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BATTERY OPERATED AGRICULTURAL WEEDER & SPRAYER

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ABSTRACT: *The Present work discusses the look and construction of a battery driven motorized agricultural weeder. The aim of this study was impelled by a sensible observation regarding the effortfulness of manual weeding. Agricultural space has been the world of continuous analysis, and has created important improvement within the recent amount. Weeding is a crucial agricultural unit operation. Weed could be a plant that's thought of undesirable in an exceedingly explicit scenario, it's primarily "a plant within the wrong place". They sharply vie for water, nutrients and daylight, leading to reduced crop yield and poor crop quality. Delay and negligence in weeding operation have an effect on the crop yield by up to thirty to sixty per cent. Crores of rupees area unit spent in agriculture, however thanks to weeds the yield of the crops is drastically falling down. Albeit their area unit losses with insects, worms and from pathologic crops the loss thanks to weeds is high. There are a unit variety of strategies like manually removing the unwanted plants by using ancient hand tools or by spraying chemical weedicides which can kill the weeds or buying some mechanical equipment's. From the above-named strategies, the mechanical weeding is generally most well-liked thanks to its low expense and human effort. Farmers usually use 2 sorts of weed management strategies which incorporates ancient bullock power instrumentation and chemical technique of weeding however these 2 weeding strategies have sure disadvantages, bullock power isn't effective technique of weed management and chemical weed management reduces the standard of soil. The employment of chemical weedicides isn't most well-liked thanks to the risky nature of the chemicals. The manual weeding method is additionally not most well-liked owing to the high labour value. The purpose of this project is to produce and implement electrical & mechanical technology to get the utmost yield to farmers, and conjointly to produce a cost-effective operation than typical kind weeding method.*

KEYWORDS: *Weeder, Sprayer, Agriculture*

INTRODUCTION:

India is a developing country; it needs new inventions and techniques for economic developments. Agriculture is that the backbone of our country, and additionally we are the second largest country producer of agriculture. The economic developments within the agricultural sector of India have quite additional opportunities for analysis to develop effective machines for the betterment of the farmers. Nowadays, the auto sector has stirred on to electrical vehicles to cut back emission levels associate degree to realize an eco-friendly environment.

In vegetables crop production, weed management is extremely essential and is taken into account one amongst the foremost vital operations. Weed management is one amongst the foremost troublesome tasks in agriculture. The weeds are one amongst the explanations for the failure of crop production weeds ought to be controlled. A weed could also be outlined as any plant growing wherever it's not wished.

To achieve a high yielding vegetable production, sensible agricultural practices are also needed. Weeds are well-known to be terribly competitive in getting wet, daylight and nutrients. This competitive nature can sadly have an effect on the crop yield. One amongst the foremost vital practices is to properly manage weeds. Therefore, new methodology is to be enforced for the removal of the unwanted weed within the crop.

When weeds grow in farmland, they will injury the crops and reduce the crop yield of the farm. To urge eliminate the weeds while not killing the crop several farmers spray their fields with herbicides. The spraying is historically done by backpack spryer with labor which needs additional human effort, it cowls tiny space, time intense and low storage capability. So, to beat on top of issues, we've styled and developed the versatile instrumentality which is able to be useful to the medium and tiny scale farmer for the weeding and spraying operations.

Our intention is to create a machine that removes these unwanted plants additional with efficiency and at a substantial less value. To unravel this drawback, we've invented a weed removing and spraying machine. the present weeders square measure operated by an engine, even if they're economical they're not so affordable and manufacture most pollution to surroundings, for that reason we've improved the weeder to figure with Dc motor and feeds power from battery and additionally we've organized a grass collector at very cheap of the weeder that collects the grass and waste materials.

OBJECTIVES:

- Design and analysis of Agricultural weeder & sprayer.
- Weed removal with less effort.
- To make Eco- friendly agricultural weeder.
- To loosen the soil.
- To complete weeding process in less time.
- To spray pesticides/ weedicides.

LITERATURE REVIEW:

The following literature is based on the research papers published in various national and international journals, books, and review articles:

A. Sarang A. Bhongade1, et.al, "Battery Operated Weeder & Sprayer" IRJET, Volume: 06 Issue: 03 March 2019: The Agricultural development plays important role as a driver of rural poverty reduction. The effort required to develop a weeder will meet the demand of farmers. The efficiency of weeder should be satisfactory and it is easy to operate. It was faster than the traditional method of removing weed. Less labor needed and it is more economical than hand weeding. Here do not use any fuel and power. Hence maintenance cost is very less. Cost of weeding by this machine comes to only one-third of the corresponding cost by manual laborers. The fabrication of Low-cost Weeder is done with locally available material. The overall performance of the weeder was satisfactory. (1)

