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Development Of Low Cost Weeding- Cum-Earthing-Up Equipment

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ABSTRACT: *Every year in INDIA, an average of 1980 Cr of rupees is wasted due to weeds. Our country faces the total loss of 33% of its economy from Weeds. The Losses are due to some of the following reasons, total loss of 26% from Crop Diseases, total loss of 20% from Insects and Worms, total loss of 6% from Rats. Has been Surveyed. Shrinking farm lands, acute labour shortage, decreasing income per acre of cultivation, and economic frustration are some of the key factors hurting a farmer's confidence in continuing farming. Weeding control is done by: mechanical weeding, thermal weeding: flaming, biological control, chemical control, and by farming pattern. It has always been a problem to successfully and completely remove weeds and other innocuous plants and also earthing-up the crop. Invariably, weeds always grow where they are not wanted. This work involved the design and construction of low cost weeding-cum-earthing-up equipment, which consists of two main units viz. first weeding unit and second soil cutting and earthing-up unit. A serrated blade and two discs were selected for weeding and earthing-up operations respectively. The developed machine was tested on maize crop. The weeding efficiency was 90.7% and cutting width was 35cm.*

KEYWORDS: *Weeding, Earthing-up, and weeding efficiency*

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I. INTRODUCTION

Majority of the Indian population depends on agriculture and agro-based industries and businesses. Lack of mechanization is one of the major problems to improving the productivity of agriculture. One of the major reasons for lack of agricultural productivity is weeds. The competitive abilities of weeds has serious negative effect in crop production and responsible for distinct losses in crop yield. Weed control is often the most important agricultural task facing farmers in developing countries. Weeding and interculture is one of the important management practice which has reasonable effects on crop yield. More than 33 percent of the cost incurred in cultivation is diverted to weeding operations there by reducing the profit share of farmers (Raut *et al.* 2013). Reduction in yield due to weed alone was estimated to be 16 to 42 % depending on crop and location which involves one third of the cost of cultivation (Rangasamy *et al*. 1993). Depending upon the weed density, 20 to 30 per cent loss in grain yield is quite usual which might increase up to 80 per cent if adequate crop management practice is not observed. Weeding and hoeing is generally done 15 to 20 days after sowing. The weed should be controlled and eliminated at their early stage. Competition in the early stage of growth and failure to control weeds in the first three weeks after seeding, reduce the yield by 50 per cent (Gunasena and Arceo, 1981).

The most common methods of weed control are mechanical, chemical, biological and cultural methods. Out of these four methods, mechanical weeding either by hand tools or weeders are most effective. In Indian agriculture, it is a very difficult task to weed out unwanted plants manually as well as using bullock operated equipments which may further lead to damage of main crops. Presently there are many types of weeders available from simple to complex and motorized weeders. Several innovative and cost effective designs were developed and experimented according to the requirements of the farmers and soil conditions. Efforts are still on to reduce the drudgery in weeding operation. (Thiyagarajan *et al*. 2006).

Many farmers are unable to control the weeds effectively in their farms resulting in yield losses. The problem of weed control is very serious especially during k*harif* season. Due to the problem of weeds, cost of cultivation increases considerably and drastically reduces the crop yields. Mechanical methods of weed control

are the most common control measures in India and traditional tools are mainly used for the purpose. If improved and efficient designs of manual, animal drawn and engine powered weeders are made available to the farmers, the problem of weed control can be effectively tackled and would result in timeliness of weeding operation, reduced cost of cultivation and higher crop yields. Saving of labour requirement (man-h/day) is achieved with the use of improved long-handle mechanical weeders like wheel hoes, animal drawn weeders (two to three rows) and engine-operated power weeders. Typical work rate of hand tool (*Khurpi*), hand chopping hoe, push / pull type or push-pull weeder and animal drawn weeding implement varies between 300-500, 200-300, 100-125 and 6-20 manh/ha respectively resulting in saving in cost of weeding approximately from Rs. 4000-5000 per ha (manual weeding) to Rs. 1500-2000 per ha in case of improved mechanical weeders (Singh *et al*. 1999-2000) and (Alam and Singh 2003). Besides, saving of labour requirement and cost of weeding operation, the drudgery of weeding operation is also reduced with the use of improved mechanical weeding implements and machines because their operation is usually in standing posture to that of manual weeding in squatting posture or sitting posture.

II. OBJECTIVE OF THE STUDY

The aim of the project is to design, construct and test weeding-cum-earthing-up equipment, to perform the weeding and earthing-up operations simultaneously and finally to provide the best opportunity for the crop to establish itself after planting and to grow vigorously up to the time of harvesting.

III. MATERIALS AND METHODS

Main frame: The maine frame is made up of MS angle . The length ,width, height and thickness of maine frame is 450, 50, 50 and 5 mm respectively.

Handle: A handle is fabricated for smooth operation of developed equipment. The handle was made of MS flat (450 x 50 mm) of 450 mm length and MS pipe (30 mm dia.) having thickness 3 mm . A mild steel pipe of 1180 mm length was welded on the upper end at MS flat and lower end at the centre of main frame.

