Three In One Agricultural Equipment

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Abstract- Seventy percent of people in India, an agricultural nation, rely on agricultural output. However, we can see that as the population grows, farmland are divided among families, which is why Indian farmers typically hold just two acres of land. [5] In essence, many Indian farmers also use oxen in their operations. The energy requirements of agriculture in comparison to other nations worldwide will not be met by this. Therefore, we believe that modern machinery that is tailored to small farms from an economic and effort perspective can replace the labor of humans and animals. As a result, we are creating this equipment to satisfy all of these requirements and fix the work issue. Therefore, in order to meet all of these needs and resolve the job issue, we are developing this equipment. This project also saves time, which is a crucial component of farming, according to the project design. Developing this model and integrating activities results in increased efficiency at a lower cost and time.

INTRODUCTION

Agriculture plays a crucial role in the global economy, but small and medium-scale farmers often face challenges due to high operational costs and the inefficiency of traditional farming equipment.[6] The project titled "Three in One Agricultural System" aims to address these issues by designing and developing a single piece of equipment that integrates three essential farming operations: spraying, grass removing and fertilization. This equipment seeks to provide an affordable and efficient solution that can help reduce costs, increase productivity and saves time.

Three in One Agricultural System has been gaining attention due to its potential to enhance efficiency and productivity in farming operations. Traditional farming systems rely on different machines for specific tasks like spraying grass removing and fertilizing. According to a study by “Design and Fabrication of multipurpose International farming Journal of equipment” [1], multi-functional equipment reduces the need for multiple machines and labor, allowing for more streamlined operations. This finding supports the premise of the "Three in One Agricultural System" project, which aims to integrate three critical functions into one machine.

The development of low-cost farming equipment will significantly benefit small and medium scale farmers by reducing operational cost.[5] This project aims to enhance the sustainability and efficiency of farming practices, contributing to better livelihoods for farmers and a healthier environment.

The objectives of the project are as follows:

1. Design and develop affordable farming equipment.
2. Increase efficiency and productivity.
3. Decrease maintenance.
4. Improve timeliness and labor management.II.

METHODS AND MATERIALS

1. Identification of Topic
2. Literature survey
3. Preparing synopsis
4. Design of prototype
5. Fabrication of prototype
6. Testing of prototype
7. Collecting feedback from farmers
8. As per feedback and testing modifications in prototype
9. Final testing of prototype
10. Feedback from farmers
11. Result and Final Report Writing.

A. Figures and Tables

Materials:

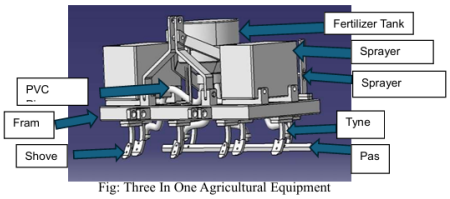

Fig: Three In One Agricultural Equipment

Sr. No.	Material	QTY
01	Sprayer Tank	02
02	Rubber Hose Pipe	04
03	PVC Hoses	03
04	Sprayer Nozzle	02
05	Cultivator Shovel	02
06	Cultivator Panja	03
07	Cultivator Pas	01
08	C Type Frame (4ft*1.5ft)	01
09	Tynes	07
10	Plastic Bottle 20ltr	01
11	DC Motor Pump	02
12	Battery 12V 12AH	02
13	MS Angle	01

Table : Materials Required

RESULTS CALCULATIONS

Refill Calculations: By considering actual liquid spraying ratio given by farmers,

A 16-litre sprayer tank is refilled 10 times to spray 1 acre,.

Total spray volume required = 16 × 10 = 160 litres Now, by using two 20-litre tanks: Each refill with both tanks = 20 × 2 = 40 litres

Total number of refill rounds needed = 160 ÷ 40 = 4

Refill the two 20 liters tanks 4 times to cover 1 acre area.

Flow Rate of 4 Hole Nozzle:

Flow rate depends on nozzle size, pressure, and the liquid type.

Typical values for a 4 hole nozzle at 3 bar pressure: Flow rate per hole ~ 0.4 L/min (average) - Total flow rate ~ 0.4 × 4 = 1.6 L/min

Approximate Table:

Pressure (bar)	Flow per Hole (L/min)	Total Flow (L/min)
2	0.35	1.4
3	0.40	1.6
4	0.45	1.8

Table: Flow of Nozzle (L/min)

Time to Empty 20 liter tank at 3 Bar:

Given: Flow rate at 3 bar for 4 hole nozzle = 1.6 L/min,

Tank volume = 20 liters

Agricultural Sprayer Pump Calculations Time = Volume ÷ Flow Rate = 20 ÷ 1.6 = 12.5 minutes

It will take approximately 12.5 minutes to empty a 20 liter tank

i.e. If sprayer tank is full it will cover one guntha (0.25 acre) land.

And, about fertilization tank it will depend upon the nozzle opening, According to the practicals i.e. testing if nozzle is 25% opens then it will cover approximately 15 guntha (0.375 acre) land.

SCOPE OF STUDY

The scope of the "Three in One Agricultural System" project focuses on designing, developing, and evaluating a multi-functional piece of farming equipment that integrates three key agricultural operations: spraying, grass removing, and fertilization. This study will target small and medium-scale farmers, with the goal of creating an affordable machine that reduces operational costs, labor intensity.

Key areas covered in this study include:

1. Design and Development: The project will explore theengineering and design principles required to develop a machine that performs multiple functions in a compact, cost-effective form. Emphasis will be placed on ergonomics, ease of use, and adaptability to various farming conditions.
2. Cost and Maintenance Reduction: The project will focus on creating an affordable solution with minimal maintenance requirements, aimed at lowering the overall cost of ownership for small-scale farmers.
3. Testing and Evaluation: Prototype machines will be tested in real agricultural environments to assess their performance, efficiency, durability, and ease of use. Feedback from farmers will be gathered to refine the design and functionality.
4. Impact on Productivity and Labor Efficiency: The study will examine the effects of the three-in-one system on farm productivity, including the reduct
5. of labor requirements, timeliness of operations, and improvements in crop yield.

The findings of this study will help establish the feasibility and benefits of the "Three in One Agricultural System" for small-scale farmers, guiding further development and potential commercialization.

CONCLUSION

From this project we designed and developed affordable farming equipment named “Three In One Agricultural Equipment” which minimizes efforts of farmers. It will definitely help to reduce labor dependency, increases productivity, decreases machine maintenance and the important factor which is affordable which are our objectives. So by ending with the successful testing we have concluded that our objectives are fulfilled.

DISCUSSION

According to the results we got, Three In One Agricultural Equipment is one of the helpful equipment to farmers. It help farmers to integrate three different operations simultaneously. Which will definitely help them to reduce labor dependency, increases productivity, decreases machine maintenance and the important factor which is affordable.

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