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Fabrication of a Cultivator cum Weasel

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Abstract: Weed control is the one of the most important problem that will reduce the farmer interest to continue cultivation. The farmer 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. Hence mechanical weeder is necessary to reduce the labour force. Environmental degradation and pollution caused by chemical is reduced by the use of Mechanical weeder. Low effective operation, low work effort and high time requirement for different types of hoe, weasels or cultivators, can be overcome with the use of mechanical weeder. The aim of the work is to fabricate and develop the hoe and weasel, to provide the best opportunity for the crop (Groundnut, potato and Tomato at initial level) to establish itself after planting and to grow vigorously up to the time of harvesting. Invariably, weeds always grow where they are not wanted. For this a special type of manually operated double wheel hoe and weasel is designed and constructed. The weeder is driven in forward direction by pull and push action and the hoe is attached at rear end is placed at the roots of weeds, once the operation is completed the weeder is shifted to next row, like this the complete land of cultivation is made as weed free. It is faster than the traditional method of removing weed. Main advantage is reducing labour cost by reducing number of labours, less time consumption. The operation is made to be simple that even any person can handle, by just handling it without any stress
Keywords: Solid works, Cultivator Cum Weasel

I. INTRODUCTION

Agriculture is the backbone of Indian economy; majority of the Indian population depends on agriculture. Agriculture products have prime importance in the national economy. One of the major reasons for lack of agricultural productivity is weeds. 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. 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). Weeds waste excessive proportions of farmers' time, thereby acting as a brake on development. Weeding is the removal of unwanted plants in the field crops. Weeds may be unwanted for a number of reasons. An important one is that they interfere with food and fiber production in agriculture, wherein they must be controlled in order to prevent lost or diminished crop yields. Other important reasons are that they interfere with other cosmetic, decorative, or recreational goals, such as in lawns, landscape architecture, playing fields, and golf courses. Similarly, they can be of concern for environmental reasons whereby introduced species out-compete for resources or space with desired plants. Weeds have long been a concern, perhaps as long as humans have cultivated plants. Manual weeding requires huge labour force and it is a time-consuming process. It is necessary to design the weeder which minimizes the human effort and provides efficient work output.

II. PROBLEM DESCRIPTION & ASSEMBLY

Weeds are considered the biggest problem facing organic farming, where weed control is more expensive compared to synthetic herbicides whose use is prohibited in clean agriculture. Rood (2002) has reported that weed management is the most difficult part of organic rice production and it is the major reason for organic rice yields being 50% lower than conventional yields. Lower yields and higher costs for weed control labour are two of the major reasons that organic cotton must be sold with high price premiums (Schneider, 1993).

A. Unavailable or limited herbicides candidate in clean farming

Controlling weeds without herbicides takes a lot of time and is very costly for us. All weeding is done by tractors or hand, which is very labour-intensive. Conventional farmers spend only about 3250 Rs per one acre on herbicides that knock out every weed in sight. Organic farmers may have to spend up to 65,000 Rs an acre to keep weeds under control (Earthbound Organic, 2006).Various least toxic, natural herbicides have limited efficacy, particularly against noxious perennial weeds. Also, mycoherbicides have some promise, but also pose risks to non-target plants (Baker & Brown-Rosen, 2007).

B. The costs of weed control in organic farming are more expensive

Where synthetic herbicides have their use prohibited compared to herbicides allowed in conventional farming. Growers of organic crops cite weed control as their greatest difficulty in crop production because they are not permitted to use chemical herbicides (Gianessi & Reigner (2007). They substitute hand weeding and cultivation for herbicides at a greatly increased cost and with reduced effectiveness. Aggregate studies that estimate the value of herbicides assume that growers would substitute a certain amount of hand weeding and tillage if chemicals were not used, which would not be sufficient to prevent yield losses totalling about 20% of the U.S. crop product.

C. Uneven rows

We noticed that the rows have curves in them, when we were pulling the hoe behind a implementive, there are a few possible issues that should be checked (parallel and tandem). The hoe blade can become bent from damage, however occasionally normal wear and tear can also cause the bend.

D. Design Aspects

Weeder needs to have built-in adjustability to change the width of working. It should have some arrangement to avoid mud getting stuck between the teeth/blades and needs to be fitted with a guard. It should be simple in design also work in all season weather. It can be manufactured locally and sold at an affordable price.

