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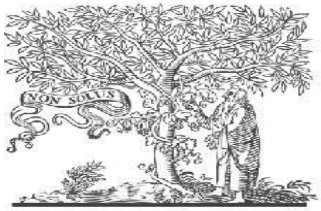

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Multi-Functional Agricultural Machine using IoT

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***Abstract*— In India, where over half of the population relies on farming for livelihoods, many farmers still use manual methods and animals for agriculture due to financial constraints preventing access to modern equipment like tractors. To address this challenge, an advanced mechanized solution tailored for small-scale farmers is developed.**

The model integrates multiple farming operations such as vegetable harvesting, pesticide spraying, and weeds plucking into a single multipurpose machine. This innovation aims to alleviate physical strain and inefficiency associated with manual and animal labor, ultimately enhancing agricultural productivity and livelihoods.

Keywords—multi-purpose agricultural machine, small farmers, economical equipment, easy and fast production.

I. INTRODUCTION

Numerous people in India depend on farming for their livelihood and it's one of the key diligences is farming. It's being a predominant occupation in India in old times and plays a significant role in the development within frugality of our nation. The chines for food product in India are growers. Substantially Indian growers depend on two styles of civilization, one is through traditional ways and other is through advanced ways using instrument. Traditionally, agriculture is done by mortal being with the help of bullock wagons, tractors etc. In new-fashioned technology, the main problem in farming field includes lack of labor vacuity, lack of knowledge regarding new technology, increase in labour payment, loss of seeds and further destruction in water. To overcome all these disadvantages a machine for farming has been developed. The main design of this farming machine applies robotization in farming field. The farming machine efficiently performs vegetables harvesting, weeds plucking and pesticides sprinkler by using IoT technology. Generally, accomplishment of any crop involves numerous functions like harvesting, sowing, and irrigation. Farmers mostly use traditional ways and labors for carrying out these functions, our purpose is to combine all the individual tools to deliver farmers with multipurpose outfit by a single machine. By using both mortal and carnal power, it takes a long period for refinement. So, this multipurpose farming machine is designed and fabricated as multipurpose outfit which is used for farming processes like a harvesting, weeds plucking and pesticide spraying. Using this machine will save time and money while adding crop affair according to the population growth. Machine use could grease farming further snappily and bear lower work from farmers.

II. PROBEM STATEMENT

Traditional farming methods are slow, and require a lot of manual labor, with different tools needed for harvesting, sowing seeds, and irrigation. To tackle this, there's a crucial need for a single machine that can do all these tasks efficiently, saving time and labor for farmers. This multifunctional agricultural machine, aims to streamline farming operations, increase crop yield, and reduce costs. Its adoption could revolutionize farming practices, making them faster, easier, and more economical for farmers. This also prevent the health problems faced by farmers in field work.

III. EXISTING SYSTEM VS PROPOSED SYSTEM

The proposed agricultural machine offers a paradigm shift in farming technology, addressing key challenges faced by farmers in the modern era. By leveraging machine automation, this model enhances efficiency, reduces labour dependency, minimizes resource wastage, and ultimately contributes to the sustainability and profitability of agricultural operations. As compared to

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existing methods, the agricultural machine represents a transformative solution that holds immense potential for revolutionizing the agricultural sector using IoT.

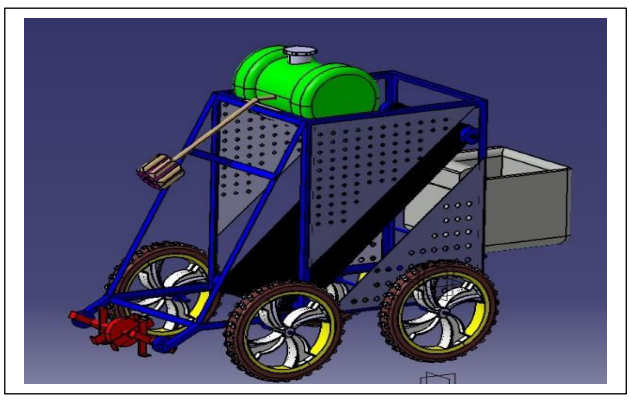
IV. OBJECTIVES

- To design an automatic multifunctional agricultural machine using IoT.
- To perform multiple functions of farming using a single machine,
- To develop user friendly and easy to handle machine.

V. METHODOLOGY

The primary function of this multi-functional agricultural machine is to provide multiple functions that are required in field by farmers. The functions like pesticide spraying, weeds plucking and vegetable harvesting are all done in single machine using IoT. The main components used are Battery, 8 Channel 5V Relay, ESP32 Microcontroller, Motors drives etc.,

The machine contains different switching modes and for each operation one switch mode is given. According to the instruction given the machine operates and completes the function required by farmer. Along with switching modes web app which is runnered through internet is also connected, so that whenever there is an interruption in switching mode web app can lead the function. If web app is also interrupted due some disturbances in Wi-Fi connection, then remote control mechanism can be used.



3D View of the machine is designed using Catia software.

