

Solar Pesticide Spraying and Cutting Machine

Aman Kumar Jha*, Anil Kumar Maurya, Kunal Kumar Gautam, Azmal Zamal Rashid, Ankit Singh

*Department of Mechanical Engineering, IIMT College of Engineering, Greater Noida, Uttar Pradesh, India

ABSTRACT

Agriculture is demographically the broadest economic sector and plays a significant role in the overall economy of India. For the growth of Indian economy, mechanization is necessary. The main purpose of mechanization in agriculture is to improve the overall productivity and production. The socio-economic conditions of peoples living in villages of developing countries including India, human muscle power can be good alternative to fulfil the energy requirements for performing many activities like water pumping and grass cutting.

Keywords: Solar Panel, Sprayer, Grass Cutter, Wheel Control.

I. INTRODUCTION

Agricultural sector is changing the socio-economic environment of the population due to liberalization and globalization. About 75% people are living in the rural area and are still dependent on agriculture. Agriculture has been the backbone of the Indian economy. Spraying of pesticides is an important task in agriculture for protecting the crops from insects. Farmers mainly use hand operated or fuel operated spray pump for this task. This conventional sprayer causes user fatigue due to excessive bulky and heavy construction. This motivated us to design and fabricate a model that is basically trolley based solar powered Grass Cutter, Pesticide Sprayer & Lighting System in a single unit. Due to use of solar energy for operating pump & grass cutter, there will be elimination of fuel operated spray pump & cutter by which there will be reduction in vibrations and noise. The elimination of fuel will make our spraying system eco-friendly. Solar powered system can give less tariff

or price in effective spraying, grass cutting & Lighting operation. Solar energy is absorbed by the solar panel which contains photovoltaic cells. The conversion of the solar energy into electrical energy is done by these cells. This converted energy utilizes to store the voltage in the DC battery which used to function whole unit.

II. METHODS AND MATERIALS

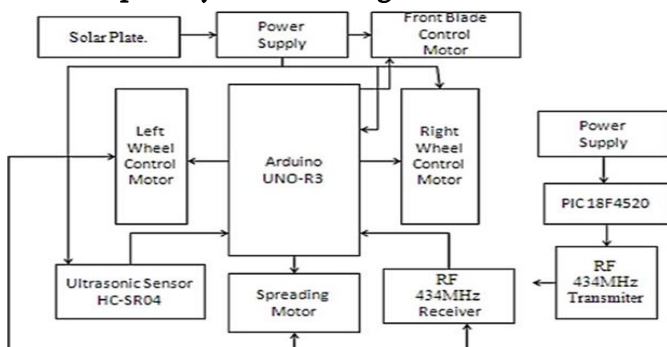
In this project we are fabricating a prototype of the solar powered grass cutter, Pesticides Sprayer & Lighting unit. With the help of a multi operational vehicle, the following objectives can be achieved:

- To minimize human effort in the agricultural field.
- To perform TWO operations (Spraying pesticides and grass cutting) at single time.
- To increase production and save time of farmers.
- No pollution problems.

Farmer can operate this vehicle easily without tiring for long times. In this project the main part is the Arduino UNO R3 which controls the all assembly of project. The user is

with the RF control remote, the user must select that in which mode the system has to operate either it is in manual mode and the auto mode in manual mode the user has to decide that where the robot will move. The blade of the robot is handmade design the motor used for the cutter is the brushless DC motor and it has the rpm of 3500 it operates on 12V DC supply. The battery is source part for the project the battery is supplying the 12V DC for the motor and pump. The charge on the solar plate once the battery is fully charged the robot will move properly. Also, the second application is the pesticide spreading here we use the 12V DC operated pump with the 1.5m length pipe and the spreading nozzle is connected at the end of the pipe. For supplying water to the end and storing pesticide we use the water tank of 2 liter. RF control remote used here has the range of 300ft (100m). In this range the user has to give instruction to the robot. The RF uses the frequency of 434 MHz and we use the encoder and decoder IC at the transmitter and receiver respectively. The ICs are HT12E and HT12D. Also, at transmitter with the encoder IC we use the another IC PIC18F4520 because the encoder IC is the 4-bit encoder but we require the greater than 4-bit control for that we use the PIC18F4520.