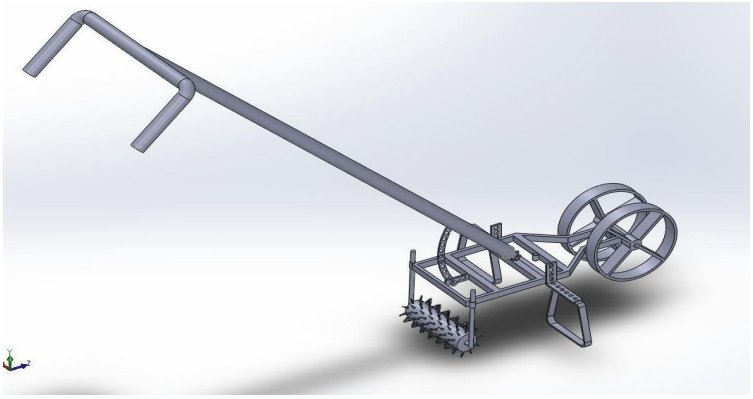

Fig.1. The proposed assembled model

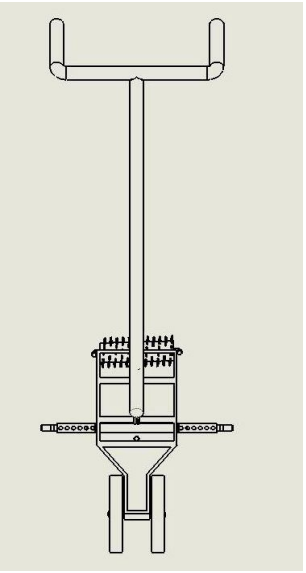

Fig.2. Front view of a designed model

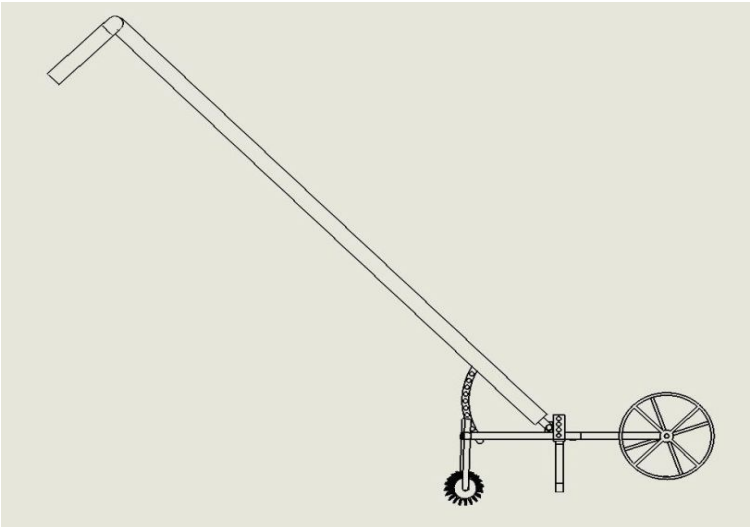

Fig.3.Side view of a designed model

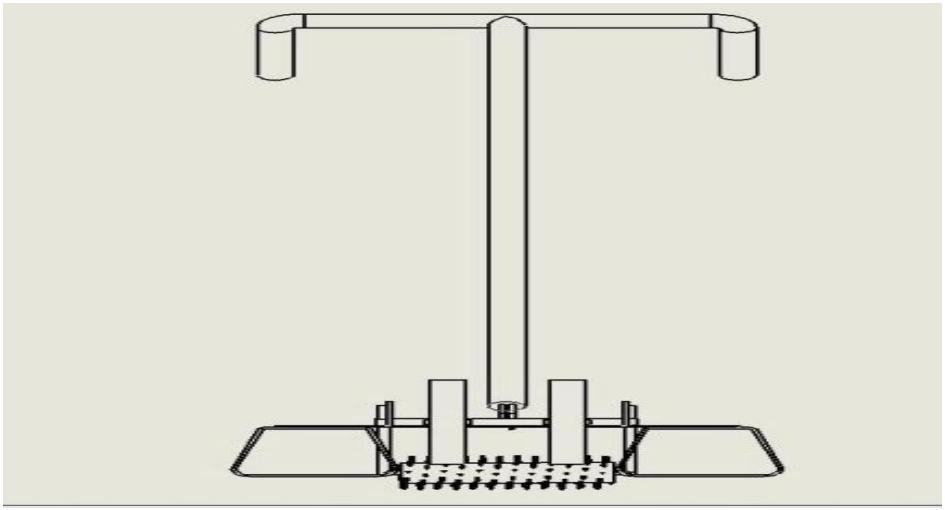

Fig.4 g.4. Top view of an designed

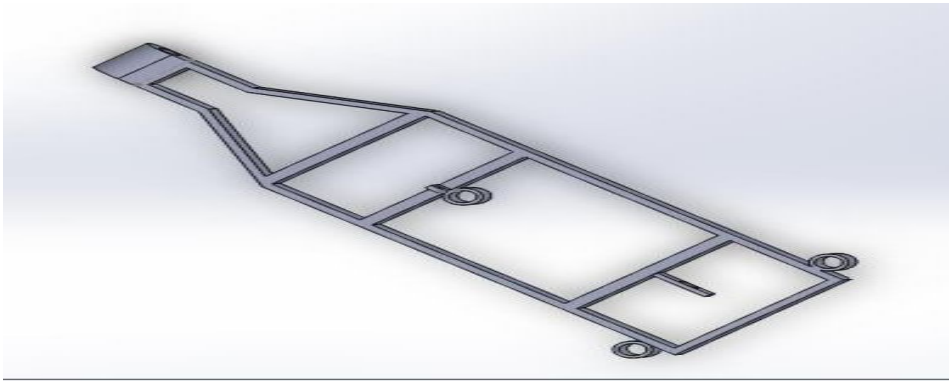

Fig.5. Frame

This Frame is design by using SOLID WORKS Software. Two slots are provided at the black to the frame, one slot in provided at the front of the Frame. At the middle of the frame , slots are provided at that position the tool is attached, maximum work done with minimum work effort. At the back side of the frame, Handle holder are provided with angular arrangement, front side of the frame wheel adjustment is provided. In addition to the frame Tool holder is attached for attaching number of tools. Here the frame is made of Mild Steel iron ,the handle holder and wheel holder are attached to the frame by welding . The handles and wheels are attached to the frame by using screw and nut. Based on these design, fabricated model is shown as follows

Fig.5. Fabricated Frame Tool holder

Tool Holder is used hold the tools like hoe, plough, disc plough, hiller, Furrower and roller weeder. For holding the tool screw is provided at the back side of the tool holder. This Tool holder is attached to frame on either middle or back s