B. P.T.Saravanakumar, et.al, "Fabrication and Performance Evaluation of Farmer Friendly Electric Weeder", SSRG International Journal of Industrial Engineering, Volume 8 Issue 1, 21-27, Jan-Apr 2021: Hereby the fabrication and performance evaluation has confirmed that it has less operating cost than conventional type weeder. It shows the 'C' type blade gives better weeding efficiency and less plant damages during the operation on the field than compare to other types of blades. Weeding efficiency is reduced while the moisture is higher than 17% in soil. (2)

C. P.V.V.S. Maneendra, et.al, "Fabrication of motorized agriculture weeder with grass collector", JETIR, March 2020, Volume 7, Issue 3: The soil tiller and weeder is one of the main farms of mechanization in promoting soil tiller and weeder especially considering the fact that the majority of the farmers having small land. It was reducing the human effect. The semi-automatic machine is developed to reduce the time and effect required for production up to a great extent; also, the machine manufacturing cost is less as compared to others. (3)

D. **Dr.V.Jayaseelan, et.al, "Design and fabrication of battery operated weeder machine" IRJET, Volume: 07 Issue: 05 May 2020:** The Weed removal machine is built to be compact and efficient to cut the weeds. The machine was tested on a field to check its weeding capability and efficiency. The test results were successful as the machine performed flawlessly. The efficiency of weeder is satisfactory and it is easy to operate. It was faster than the traditional method of removing weed. Less labor needed and it is more economical than hand weeding. Here do not use any fuel and power.

PROBLEM DEFINITION:

Weeding is a crucial agricultural unit operation. Weed could be a plant that's thought of undesirable in an exceedingly explicit scenario, it's primarily "a plant within the wrong place". They sharply vie for water, nutrients and daylight, leading to reduced crop yield and poor crop quality. For example, a plant could also be valuable or helpful during a garden, or on a farm or plantation however if a similar plant is growing wherever it reduces the worth of agricultural manufacture or spoils aesthetic or environmental values, then it's thought of a weed. The key drawback is that the weed grows at the side of the crop; Weed takes advantage of the nutrients, the crop becomes weak and therefore the weed gets strength.

Delay and negligence in weeding operation have an effect on the crop yield by up to thirty to sixty per cent.

In vegetables crop production, weed management is extremely essential and is taken into account one amongst the foremost troublesome tasks in agriculture. Also, Manual weeding needs higher level labor input and additionally terribly tedious and time intense method, the supply of labor is additionally major issue in agriculture it's terribly troublesome to get rid of the unwanted plant by manual weeding and bullock power.

METHODOLOGY:

We initially, we constructed the frame by using mild steel hollow square pipes. By welding these square hollow pipes, we bring a shape for agriculture weeder.
The DC motor is mounted on the front side of the weeder by using nuts and clamps.
Circular pipe is welded at the rear end of the frame, a switch is provided on the handle.
To make this weeder comfortable and friendly we constructed and introduced the sliders for easy height and length adjustments based on the height of the operator.
Two wheels are attached to the frame for easy movement in desired direction.
The battery is mounted between the handle and motor to reduce the burden on the operator, Battery is mounted at the center or in between the handle and motor.
A collector in constructed and welded at the bottom of the frame to collect the weeds and waste materials.

COMPONENTS:

12V BATTERY:

A battery is a device consisting of one or more electrochemical cells with external connections for powering electrical devices such as flashlights, mobile phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal.

12V DC MOTOR:

A switch is an electrical component that can disconnect or connect the conducting path in an electrical circuit, interrupting the electric current or diverting it from one conductor to another. The most common type of switch is an electromechanical device consisting of one or more sets of movable electrical contacts connected to external circuits.

When a pair of contacts are touching, a current can pass between them, while when the contacts are separated, no current can flow.

KNAPSACK PUMP:

It is operated by a battery which create a pressure difference in which pesticides and liquid is forced through nozzle in fine droplet form. The pressure of this sprayer approximately 7 kg/sq cm. and capacity of storage tank is less than 20 liters.

BEARING:

A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Most bearings facilitate the desired motion by minimizing friction.

SWITCH:

A switch is an electrical component that can disconnect or connect the conducting path in an electrical circuit, interrupting the electric current or diverting it from one conductor to another.

MS SQUARE HOLLOW ROD:

Square hollow sections (SHS) are another popular type of structural steel tube that's kind of a middle-man between RHS and CHS in terms of attributes, appearance and structural behavior. SHS features a flat surface that's also economical for joining and welding, with clean lines and minimal edge preparation required.

SHAFT:

A rotor shaft or axletree is a central shaft for a rotating wheel or gear. On wheeled vehicles, the axle may be fixed to the wheels, rotating with them, or fixed to the vehicle, with the wheels rotating around the axle. In the former case, bearings or bushings are provided at the mounting points where the axle is supported.

