

DESIGN AND FABRICATION OF MULTI-PURPOSE AGRICULTURAL MACHINE

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ABSTRACT:- Now a days farming sector is getting more and more advanced day by day. Various machines are made to ease the farming processes, to use less human effort and get more output. The main purpose of this project is to combine and perform some of the farming operations and reduce the effort and time required to perform those operations. The machine combines operations like Weeding, Seed sowing, Pesticide spraying, Canal making and tilling. Weeding operation is used to remove unwanted plants and grass that grows around the main crop, Seed sowing operation is used to plant the seeds in a row and at a particular distance in the farming field, Pesticide spraying operation is used to spray the pesticides over the plants to protect the crops from weeds, fungi and insects, Canal making is the operation in which canals are made along the length of the farm to make the water flow along the canal to supply the water to the crops, Tilling is the agricultural preparation of soil by mechanical agitation of various types such as digging, stirring and overturning. Each wheel of the machine is connected with a motor with a chain and sprocket mechanism, which is connected to a battery to drive the motor.

Keywords —Multi-Purpose, Weeding, Pesticide Spraying, Canal Making, Seed Sowing, Tilling machine.

I. INTRODUCTION

Agriculture is the most renowned occupation in many developing nations such as India, Brazil, etc. One major reason for lesser growth of crops in agricultural area is weeds. Weeds compete with the crops for nutrients, space, light and water. Weeds cause significant losses in vegetable crops and cash crops such as sugarcane. Most of the population in developing nations depends on farming and agro-based industries and businesses. The labour required for weeding can be reduced by using mechanical hand weeders. Sowing is the process of planting seeds into the soil. Pesticides are the chemicals that are meant to control pests. A Canal or Ditch is a small passage to circulate the water flow between the crops. Tilling is the process of stirring of soil before farming.

So as to minimise such losses in farming we have proposed “Multi-Purpose Agricultural Machine”, where following operations can be performed like,

1. Tilling.
2. Canal Making.
3. Seed Sowing.
4. Pesticide Spraying.
5. Weeding.

TILLING: -

A Tilling process is the agricultural preparation of soil by mechanical processes of various types such as digging, stirring and overturning.

CANAL MAKING: -

A Canal is a small passage to guide water flow in between the pants. A canal can be used to circulate water to the farm and for drainage, or to channel water from a more distant source for plant irrigation. Canals are commonly seen around farmland, especially in areas that have required drainage.

SEED SOWING: -

Seed sowing is the process of plantation of seeds into the soil. An area or object that has had seeds planted in it will be called as sowed. In sowing, generally the depth in which the seed is to sowed should be two to three times the size of the seed.

PESTICIDE SPRAYING: -

Mechanical sprayers are one of the most common forms of pesticide application, mostly in conventional agriculture. A hydraulic sprayer contains the following components: tank, pump, control valve, power source, nozzle and support frame. A mixture of pesticide formulation which contain water and chemical can be turn into large rain type drops or tiny almost –in small particles with the help of sprayers.

WEEDING: -

Weeding is the process of removal of weeds. Weeds are the plants that steal the nutrients, space, light and water required by productive crops. Weeds can be tasteless and poisonous as well as reduce the production of crops. In agriculture weed control is important. In order to contain these plants many strategies have been developed and processed. Method includes removing of unwanted plants (weeds) surrounding the plants.

II. PROBLEMS FOR SELECTING THE PROJECT

- Requirement of different machines for different operations.
- Large amount of investment required by farmers for the different operations.
- Required more man power for the operations.
- Also more amount of time required for performing individual operations.

III. SCOPE OF PROJECT

Multi-Purpose Agricultural Machine mainly concentrates on the problems faced by the fellow farmers during farming, such as Tilling, Canal Making, Seed Sowing, Pesticide Spraying and Weeding. The project should make a revolution in small farming sectors in India, as well as more efficient and cost reducing for farmers.

IV. LITERATURE REVIEW

- Combined Tillage Tools: A Review

Manjeet Prem, R. Swarnkar, D.K. Vyas, S.J. Pargi and B. C. Khodifad, from this paper we have studied the section of design and development of tilling tool. The paper contains the various parameters considered like soil conditions, draft requirement, etc.

- Fabrication of Automatic Pesticides Spraying Machine
Dhiraj N. Kumbhare, Vishal Singh, Prashik Waghmare, Altaf Ansari, Vikas Tiwari, Prof. R.D. Gorle. In this paper we have studied about the various pesticide spraying components.

- Design and Fabrication of Seed Sowing Machine.
Thorat Swapnil, Madhu Kasturi, Patil Girish, Patil Rajkumar. The following paper gives a detailed description of various major parts used in the seed sowing machine.