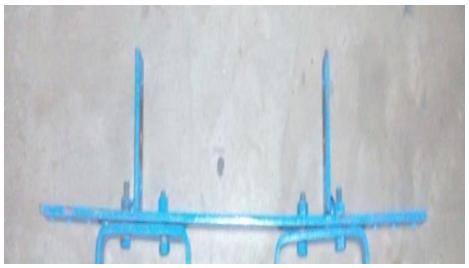

Fig.6. Fabricated tool holder

E. Wheels

Wheels are one of the important components because if wheels are not present the motion of the implement is impossible. The wheels are attached at front of the frame. Material used for wheel is mild steel, the diameter of the wheel is 10 inch.

Fig.7. Fabricated wheels

F. Handle

Another important component is handle, which is adjusted to the frame by an screw and nut. Handle is fixed at the middle position in order to push and pull the machine in forward and backward motion**.**

Fig.8. Design of Handle

G. Hoe

This hoe is made up of a mild steel and it is designed for hoeing weeds. It will do Aerating and leveling the soil. It is very Comfortable to do work in the soil. It can be easily assembled and dissembled to the tool holder.

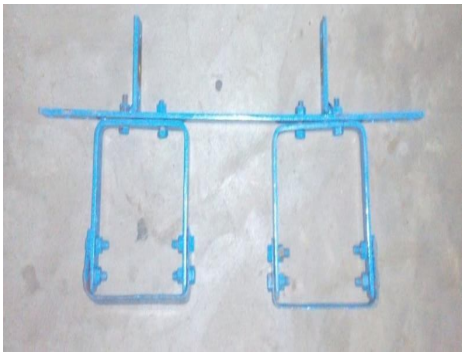

Fig.9. Design of Handle

It is also made up of an mild steel. The sharp tines loosen the soil to a constant 1 ½" depth, creating a perfect follicle for new seeds to capture moisture and promote growth. It is flexible to work around rows and between plants. It is attached to the frame in the middle or back side position.