VI. BLOCK DIAGRAM

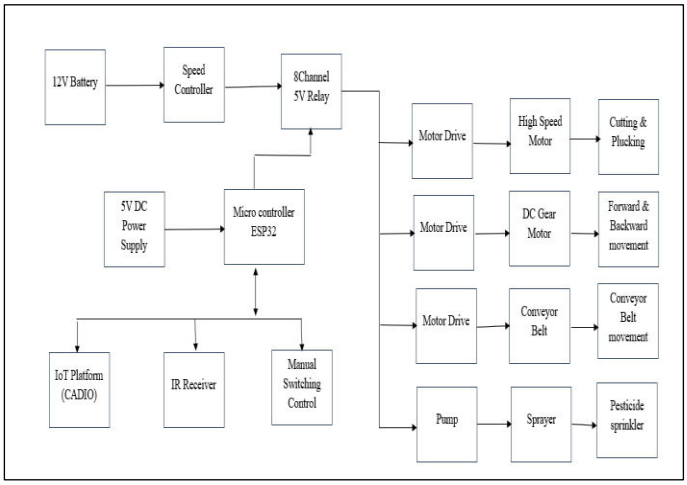


Fig. 3 Block Diagram

VII. COMPONENTS REQUIRED

1. Battery
2. 8 Channel 5V Relay
3. ESP32 Microcontroller
4. Motor Drive
5. Sprayer Pump
6. High Speed Motor
7. Gear Motor
8. Conveyor Belt
9. Weeds Plucker

VIII. SCHEMATIC DIAGRAM

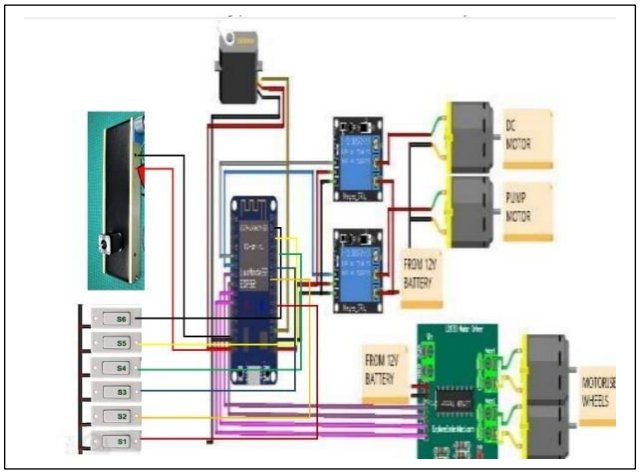


Fig. 4 Schematic Diagram

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IX.TECHNOLOGY USED

This agricultural machine uses IoT technology, which means it can be controlled through the internet. It can be operated by using a web app on phone. The app controls everything the machine does, like moving forwards and backwards, pulling out weeds, spraying pesticides, and harvesting vegetables. Hence, by this technology, the machine can work automatically and do its tasks well without any manual help.

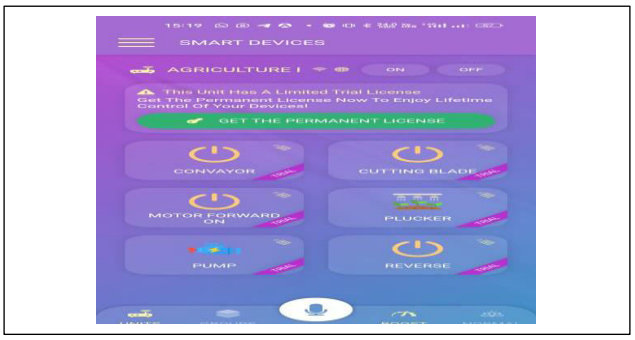

Fig. 5 Internet of Things for smart farming

X. OPERATION OF THE MACHINE

This is a smart farming machine that helps with different tasks like spraying pesticides, harvesting veggies and pulling out weeds. It is controlled by a small computer called a microcontroller, which gets instructions from a user through Wi-Fi. The machine has a motor that powers everything, and it uses different attachments for each job. For example, it has a special tool for spraying water and another for pulling out weeds. There's also a part that harvests vegetables. The machine can be controlled from a distance using remote control and switches for each task. Overall, it's like having a helpful machine for farmer in fields.

XI. RESULTS AND DISCUSSION

- **Vegetable Harvesting**: The vegetable harvesting blade cuts the vegetables from the field, and a conveyor belt helps to move them into a basket. So that the cut veggies are placed in basket. This setup can reduce the back pain that farmers often experience from bending over to harvest crops manually.

Fig. 6 Cutting Blade

Fig. 7 Conveyor Belt

- **Weeds Plucker**: The weeds plucker automatically removes weeds from the fields, helping to keep the fields clear and the crops healthy without the need for manual labour.

Fig. 8 Weeds Plucker

- **Pesticide sprinkler**: This operation utilizes a 12V submersible pump, a 3-liter container, and a funnel attached to it. The container stores both pesticide and water, along with the submersible pump. The pump is linked to a pipe, which is subsequently connected to micro-sprinklers via valves. Through sprinkler it sprinkles the pesticides to the crop.

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Fig. 10 Pesticide Sprinkler

XII. CONCLUSION

The designed model in this project serves multiple functions such as weeds cutting, pesticide spraying, and vegetable harvesting, all consolidated into a single machine. This addresses the needs of small-scale farmers who struggle to afford expensive agricultural equipment. The machine requires less manpower and time compared to traditional methods, thus alleviating some of the challenges faced by farmers. Being IoT-based, the model is cost-effective and efficient, enabling farmers to increase productivity through smart agricultural systems. The project showcases the feasibility and potential of an IoT-based multipurpose agricultural machine, offering various functionalities controlled and monitored remotely through the Internet of Things.

XIII. FUTURE SCOPE

Agriculture holds significant importance in our country, serving as a major market-driven industry that employs a significant portion of the population. Recent advancements in the sector have contributed immensely to economic growth. Innovations such as drones and data-driven technologies have revolutionized farming practices, aiding farmers in enhancing productivity and bolstering the agricultural economy. Drones outfitted with cutting-edge imaging technology provide instantaneous insights into the condition of crops, facilitating prompt corrective measures by agricultural practitioners. Tracking and monitoring of farming activities can be facilitated through the use of cameras, while the integration of solar energy adds further sustainability to the process. These advancements pave the way for the development of smart agricultural machinery, heralding a new era of efficiency and productivity in farming practices.

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