International Journal of Agriculture Innovations and Research
Volume 6, Issue 2, ISSN (Online) 2319-1473
Manuscript Processing Details (dd/mm/yyyy) :
Received: 22/08/2017 | Accepted on : 26/08/2017 | Published : 31/08/2017

Performance Evaluation of Power Weeder Under Dry and Wet Land Conditions

***G. Kishore Kumar, D. Anil Kumar and Y. Dileep Sean**
College of Agricultural Engineering, Bapatla
*Corresponding author email id: kishore.thespy@gmail.com

Abstract **– The power weeder is evaluated under two different field conditions i.e. wet and dry land. Field capacity, plant damage, weeding efficiency and fuel consumption were evaluated. The field performance analyses have shown that weeding efficiency as 76.40, 69.65, plant damage 11.10, 8.34% in dry and wet land, respectively. Form the results, power weeder has the highest field capacity (0.0494 ha/h), Plant damage (11.10%) and weeding efficiency (76.40%) in the dry land when compared with the wetland.**

Keywords **– Power Weeder, Plant Damage, Weeding Efficiency.**

I. INTRODUCTION

The present weed control practices in India are chemical, mechanical and biological. Manual weeding, besides being laborious, is inefficient (not done on time in most cases), and always not practical because of adverse soil conditions. Mechanical weed control is preferred among all weeding methods due to many reasons. Mechanical weeding is preferred to chemical weeding because weedicide application is generally expensive, hazardous and selective. Besides, mechanical weeding keeps the soil surface loose by producing soil mulch which results in better aeration and moisture conservation [3]. The cost of weeding by engine operated weeder comes to only one-third of the weeding cost by manual labours [2]. Row crop weeders are simple, economically viable and useful for small to medium scale farm holders. It is also a positive step towards reduction of drudgery involved in row crop weeding [4].

Delay and negligence in weeding operation affect the crop yield and the loss in crop yields due to weeds in upland crops vary from 40-60 per cent and in many cause complete crop failure [1]. Hence a study was taken to evaluate the performance of power weeder under dry and wetland conditions.

II. MATERIALS AND METHODS

The experiment was conducted at Agricultural college farm, Bapatla, which is located at latitude of 15^0 58' N and $80^0$28' E longitude. Power weeder was evaluated for its performance under two different field conditions i.e. dry and wet. In dryland, power weeder was evaluated in maize crop. Field was divided into equal number of plots of size 20m × 10m in which row to row spacing maintained 60 cm. Weeding was done in maize crop at 25 days after sowing. Then after, weeding was done in the wet land (paddy field) in which crop row to row spacing of 30 cm. The weeding done in the field at 40 days after transplanting. The following parameters were considered to evaluate performance of power weeder.

Actual Field Capacity

Time consumed for real work (t_p) and that lost for other activities such as turning at headlands, blade cleaning when clogging with weeds (t_c) was measured by stopwatch and recorded for calculation.

$$a = \frac{A}{(t_p + t_c)}$$

Where,
a = Actual field capacity (ha/h).
A = Area covered, ha.
t_p= Productive time.
t_c = Unproductive time, h.

Theoretical Field Capacity

It is the rate of field coverage of the implement blade on hundred per cent of time at the rated speed and covering hundred per cent of rated width. It is given by formula.

$$f = \frac{(W \times S)}{10}$$

Where,
f = Theoretical field capacity (ha/h).
W= Width (m).
S = Speed of operation (km/h).

Field Efficiency

Field efficiency is the ratio between actual field capacity and theoretical field capacity. This is calculated by using the following equation.

$$e = \frac{\text{Actual field capacity}}{\text{Theoretical field capacity}} \times 100$$

Fuel Consumption

The fuel consumption has direct effect on economics of the power weeder. It was measured by top fill method. The fuel tank was filled to full capacity (500 ml) before the testing at level condition. Fuel consumption was estimated by keeping the machine on a level platform and fuel was filled to full capacity mark. The amount of fuel required refilling the fuel tank again after one-hour continuous operation up to full capacity mark with help of measuring jar and fuel consumption per hour was calculated.

Weeding Efficiency

Weeding efficiency was calculated by using the following formula:

$$e = \frac{(W_1 - W_2)}{W_1} \times 100$$

Where,
e = Weeding efficiency, percent.
W1 = Number of weeds/m2 before weeding.
W2 = Number of weeds/ m2 after weeding.

Plant Damage

International Journal of Agriculture Innovations and Research
Volume 6, Issue 2, ISSN (Online) 2319-1473

It is the ratio of the number of plants damaged in a row to the number of plants present in that row. It is expressed in percentage. The Plant damage was calculated by the following formula:

$$q = \left\{\frac{n_1}{n_2}\right\} \times 100$$

Where,
q = Plant damage in per cent,
n_1 = Number of plants damaged in a 20 m row length after weeding,
n_2 = Number of plants in a 20 m row length before weeding.