NUT & BOLTS:

A nut is a type of fastener with a threaded hole. Nuts are almost always used in conjunction with a mating bolt to fasten multiple parts together. The two partners are kept together by a combination of their threads' friction, a slight stretching of the bolt, and compression of the parts to be held together.

A bolt is a form of threaded fastener with an external male thread requiring a matching pre-formed female thread such as a nut. Bolts are very closely related to screws.

NOZZLE:

A spray nozzle is a precision device that facilitates dispersion of liquid into a spray. Nozzles are used for three purposes: to distribute a liquid over an area, to increase liquid surface area, and create impact force on a solid surface.

CONSTRUCTION:

Assembly of machine consist the mounting of motor on the frame & chassis is mounted on wheel. Then the motor is assembled on chassis by using nut, bolt & somewhere by weld.

Manufacturing of motor includes following procedure Blades are cut by grinding cutter &bending of blade is done manually. These blades are attached with the frame by adjusting setting.

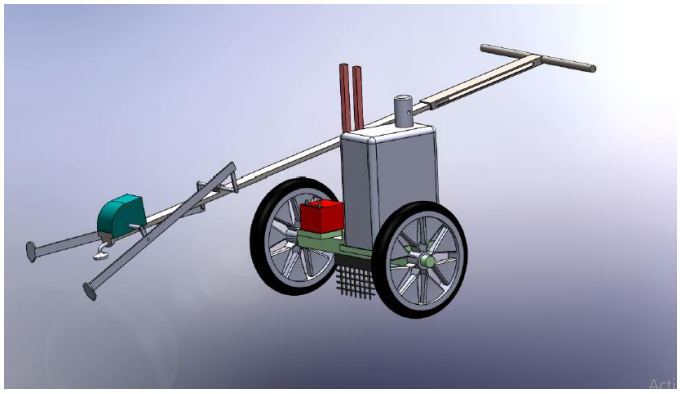
Two wheels are fitted below the wiper motor. Fitted by nut & bolt

Circular pipe is used for the handles with required dimensions & switch is fitted on handle & connected to battery by using wire.

Switch & electrical connections are made for on/off the engine & Switch is mounted on handle of machine.

Knapsack pump is used as a spraying device which is operated via battery.

DESIGN:



WORKING:

The Weeder stands on two wheels placed parallel to each other. To move the equipment, some amount of pushing force is to be given by the operator. The direction of the weeder can also be controlled with the handle.

The DC motor is used in this machine which is powered by 12volt battery. A switch is mounted on the handle to turn the motor on/off. Battery is placed on the right side of the frame which is fixed on the shaft.

Two links with blades on their ends are attached to the motor. Double Crank Mechanism is used to transfer rotary motion to the blades from the motor. These blades help to remove weed from soil.

When the operator tilts the machine forward & turns the motor on, the blade touches the soil surface. When sufficient force is given in the downward direction, the blade gets into the ground. With the help of rotary motion weeds are removed from the soil.

The weeder also acts as a tiller. It plows the top surface of the soil by doing so. A collector is placed below the shaft to collect the removed weed.

Knapsack Pump is used to spray pesticides; it is placed on the left side of the frame which is fixed on the shaft. Battery is pre-installed inside the pump which helps to operate the pump.

Nozzle is placed at the front of the weeder to spray pesticides.

COSTING:

Components	Price (in Rupees)
12 volt DC motor	3000rs
12 volt battery	3000rs
Knapsack Pump	2500rs
Wheels	900rs/piece
Bearing	400rs/piece
MS rod	60rs/kg
MS square hollow rod	50rs/kg
Nut & Bolts	60rs/kg
Total cost of components	**Approx.12,000/-**

The above-mentioned cost excludes the cost of fabrication & miscellaneous cost.

COMPARISON:

Sr. no	Factors	Battery Operated Weeder	Current Existing Weeder
1	Design	Simple	Complex
2	Weight	Light	Heavy
3	Power source	Electricity	Fuel
4	Noise & Vibration	Less	More
5	Time required	More	Less
6	Sprayer	Present	Absent
7	Maintenance cost	Less	More
8	Overall cost	Less	More

CONCLUSION:

Agricultural development plays important role as a driver of rural poverty reduction. The effort requires to develop a weeder will meet the demand of farmers.

The efficiency of weeder should be satisfactory and itis easy to operate. It was faster than the traditional method of removing weed. Less labor needed and it is more economical than hand weeding.

Here do not use any fuel for this operation; hence maintenance cost is very less. Cost of weeding by this machine comes to only one-third of the corresponding cost by manual laborers. The fabrication of low-cost weeder is done with locally available material.

The overall performance of the weeder was satisfactory.

REFERENCES:

1. Sarang A. Bhongade, et.al, “Battery Operated Weeder & Sprayer” IRJET, volume:06 issue:03 march 2019
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