JSRT JOURNAL
JOURNAL OF SCIENTIFIC RESEARCH AND TECHNOLOGY
PAGES: 223-226
06/07/25
VOLUME-3 ISSUE-7 JULY

Solar Based Multipurpose Farming Machine

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ABSTRACT

Today's agricultural field demands to find new ways of agricultural operation to improve performance efficiency. In the field of agriculture various problems are faced by the farmers in the operations like seed sowing, pesticide spraying, weeding. Also, the equipment's used to perform the operations are very heavy. Due to migration of humans in the cities the labor problem occurs. Nowadays robotics technology plays a paramount role in all sections like medical field, industries, and various organizations. In other countries robots are used to perform different operations in the agricultural field. We can make the use of available technologies and the robotics technology in the farming system to reduce the efforts of farmers and to reduce time, energy and required cost. Any autonomous vehicle is going to go wrong at some time and the chance of catastrophic failure should be minimized within the design process. A small light vehicle is inherently safer than the larger one. Redundant, self-checking systems should be built into the system architecture to allow graceful degradation. The vehicle should be in communication with the base station, giving data about current condition and context.

Keywords: Agriculture, solar panel, motor.

I.INTRODUCTION

Our whole economy is based on agriculture. Agricultural field involves the effective production of food, feed, fiber, and other goods for humans and animals. Also, agriculture includes operations like production of cut flowers, timber, fertilizers, animal hides, leather, and industrial chemicals. Heavy material handling is required in the farming operations. For example, in vegetable cropping, handling of heavy vegetables in organic farming, handling of heavy compost bags. As compared to other fields, globalization and development in agriculture field is less. So, it is necessary to make some advancement in this field. Today's agricultural field demands to find new ways of agricultural operation to improve performance efficiency. In the field of agriculture various problems are faced by the farmers in the operations like seed sowing, pesticide spraying, weeding. Also, the equipment's used to perform the operations are very heavy. Due to migration of humans in the cities the labor problem occurs. Nowadays robotics technology plays a paramount role in all sections like medical field, industries, and various organizations. In other countries robots are used to perform different operations in the agricultural field. We can make the use of available technologies and the robotics technology in the farming system to reduce the efforts of farmers and to reduce time, energy and required cost.

In addition, with seed sowing, multipurpose operations such as Leveling & Plugging are also needed. But many problems are faced by farmers during seed sowing operation, like proper adjustment of distance between two crops, distance between two rows. Seed sowing is very basic and paramount operation in the agricultural field. Nowadays seed sowing is done either manually or by tractors. Manual method includes broadcasting the seeds by hand. Sometimes method of dibbling i.e. making holes and dropping seeds by hand is used. Also, a pair of bullocks is used to carry the heavy equipment of leveling and seed dropping. Another method of seed sowing is to use tractor in farms. The heavy equipment's of seed storage and dropping mechanism are attached to the tractor to drop the seeds. A ground wheel is attached at the base of the seed sowing machine. The power transmission system is used to transmit the motion of the rotation to the metering mechanism. The metering mechanism contains number of scoops to drop out the seeds from the hopper.

The seeds are then transmitted in the seed distributor pipes. Flexible and compatible pipes can be used to distribute seeds. With the help of tiller, we can make the land smooth for sowing the seeds. The metering mechanism arrangement can be changed depending upon the nature and the type of seed. Thus, we can perform sowing of the different kind of seeds. But these methods of seed sowing require more time & the man power. Using the present techniques problems of misalignment of distance between seeds and the rows of the seeds occurs.

II. LITERATURE SURVEY

Solar Powered Autonomous Multipurpose Agricultural Robot - Shweta Madiwalar, N. Pruthvi Raj, B. P. Rahul - Outlines a solar-powered robot for seed sowing, grass cutting, and pesticide spraying, using IoT for remote control and machine learning for crop selection, enhancing sustainable farming.

The Multipurpose Solar-Electric Tractor: A Sustainable Solution - M. A. Rafsany, et al. - Introduces a solar-electric tractor for plowing, threshing, and irrigation, emphasizing efficiency, reduced emissions, and the need for cost-lowering incentives.

IoT and Solar Energy Based Multipurpose Agricultural Robot for Smart Farming - Prashant V. Thokal, Amar M. Gajbhiye, K. Sai Prasanna, M. Srilekha - Describes a solar-powered robot with IoT for tasks like seeding and spraying, achieving high accuracy in crop health monitoring using NDVI, reducing costs.

Solar Powered Multipurpose Agricultural Machine - Anonymous - Discusses a solar-powered machine for seeding, spraying, and cutting, designed to improve productivity and reduce fuel dependency for farmers.

Design of a Solar-Based Agricultural Robot - Anonymous - Presents a lightweight, solar-powered robot for tilling, seeding, and weeding, offering cost-effective and eco-friendly solutions for small-scale farmers.

III. OBJECTIVE OF THE PROJECT

3.1 Problem Identification

1. The problem in existing system is that the agricultural land is fully maintained by human. Human power is required for detecting the infected plant, watering the plants. This intern required adequate number of human powers at the land site for frequent monitoring of the land and control of required features.