- Development of rotary weeder blades by Finite Element Method
Mr. Mahesh Gavali, Mr. Satish Kulkarni. In this research paper we studied about the blade design, blade geometry and the changes made in blade design.

V. BASIC DESIGN OF CONCEPT

The concept is to design a project for the poor fellow farmers and perform all the multiple functions for a cheap cost as compared to the other agricultural machines. Mechanism of the machine is very simple. For the machine no skilled person required. So, that for more efficient in small scale farming.

Operations

- | | |
|-----------------|-----------------------|
| 1) Tilling | 4) Pesticide spraying |
| 2) Canal Making | 5) Weeding |
| 3) Seed Sowing | |

VI. CONSTRUCTIONAL DETAILS

Multi-Purpose Agricultural Machine consists of following components

- 1) Main frame,
- 2) Wheel,
- 3) DC Motor,
- 4) Chain sprocket,
- 5) Sprayer(Nozzle),
- 6) Pesticide tank,
- 7) Pump,
- 8) Hopper,
- 9) Seed Sowing tool,
- 10) Switches,
- 11) Weeding tool,
- 12) Canal making tool,

- 13) Tilling tool,
- 14) Handle,
- 15) 2 12V Batteries.

The machine consists of a main frame on which other components of the machine reside. The main frame is made up of MS angle bar. The main frame is attached with the wheel by a slider mechanism for height adjustment of the main frame, near the wheel shaft DC motor is fitted and wheel shaft and motor shaft is connected by chain and sprocket mechanism. The DC motor is a high torque and low RPM motor. Two batteries of 12V each are used to run the DC motor and pump.



On the base of main frame other components are placed such as Pesticide tank of 5litre capacity, Hopper, Batteries. A DC pump is attached with the pesticide tank and the outlet of the pump is attached with the Nozzle or Sprayer by pipe. Hopper and seed sowing tool is attached together. Switches are used to operate DC motor and DC pump. Other tools are used to perform various operations such as weeding blade for weeding operation, tiller for tilling and canal maker for canals, these tools are attached using tool holder attached to the main frame. And a handle is attached to guide the machine.



VII. EXPERIMENTAL SETUP

All operations performed on farming land
For Tilling:



Picture: Tilling tool

The tilling tool used for operation is fixed, the number of blades used in the is four and each blade is bent at an angle of ‘‘

For Seed sowing tool:



Picture: Seed sowing tool

The seed sowing tool is made up of high speed steel rod and plate, fixed using nut and bolt to the machine. The tool makes the passage and guides the seeds into the passage.

For Pesticide sprayer:



Picture: Pesticide tank, DC pump, Nozzle

The pesticide tank is a 5litre tank with a pump attached to the base of the tank, and the outlet of the pump attached to a nozzle via pipe.

For Weeding:



Picture: Weeding tool

A weeding tool is a one sided sharpened tool which during operation cuts through the weed roots and thus removes the weeds.

VIII. ADVANTAGES

- Multiple operations can be performed on a single machine.
- Number of machines required for the multiple operations can be eliminated.
- Cost of operation can be reduced.
- Every farmer can afford this machine.
- Labour requirement and labour cost is also reduced.

IX. APPLICATION

- To be used in small scale farming.
- Tilling and canal making for any type of crop soil.
- Seed sowing for specific crop seeds.
- Can be used up to 2.5 feet height of plants for weeding and spraying operation.

X. CONCLUSION

Hence, we designed multi-purpose agricultural machine and fabricated it and tested it to help fellow farmer to perform five different operations in a single machine by changing blades attachment. The tools are held by nut and bolt joint. And also non skilled farmer can perform operation. Hence it is useful in small scale farming sector.

REFERENCES

- Mr. Mahesh Gavali , Mr. Satish Kulkarni, **Development Of Rotary Weeder Blades**, International Journal Of Scientific Research Engineering & Technology (Ijsret), Issn 2278 – 0882, Volume 3, Issue 6, September 2014.
- Suraj V Upadhyaya, Vijaya Vittala Gowda G,Poojith M B, Vikranth Kumar K, **A Review On Agricultural Seed Sowing**, (An Iso 3297: 2007 Certified Organization), Vol. 6, Issue 4, April 2017.
- Nitish Das, Namit Maske, Vinayak Khawas, Dr. S. K. Chaudhary, **Agricultural Fertilizers And Pesticides Sprayers**, Ijirst –International Journal For Innovative Research In Science & Technology| Volume 1 | Issue 11 | April 2015.
- <https://en.wikipedia.org/wiki/Weedingblades>.
- <https://en.wikipedia.org/wiki/Pesticidespraying>.
- https://www.ijirset.com/upload/2017/april/267_76_A%20review%20_3hard.pdf.
- <https://www.grc.nasa.gov/www/k-12/rocket/nozzle.html>.
- <http://www.ijirst.org/articles/ijirstv1i11016.pdf>.