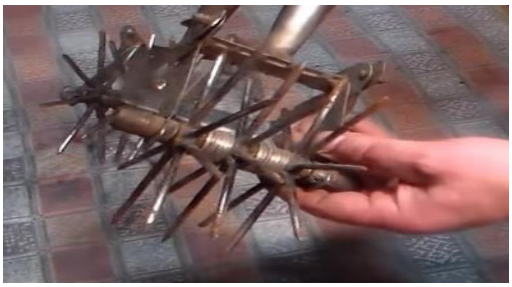

Fig.10. Fabricated weasel

III. RESULTS AND DISCUSSION

This concept involved the development of hoe cum weasel, after discovering that tools such as spade and trowel require high drudgery, time consuming and high labour requirement. As a solution to these problems, hoe cum weasel was designed and developed. The hoe cum weasel was made of two implements i.e. the primary height adjuster and the secondary is an adjustable attachment is provided for the placement of a pair of hoe's in order to change the gap between the rows in horizontal direction in the crop. The tool developed will be able to fulfill the present requirement for the weed control. Accordingly, the present development is directed to an improved manual tilling, mulching and weeding tool.

We have two types of weasel tools. One is weasel with large nut gatherer and weasel cultivator. In our project we use only weasel cultivator. The frame is designed in such a way that a weasel cultivator can be attached to the machine in both front and backward positions. We have different types of hoes. some of them are Draw hoe, scuffle hoe, hand hoe, wheel hoe. In our project we used Wheel hoe. As well as in the previous case a pair of hoes are attached in forward or in backward positions in both the sides of the frame. Weeding efficiency (Functional efficiency) was determined by removing manually the weeds in 1m x 1m area of the farm, the weeds were weighed and recorded. The process was repeated in five randomly selected locations on the farm. The average weight of the weeds in 1m x 1m area was calculated for the types of soil. The average weight of the weeds in 1m x 1m area after pass of the weeder through the farm was deducted from the actual weight of the weeds in 1m x 1m area. Thus, functional efficiency was determined fro m the relation

A. Functional Efficiency

= {(Weight of weeds removed by using weed remover)/ (Actual weight of weeds removed manually)}

For finding the results, we have taken 2 cases. They are listed below

1) Weeding test on Semi moisture land

2) Weeding test on Dry land

Table.1 Weeding test result on Semi moisture land

AREA	WEIGHT OF REMOVED WEED USING HAND PULLING (kg)	TOTAL WEIGHT OF REMOVED WEED USING WEED REMOVED (kg)
1	0.05	0.07
2	0.03	0.06
3	0.07	0.07
TOTAL	0.15	0.20
MEAN VALUES	0.05	0.07

Functional Efficiency for semi moisture land= 71.4%

Table.2 Weeding test result on Dry land

AREA	WEIGHT OF REMOVED WEED USING HAND PULLING (kg)	TOTAL WEIGHT OF REMOVED WEED USING WEED REMOVED (kg)
1	0.31	0.33
2	0.32	0.45
3	0.25	0.30
TOTAL	0.88	1.05
MEAN VALUES	0.3	0.35

Functional Efficiency for Dry land= 85.71%

Table.3. Time spent when tested on semi moist land

METHODS	LABOUR REQUIREMENT	TIME SPENT (Min)
Manually Operated Weeder	1	4.8
Spade	1	9.4
Trowel	1	10.8

Hence by comparing weed remover and spade it has been observed that weed remover is almost 2.3 times faster than spade and more than 3 times faster than Trowel on semi moist land.

Table.4. Time spent when tested on dry land

METHODS	LABOUR REQUIREMENT	TIME SPENT (Min)
Manually Operated Weeder	1	5.3
Spade	1	10.2
Trowel	1	13.5

Hence by comparing weed remover and Spade it has been observed that weed remover is almost 2 times faster than spade and more than 3 times faster than Trowel on Dry land.

IV. CONCLUSION AND FUTURE SCOPE

In conclusion, it was found during observations after the development and testing of this particular manually operated weeder that the overall benefits accruing and associated with the use of the equipment includes:

A. It was faster than the traditional method of removing weed

B. It cannot work where there was stone or any obstacle.

C. Improvement could be brought in their postures, thereby facilitating them to walk comfortably along the row while weeding with this manual weed

D. Less labour needed and it is more economical than hand weeding

E. Here no fuel is used, hence maintenance cost is very less.

V. FUTURE SCOPE

Through observation, this work was good for local farmers and small scales agro-based industries that need a better treatment and operations carried out on farms. The weight of the weeder can be reduced by using lightweight materials and by reducing the size of wheel. Since the weeder was designed for low cost, the weeder was made manual but it can be made automatic by placing a motor. By using some advanced attaching mechanisms, the time required for assembling can be reduced for additional attachments.

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