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A REVIEW PAPER ON DESIGN AND FABRICATION OF MECHANICAL WEEDER

Mr Harsit Jaiswal[1], Mr Sadhu Ahirwar[2] & Prof. Prashant Bajpayee[3]
[123]Department of Mechanical Engineering, Sistec-R Bhopal, India

ABSTRACT

In Indian agriculture, it's 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. More than 25 percent of the cost incurred in cultivation is diverted to weeding operations there by reducing the profit share of farmers. This review paper is a small work towards analyzing weeding-cum-earthingup equipment aspects for economical cultivation which will help to minimize the working fatigue and to reduce labour cost.

1. INTRODUCTION

A weed is essentially any plant which grows where it is unwanted. A weed can be thought of as any plant growing in the wrong place at the wrong time and doing more harm than good. It is a plant that competes with crops for water, nutrients and light. This can reduce crop production. Some weeds have beneficial uses but not usually when they are growing among crops. Weeding is the removal of unwanted plants in the field crops. Mechanical weed control is very effective as it helps to reduce drudgery involved in manual weeding, it kills the weeds and also keeps the soil surface loose ensuring soil aeration and water intake capacity. The main objective is the development of a weeding tool, which can be used in different plant spacing systems, various plant intra-row distances and growth stages. The need for non-chemical weed control techniques has steadily increased in the last fifteen years, as a consequence of the environmental pollution originated by the intensive application of pesticides in agriculture. Another reason why non-chemical weeding is in the limelight nowadays is increased interest in the organically produced agricultural products and foodstuffs.

2. LITRATURE REVIEV

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. Invariably, weeds always grow where they are not wanted. This work involved the design and construction of mechanical weeder, after discovering that tools such as cutlass and hoes require high drudgery, time consuming and high labour force. As a solution to these problems, mechanical weeder was designed and constructed. The mechanical weeder was made of two implements attachment i.e. the primary cutting edge which is in front to loose soil above and the secondary cutting edge which is behind to do cutting and lifting of weeds. The overall machine field efficiency was 98.67%. The Single Wheel Weeder being manufactured is the equipment, which is used for very special purpose when the weeding is required at narrow places or between rows. The blade is thin but very sturdy and tough besides, it is very safe to use and offers zero threat of hurting to the user, Other than the wheel, there is nothing mechanical in this single wheel weeder but, it works wonderfully under the condition where it is put into. This hassle free equipment requires no special maintenance. It is necessary to design the weeder which minimize the human effort and provide efficient work output. The tool which is designed is able to fulfill the present requirement for the weed control. The present design is directed to an improved manual tilling, mulching and weeding tool..The compact design is very helpful for in the field of agriculture.

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2.1 S. S. Meena.et.al.[1]studied about weed management is an ever-present challenge to crop production. Presence of weeds in general reduces crop yield by 31.5 per cent (22.7 % in Rabi season and 36.5 per cent in Kharif and summer season). Yield losses due toweeds were about 65 per cent depending on the crop, degree of weed infestation, weed species and management practices. Presently available weeder mostly runs by tractor or power tiller, these are large in size, cannot work for low inter row spaced crops. Themain working components of power weeder were flexible drive shaft, worm gear box, rotor shaft, flanges and blades.[1]

2.2 B Prasan Patil.et.al [2] Indian economy is fully based on the agriculture sector. Rice is the most important staple food in Asia. More than 90 percent of the world's rice is grown and consumed in Asia, where 60 percent of the world's population lives. Rice production accounts for between 35-60 percent of the calorific intake of three billion Asians. India occupies 39.19 Mega-hector areas under paddy cultivation with the production of 106.0 million tonnes. India is second larger producer of rise. In India west Bengal stands first in production of paddy. And it is essential to remove unwanted corps. It is a plant that completes with crop for water, nutrients and light. Weed takes 30 to 40 percent of applied nutrients resulting in yield reduction. Paddy production in India during the year2012-13 which is about 85.599 million tones and total loss of rice yield due to weeds is about 14.91 percent. More than 33 percent of the cost incurred in cultivation is diverted to weeding operations there by reducing the profit share of farmers.[2]

2.3 A.K.M Saiful Islam.et.al. ([3] Mechanical intervention in crop production is increasing rapidly in Bangladesh. Researchers are finding ways to manage weeds in rice field using suitable mechanical devices instead of conventional hand weeding. The weeding efficiency was the highest in HW (92%), followed by BPW (78%) and BW (73%).