Cost of Operation

Cost of operation was calculated by considering depreciation, interest, housing, repair and maintenance, fuel cost and operator wages, for the power weeder where as for the wheel hoe, star weeder and traditional local tool only the operator wages are taken into consideration.

III. Results and Discussion

Field Capacity of Power Weeder

The field capacity of the power weeder under two different field conditions shown in Table 1. From the table, the field capacities were reported as for dryland and wetland were 0.0494 and 0.0439 ha/h. Field capacity was lower in case of wetland because of weeder would move some slow through the water in the field.

Table 1. Field capacity of power weeder under dry and wetland

Type of field	Field capacity (ha/h)
Dryland	0.0494
Wetland	0.0439

Plant Damage

High percent of plant damage was observed in dry field condition i.e., 11.10% and incase of wetland 8.34% (Fig 1). Power weeder causes the more damage to plants in dryland due to high speed of operation. When the power weeder moving with high speed, the operator cannot control of its movement on to the plants.

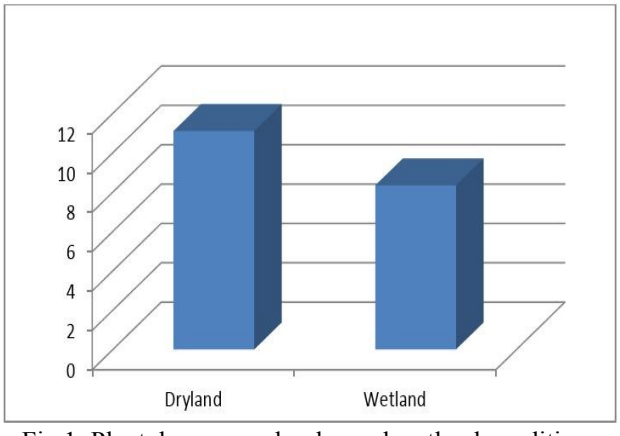

Fig.1. Plant damage under dry and wetland conditions

Weeding Efficiency

Table 2 shows the weeding efficiency of power weeder under dryland and wetland conditions. Weeding efficiency of power weeder is observed to be highest in dyland condition i.e. 76.40% and wetland condition is 69.65%.

Table 2. Weeding efficiency of power weeder

Type of Field	Weeding Efficiency (%)
Dryland	76.40
Wetland	69.65

Field efficiency of power weeder is more for wet land weeding. Weeding efficiency, plant damage fuel consumption and cost of operation are more for dry land weeding. The plot showing the comparison of field parameters in dry land and wet land with power weeder is shown in Fig. 2.

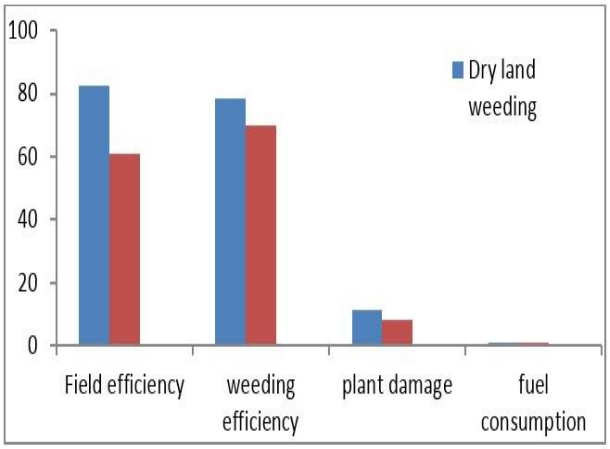

Fig. 2. Comparison of field parameters in dry land and wet land with power weeder

IV. Conclusions

The power weeder is evaluated under two different field conditions i.e. wet and dryland. Field capacity, plant damage, weeding efficiency and fuel consumption were evaluated. From the results, power weeder has the highest field capacity (0.0494 ha/h), Plant damage (11.10%) and weeding efficiency (76.40%) in dryland condition, where in case of wetland field capacity, plant damage and weeding efficiency were 0.0439 ha/h, 8.34% and 69.65% respectively.

References

[1] A.N. Rao, and B.S. Chauhan. 2015. Weeds and Weed Management in India - A Review. *Weed Science in the Asian-Pacific Region*. 87-118.

[2] A. Tajuddin. 2006. Design, Development and Testing of an Engine Operated Weeder. *Agricultural Engineering Today*. 30(5, 6): 25-29.

[3] V.S. Mynavathi, N.K. Prabhakaran, and C. Chinnusamy. 2008. Evaluation of Mechanical Weeders in Irrigated Maize. *Indian Journal of Weed Science*. 40 (3 & 4): 210-213.

[4] Y.B. Padole. 2007. Performance Evaluation of Roraty Power Weeder. *Agricultural Engineering Today*. 31 (3 & 4): 30-33.