Efficiency Improvement Methodologies in the Field of Agriculture

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ABSTRACT

Today's era is proceeding towards the rapid growth of all sectors including the agriculture sector. In order to meet the future food demand, farmers have to implement new techniques which will not affect the field but will increase the overall food production. The comparison between the traditional method and the new proposed machine which can perform a number of simultaneous operations and has a number of advantages. A system with high speed of operation for an advanced automation in agriculture process which includes number of operation i.e. seed sowing, fertilizing and spraying [1]. The main source to drive the model by using solar energy and domestic 230volt supply for purpose of charging the battery. Embedded C language programming is used in microcontroller. The machine is controlled and it monitors the process of system motion of machine with the help of DC motor. The rates of control of seed sowing, fertilizing and spraying are supervised by microcontroller.

Keywords: Microcontroller, dc motor, automation, embedded c language.

I. INTRODUCTION

Indian economy mainly depends on agriculture system and there is very much necessity to make the system efficient. Now a day's population is increasing day by day then there is need of a lot of food crops to satisfied today's population. There is a need of a new technology in agriculture field. Farmers spend lots of money on machines that help them to increase the yield of crops. There are various machines that are available for seed sowing, spraying and fertilizing etc. However these machines have to be manually operated to perform the required operation and moreover separate machine are used for every function. The yield and profit returns from employing this machine are very less as compared to the investment. Automation is the ideal solution to overcome all the above mentioned shortcoming by Creating machine that perform more than one operation and automating those operation to increase Yield on the large scale. Therefore this is the time to automate this field to overcome above mentioned problems, we introduced new technology i.e. DC Motor Based Agri-

Smart Machine. We used non-conventional solar panel to avoid the shortage of electricity to the agriculture field and provided a battery to store a power from non-conventional solar panels. The innovative idea of our project is to automate the process of digging the soil, seed sowing, fertilizing and spraying on the crops seed are automatically done by using dc motor and the distance between the two seeds and flow control by using microcontroller. Also the project consists of sprayer which can be helpful in reducing the wastage of fertilizer. The ON and OFF of the sprayer can be control by microcontroller. When machine reaches the end of the field it can automatically change the direction .This whole process is controlled by microcontroller programming.

II. METHODS AND MATERIAL

A. Solar Power Seed Sowing Machine

This solar powered seed sowing machine basically works on the 'vertical discontinuous work principle'

which refer to the vertical movement which can be followed by an individual body in an agriculture field and implements its discontinuous action in relation to the horizontal line of work[5]. First a hole is drilled with the help of drill land bit. This runs with the help of motor. This is directly connected to the DC battery. This is directly connected to the solar panel through which it gets charged. This motor is controlled by microcontroller with help of which it can be started and stopped and it can control the clockwise and anticlockwise motion of the motor. For dropping the seeds using hopper which is mounted behind the motor and level arrangement is provided on handled when the leaver is pressed seed will be drop automatically from hopper travel into a pipe attached to it and drop in hole. An adjustable iron plate is fitted inside of machine. Which will collect soil and covered the land which is drilled. In this way seed sowing is done with this machine.

Drawbacks:

This machine is operated manually and performs only one operation i.e. seed sowing. System is bulky and in rainy season as the absence of sun the machine will not operate.
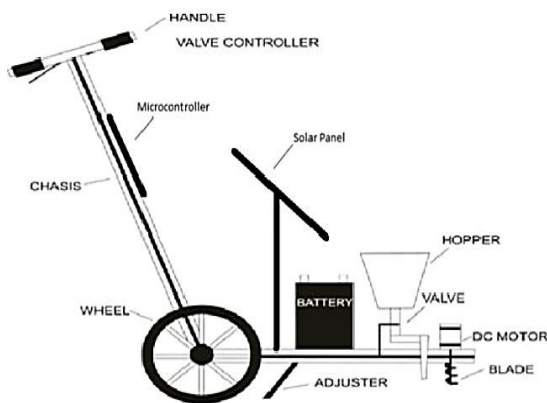

Figure 1. Solar Power Seed Sowing Machine

B. Backpack (knapsack) sprayer

One type of backpack sprayer is a compressed type air sprayer with harness that allows it to be carried on the operator's back [4]. Another type of backpack sprayer has a hand operated hydraulic pump that forces liquid pesticides through hose and one or more nozzles. The pump is usually activated by moving the leaver. A mechanical agitator plate may be attached to the pump

plunger. Some of these sprayers can generate a pressure of 100 pounds per square inch (PSI) or more. Capacity of both these types of backpack sprayer is usually 5 gallons or more.