It was found that BW damaged the lowest number of plants (9%) compared to BPW (11%) during weeding operation, although the damaged plants recovered after a few days. BW and BPW reduced 74 and 85% of labour requirement in weeding operation compared to HW. The highest weeding cost was involved in HW (Tk. 4287 ha-1) compared to BW (Tk. 1103 ha-1) and BPW (Tk. 950ha-1). Weed control methods exerted insignificant effect on grain yield.[3]

3. OBJECTIVE

According to the fact that mechanical weeding should provide cultivation of the entire space around the crop plants, three different areas need to be recognized in row crops. The first is the "inter-row area"-that is, the area between rows. Mechanical weeding of this area is more or less solved with different commercial tools available on the market. The second is the "intra-row area"-that is, the area between plants in one row and the third is the "close to crop area"-that is, the area nearest to the crop plant. The definition of the inner border (diameter) of the close to crop area is highly dependent on the crop species and growth stages, as well as from the weeding tool which is used[3]. To ensure, with high confidence, that the weeding tool will not cause any negative influence on the crop, the area in which the plant is, should be always increased with a socalled "protected" (ring-shape) area around it. Definition of the areas of great importance for the mechanical intra-row weed control is presented .

4. APPLICATION OF PROJECT

- Vary your tillage and cultivation tools to fit the situation
- Cultivation is best done when weeds are small
- Shallow tilling when weeds are in the white thread stage will avoid bringing up weed seed
- Burial versus uprooting versus cutting
  - Burial works best for small weeds especially in the crop row
  - Burial best done when crop is larger than the weed
  - If burying small weeds soil must be dry

4.1 Interventions to reduce cost of cultivation

- Reduce expenditure on Farm Inputs.
- (a) Seed
- i- use of certified seed of improved verities once in three years.

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- ii – Production of seed through FPOs/ FPCs/Farmer's groups/NGOs - MH/AP
- iii- Adoption of agronomic practices to save seed. e.g. cultivation of pulses / oilseeds on raised beds using BBF planters, dibbling of rice on raised bed (SRT), SRI and mechanical transplanting.

4.2. Specification

RS PRO Brushless DC Motor, 36 V dc, 0.68 Nm, 4000 rpm, 8mm Shaft Diameter
DC Motor -24V,300 rpm, 13A
2 Batteries -12v , 13.7A
Solar Panel -2.5 A, 12V 40W,
Pedestal Bearing -25mm Dia & 20mm Dia
Sprocket -44 Teeth
Shaft -500mm Length & 25mm Dia
Suspensions -25kg Weight Capacity
Chain -1.5M

Figure 1: Battery ***Figure 2: DC Motor***

5. WEED CONTROL PRACTICES

According to the fact that mechanical weeding should provide cultivation of the entire space around the crop plants, three different areas need to be recognized in row crops. The first is the "inter-row area"-that is, the area between rows. Mechanical weeding of this area is more or less solved with different commercial tools available on the market. The second is the "intra-row area"-that is, the area between plants in one row and the third is the "close to crop area"-that is, the area nearest to the crop plant. The definition of the inner border (diameter) of the close to crop area is highly dependent on the crop species and growth stages, as well as from the weeding tool which is used[3]. To ensure, with high confidence, that the weeding tool will not cause any negative influence on the crop, the area in which the plant is, should be always increased with a so called "protected" (ring-shape) area around it. Definition of the areas of great importance for the mechanical intra-row weed control is presented in the Figure 1. Fig. 1 Areas in the row crop field For successful and accurate intra-row weed control, the position of every single plant has to be determined. Although the plants have been sown with constant spacing, the distance between the plants in the row can vary and some of the expected positions can be without plants, because of various environmental conditions. The algorithm for controlling the weeding tool should contain appropriate reactions to all deviations from the expected plant/weed distribution pattern such as the missing plants, the weeds in the close-to-crop area and the not regular and varying distances between plants in the row. Another important aspect is the soil surface roughness. The weeding tool needs to fallow as accurately as possible the soil surface immediately next to the crop row to provide optimal hoeing depth

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6. RESULTS

We have used the engine of TVS Moped scooter which is of 70cc. This engine gives 3.5 hp power. Our required theoretical power is also 3.5hp. But we tested the prototype, it worked on smooth roads. The same model when we tested on field it did not give outputs as expected.

7. CONCLUSIONS:

7.1. From above result it is clear that to get full performance we need to chose the engine of higher power.

7.2 We in a team of four worked together for the success of our project. It is been great experience for everyone. We divided the whole project work and performed individually for given task, at last we combined all work.

7.3. While manufacturing we worked together and we learnt all manufacturing processes again. We learnt how to handle pressure while working a team. SCOPE.

8. FUTURE ASPECT

8.1. As we stated above if we use engine of higher power it will give better results. We used material from scrap (means already used). If we use new material then performance will be high.

8.2. The farmers need alternatives for weed control due to the desire to reduce chemical use and production costs. For some crop situations there are no selective herbicides. Since hand weeding is costly, an automated system could be feasible and mechanical weed control system can reduce or eliminate the need for chemicals. Currently no such system exists for removing weeds located in the seed line between crop plants. In this project, a real time mechanical weeder system is developed to identify and locate outdoor plants using machine vision technology, knowledge based decision theory.

8.3. The path from an idea to a prototype can be significantly shortened by the use of integrated mechanism design and simulations. With the intensified growth of processing power and software capabilities the concept of a virtual prototyping has become an appropriate alternative to the conventional physical prototypes.

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