3.2 Objective of the Project

1. To manufacture a Multi crop cutter operated on solar power for the ease of cutting crops at higher rate.
2. To simplify the complex driving mechanisms used in earlier projects and giving it simple and high working capability.
3. To carry out the complex crop harvesting easily and without emission.
4. To achieve crop harvesting process at low cost.
5. Another objective of the project is to provide additional units for seeding, spraying (fertilizers or water) which are also necessary for a farmer.

IV. METHODOLOGY

4.1 Block diagram

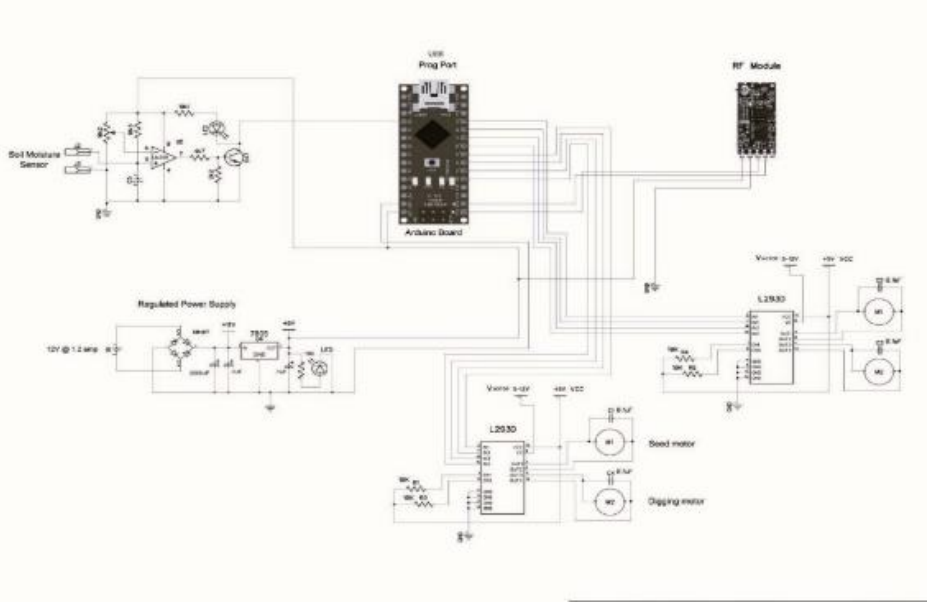

Fig 4.1 Block diagram

4.2 Hardware Requirements

1. Arduino uno
2. Batteries
3. Soil moisture sensor
4. RF module
5. Solar panel
6. DC motor
7. DC motor drive
8. Water pump
9. Servo motor
10. L293D IC

4.3 Working principle

This machine is control by the remote. The moment of the machine is controlled by the remote. when the operator presses the button of remote for running the machine the forward, backward and turning motion, the information is then by the IC built on the machine. The encoded signal is then received by the receiver by the receiver which is mounted on circuit board which is encoded. When we must do the ploughing operation, the plunger is operated by the remote which is been moved down and then the machine is moved in the forward /backward direction then the ploughing is done. For seed sowing operation, seed is fed in the seed tank of the machine, the flow rate of the seed is controlled by the motor which is operated by IC. seed sowing operation is done only in the forward direction. Crop cutter is mounted on the plunger which is used to cut the crop. Cutter used is very sharp and can be adjusted can be according to the height of the crop. This machine moves out the seeds from the brackets attached to it and it will open and close the seeds containers automatically. Even it will do the ploughing process when required no need to change the plougher mechanical section every time as it is required in case of tractors. This machine is a driverless machine as there will not be any driver sitting in the machine to control the movement or the direction in tractors there is a use of a driver to control the movement.

V. ADVANTAGES, DISADVANTAGES AND APPLICATIONS

5.1 Advantages

1. Reducing the risk of electric shocks, deaths due to poisonous creatures in the fields.
2. Watering depends on the moisture level present in the field.
3. Automatic controlling of water pump.
4. It saves water and energy.
5. Fast response
6. User friendly.

5.2 Disadvantages

1. Limited RF Range.
2. Initial Cost is high.

5.3 Applications

1. Ploughing: Preparing the soil for planting.
2. Sowing: Planting seeds in the soil.
3. Weeding: Removing unwanted plants from the field.
4. Spraying: Applying pesticides or fertilizers to crops.
5. Harvesting: Gathering crops from the field.
6. Transportation: Moving agricultural inputs or harvested crops within the farm.

VI. CONCLUSION

This Automated seed sowing Agribot has considerable potential to increase productivity. The chassis handles the complete weight of solar panel, battery and the hardware mounted on Agribot which can perform each operation skillfully and successfully.

The system is beneficial to the farmers for the basic seed sowing operation. The mode of operation of this machine is very simple even to the lay man. Low germination percentage leading to wastage of seeds can be reduced using this system. Creation of gap due to non-germination of seeds can be avoided. Total yield percentage can be increased effectively. Labor problem can be reduced. As compared to the manual and tractor based sowing time, energy required for this robot machine is less. Also, wastage of seed is less. So, this system will be a better option for the farmers who want to perform the seed sowing operation in a well-organized manner.

Any autonomous vehicle is going to go wrong at some time and the chance of catastrophic failure should be minimized within the design process. A small light vehicle is inherently safer than the larger one. Redundant, self-checking systems should be built into the system architecture to allow graceful degradation. The vehicle should be in communication with the base station, giving data about current condition and context.

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