Weeding blade: A serrated bIade is made of cast iron. It serves two purposes, first to minimize the root damage and second provide sliding action so root may not stick to the blade. The width and length of the blade are 40 mm and 400 mm respectively.

Ground wheel: Two ground wheels each of diameter 250 mm and made up of rubber were provided for smooth operation of developed equipment. Each ground wheel was kept at horizontal distance of 400 mm from main frame.

Disc: The disc is considered here as the main component which is used for the Earthingup operation in the crop and diameter of 300 mm was selected which was found suitable for manual operation.

3.1 Methodolgy

A field experiment was carried out at Advanced Centre for Rainfed Agriculture, Rakh Dhiansar, Shere-e- Kashmir University of Sciences and Technology, Jammu in *kharif* 2017 to evaluate the performance of developed equipment on response of maize crop (Variety: Mansar) with different treatments in terms of weeding efficiency, field capacity, Plant damage etc. All the recommended cultural practices were followed as per packages and practices for *kharif* 2017(Anonymous, 2016)

Weeding Efficiency

It should be measured by the weed count method described as follows:

Number of weeds before operation and number of weeds after operation should be calculated. Take at least five observations at different places (Behera, 1996).

Calculate the weeding efficiency as follows :

$$\text{Weeding efficiency (\%)} = \frac{W1 - W2}{W1}$$

Where,

W1 = Number of weeds per square meter counted before Weeding; and

W2 = Number of weeds per square meter counted after Weeding.

3.2 Design requirements:

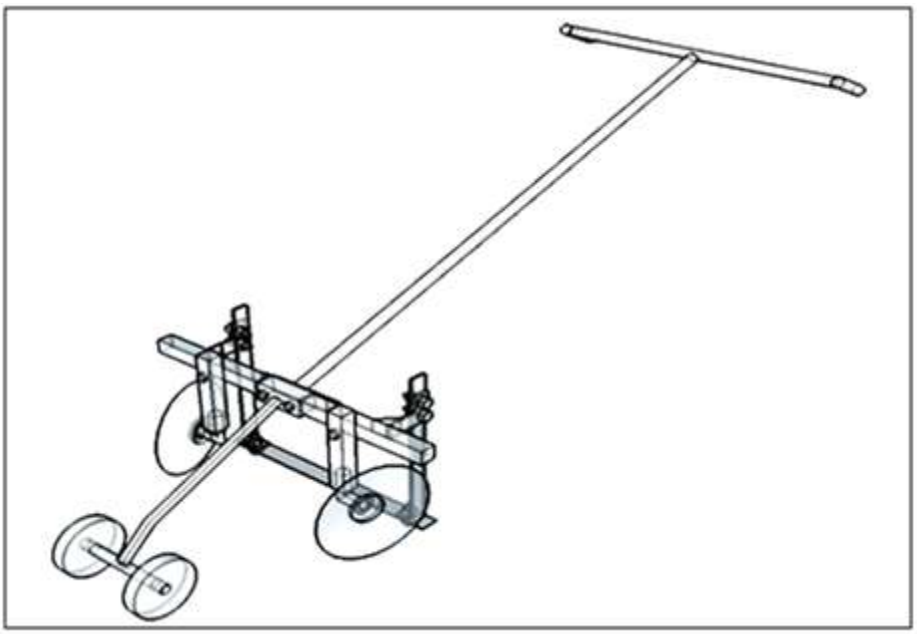
a) Physical and operational characteristics Safety: It provides safety to users,

b) Life in service: The product will last approximately long duration,

c) Ergonomics: Easy to operate by everyone, of all physique conveniently,

d) Weight: The product must less in weight

IV. CONCEPT



Conceptual view

Area	No.of Weeds before weeding	No.of Weeds after weeding	Weeding efficiency
A_1	3660	335	90.8
A_2	3825	340	91.1
A_3	3870	385	90.1
A_4	3785	353	90.7

Table 1. Weeding efficiency of developed equipment

Table 2. Speed to cover an area of 9 m^2 by developed equipment

Area	Time Taken (sec)	Speed(Km/hr)
A_1	60	1.20
A_2	67	1.08
A_3	53	1.35
A_4	80	0.90

V. CONCLUSION

1. The working width of the developed equipment was maximum among the other existing manually operating weeders and was 35cm.
2. Less labor needed and it is more economical than hand weeding.
3 . Here do not use any fuel and power, Hence maintenance cost is very less.
4. Improvement could be brought in their postures, thereby facilitating them to walk comfortably along the rows while weeding and earthing-up with this manual weeder.

VI. SCOPE FOR FUTURE WORK

1. The weight of the weeding-cum-earthing-up equipment can be reduced by using lightweight materials.
2. Since the weeder was designed for low cost, the weeder was made manual but it can be made automatic by placing a motor.
3. The developed equipment can be evaluated in other wide spaced crops and type of soil

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