Figure 1. Backpack (knapsack) sprayer

Drawbacks:

It is operated manually. In these spraying, the labor has to carry all the weight of the pesticides filled tank which causes fatigue to labor and hence reduces the human capacity.

C. Solar E-bot

Solar E-bot means simple eco-friendly agriculture robot, which runs on solar energy. It is a 4 wheeled unmanned vehicle which can move in a linear direction [2]. All the operation i.e. weed removing, fertilizer sprayer and pest controller are work independently. The robot employs mobile application system to guide the robot along the rows and perform the task accurately. The sprayer motor pumps the fertilizer from the tank and sprays both the side of field with adjustable nozzles. The solar energy stored in DC battery which is connected to the robot. The microcontroller control or monitor the operations i.e. weed removing, fertilizer sprayer and pest controller and also control the movement or motion of robot by providing RF signal by user.

Drawbacks:

Absence of sun or rainy season robot will not work. Due to large size of robot it required more space to perform operations.

Figure 3. Solar E-bot

III. RESULTS AND DISCUSSION

1. Proposed Work

A. PV Panel

Solar panel is used to convert sun light into electricity (DC). Solar cell consisting of two layers of semiconducting material (PN type). The working principle of today all solar cells is based on photovoltaic effect means the generation of a potential difference at the junction of two different materials in response to other radiation" A solar cell is a solid state electrical device (PN junction) that converts sun light directly into electricity [3]. The process of conversion first requires a material which absorbs the solar energy (photon) and then raises an electron to higher energy state, leading flow of these high energy electrons to an external circuit. Silicon crystal mostly used material for this process. When the solar panel is manufactured, the PV cells are connected together in series. The output voltage depends upon the number of cell in the series and output voltage depends on the efficiency of the cells and size and area of the cell in the panel.

B. Battery (Seal Lead Acid Battery):

The battery is used to store electrical energy in the form of chemical energy and time of delivering in the form of electrical energy. This battery use store energy to drive the assembly or system.

C. Microcontroller: (89C51):

The microcontroller 89C51 is low power, high performance c-mos, 8 bit controller 40 pins with 4 kb PEROM (programmable erasable read only memory). The microcontroller having four ports namely P0, P1, P2 and P3. Each port having 8 pins i.e.Po1-Po7 similar for all ports. This four ports having 32 pins and they are used as input as well as output ports. In this microcontroller we can write and erase the data or program 1000 times. It has highly flexible and easily interface with computer.

Pin functions:

Pin no.9-   Reset.
Pin no. 18 & 19- $(XT_1 \& XT_2)$
        The crystal oscillator is connected across these two pins and generates clock frequency up to 24 MHz
Pin no. 20-   Ground.
Pin.no.29-   PSEN (Program Store Enable): Which holds external ROM program code
Pin no. 30-   ALE (Address Latch Enable): It is used for de-multiplex the address and data bus.
Pin no. 31-   EA (Enable Access): It is used for store and erase program from memory.
Pin no. 40-   Vcc (+5v) for operation.

2. Advantages of Proposed System Over Previous Model

A. Less hardware involve: This proposed system consist of less hardware as compared to the previous model. Hence it is compact as compared to previous system and make less bulky.

B. Cost efficient: This proposed system has more cost efficient than the previous system this claim is made on the fact that the proposed system does not need the heavy and expensive hardware for implementation.

C. Perform number of operations: This proposed system is performing number of operations as compared to previous system. The previous system does not perform more than two operations and

proposed system performs more than two operations i.e. digging, sowing, fertilizing, spraying etc.

IV. CONCLUSION

In this project we have made an effort to overcome some problems in agriculture field and reduce the investment cost and increase the profit and food production. By implementing this project in the field of agriculture we can help the farmers at the initial stage of agriculture i.e. digging, seed sowing, fertilizing and spraying. This project is very useful for the farmers who are intended to do agriculture activity but facing the serious problems.

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