B. Proposed system block diagram



III. COMPONENTS USED

A Tmega328P the A Tmega328P is a single-chip microcontroller created by Atmel in the mega AVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core. Atmega328 microcontroller is used in basic Arduino boards i.e., Arduino UNO, Arduino Pro Mini and Arduino Nano. The high-performance Microchip Pico Power 8-bit AVR RISC-based microcontroller combines 32 KB ISP Flash memory with read-while-write capabilities, 1024B EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented Two-Wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.

IV. OBJECTIVE

- To reduce human efforts which in result reduces the fatigue load on farmers.
- To reduce overall time for the agriculture spraying and grass cutting.
- Use of multi-nozzles in order to spray large areas at a faster rate.
- This all operate the mechanical on the trolley with Blue-Stick app.
- The purpose of grass cutter is to avoid energy crisis and human efforts. Also, Solar based grass cutter keeps the environment clean and healthy.
- We need not to take precautions like facemasks and gloves against the hazardous chemicals.
- Easy to operate by unskilled workers.

V. ADVANTAGES

- The pesticide sprayer operates with minimal pollution.
- Low power consumption.
- Non-conventional energy is used for charging the battery.
- Flow from nozzle is continuous and at variable height.
- Power is supplied to motor directly from batteries. Hence there will be no fuel required.
- When solar rays are not available at that time battery can be charged by electric charger.
- Vibration free machine.
- Limited human contact with chemicals.
- Height of nozzle is adjustable.
- Its cost is less than electrically operated pump.

VI. DISADVANTAGES

- Battery is operated up to limited hours.
- Since, sensor and actuators are not employed. So, when there any obstacle comes, manual interference is required.
- Precision of grass cutter blade may reduce due to excessive use.
- In irregular area of land, it can be difficult to operate.
- In rainy days in muddy environment, it can be difficult to operate.

VII. RESULT

The machine reduces human efforts and time since it is operated by android app available easily in any smart phone. The cost is reduced, since it has many features in a single machine. There is less human contact with hazardous chemicals which decreases the health issues and skin diseases. The solar energy is used as power source so the non-renewable energy sources won't be used. The two nozzle sprays more pesticide in both direction at a time. The 2-litre tank

can spray pesticide for approximately one and half hour continuously. The battery is charged through solar panel which works for six hours. Since the machine is operated by the operator, the speed and movement of the machine can control via the Arduino Bluetooth RC.

VIII. CONCLUSION

By doing this project we conclude that, we can reduce the human efforts and this will be helpful for farmer. As it is operated on solar energy so the it is best application that does not affects on environment. This project work has presented progress towards achieving a future precision autonomous farming system. This system is designed to help farmers in reducing their time and energy spent for pesticide spraying and weed cutting. This system will reduce labour problem in future. So, this system will be the best replacement for currently used systems like hand sprayers and tiller mounted sprayers. The performance of the equipment will increase when it is operated on the smooth surface or less uneven surface and it will be more effective when it is used on the crops having nearly similar height and having the less space between two crops.

IX. REFERENCES

- [1]. Rajashekhargoud Angadi, Rohit L G, Satish Changond, Santosh Kagale "Cam Operated Agrochemical Pesticide Sprayer" "International Journal of Engineering research Technology (IJERT)", ISSN No.: 2278-0181 Volume 06, Issue 01 (January 2017)
- [2]. Mr. Abhishek Bhashkar, Mr. Subhash Tiwari & Prof. Prashant "Design and fabrication of multi nozzle wheel spray pump" "International Journal of Engineering sciences and research Technology", ISSN No.: 2277-9655
- [3]. Sharad Phuse, Madhav Jaiwal, Rahul Wayal, Avinash Naphade, Vijaykumar Jadhav "Solar

powered grass cutter and safety pesticide sprayer”
“International Journal of Research in Advent
Technology (IJRAT)”, ISSN No.`: 2321-9637
Special Issue National Conference
“CONVERGENCE 2018”, 09 (April 2018)