unit)

Length, mm	:	680
Width, mm	:	720
Height, mm	:	660
Weight, kg	:	47

ii. Details of weeding components

Weeder type : Rotary, sweep blade, adjustable hoes

No. of blades : Rotary : Three rows with 6 blades for each row
Sweep : Three nos, 300, 450, or 600 mm

Cultivator : Five tines

Ridger : One route

No. of blades	:	18
Distance between blades, mm	:	56
Angle between blades deg	:	45

- Cutting width of each : 56
 blade, mm
 Total working width, mm: 370
 Material of construction: High carbon steel
- iv Type of blade mounting: Eight clamps welded to the rotary shaft at an interval of 56 mm in helical configuration Weeding blades are fixed to these clamps using nuts and bolts.
- v. Details of depth wheel : A depth of 150 mm dia wheel fitted at the rear of the unit with provision for height adjustment.
- vi. Details of hitch point: A hitch point made of 120 mm mild steel flat with holes at 25 mm intervals is fixed to the frame of the weeder with a provision to raise or lower the entire weeder attachment
- vii. Mounting details : Suitable hitch frame made of 75x 40 mm channel is fitted to traction unit. The weeder can easily be mounted to the hitch frame.
- viii. Safety aspects : Separate safety covers have been provided for the rotary blades and chain transmission.

Production and Supply of Machine

The eight prototypes of the rotary power weeder with different attachments were fabricated at the prototype manufacturing workshop of AICRP on Farm Implements and Machinery and 32 prototypes by the local manufacturers. Local manufacturers were encouraged for the mass multiplication of the weeder under industrial extension programme.

List of Manufacturers

1. Trident Electric (P) Ltd., 408, Sathy Road, Ganapathy, Coimbatore - 641 006.
2. M/s Beracha Engineers, 436, Maruthamalai Road, P.N.Pudur (PO), Coimbatore - 641 041.
3. M/s Replica Engineering, 5, Kennedy House, P.N.Pudur, Coimbatore - 641 041.
4. Sree Annapoorana Farm Equipments, 8-A, Iyer Hospital Road, Singanallur, Coimbatore - 641 005.
5. M/s TUCAS Limited, Tudiyalur (PO), Coimbatore - 641 034.
6. M/s Vigneswara Textile Engineers, 84, Extension Street No.1, Singanallur, Coimbatore - 641 005.
7. M/s Valampuri Industries, Mauthamalai Road, P.N.Pudur (Po), Coimbatore - 641041
8. B.K.N. Metafab (P) Ltd, 16-F, Trichy Road, Coimbatore - 641 045

