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Design And Analysis of Solar Powered Automated Green House

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Abstract

Modern agriculture uses different types of greenhouse system. The production of healthy crops and improved quantity can be succeed through greenhouse system. The growth of plant is controlled by the environmental conditions like temperature, humidity and moisture. Through this system we are able to protect the crops from insects, inevitable weather conditions and disease. The green house will be reduce all the shortcomings for unhealthy seasonable crops and power consumption possible by using solar power in it. The factors that influence the growth of the crops are monitor using suitable sensors. PIC microcontroller will control the optimum conditions inside the green house system.

Keywords: PIC controller, sensors, solar power

I. INTRODUCTION

Modern world is controlled by the automation. It plays a major role to do any processinstead of using human being for a particular job. It increases the financial conditions of the farmers the yield of crops should be increased when the crops scarcity is more. In automating the greenhouse systemOptimum conditions to the crop

can be provided toincrease the yield. Alternative power source of solar power is used to avoid the scarcity of power system in field.

II. PROBLEMS IDENTIFICATION

Labour charge in agriculture field has been increased. Farmers have to spend half of their profit to the labours. Lack of fresh and under ground water affects the agriculture production. Educated human resource are not intrested in agriculture because of less profit and continous monitoring in the field. Power consumption is so high and supply is not uniform so it is necessary to adapt alternative power source to save electricity. Irregular maintanance of the crops will affect the results in production of healthy crops and yield. Therefore there is a necessity to automate the field and maintain suitable environment to the crop.

III. PROPOSED SYSTEM

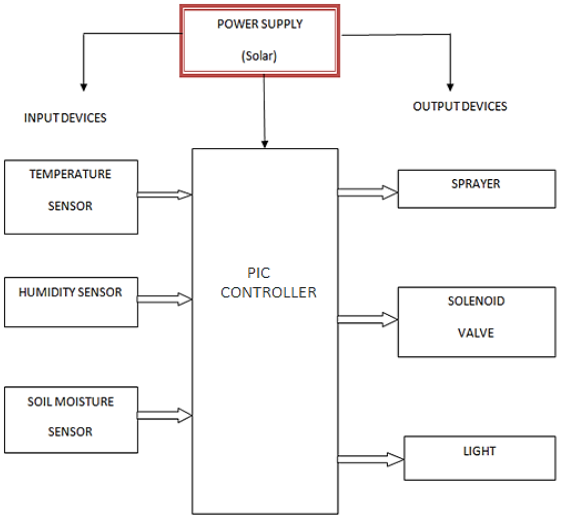

Fig no 1. Block diagram

The design for control unit in automated green house is shown in the above block diagram. The power supply for entire plant is supplied by the solar cells. After the literature results we come to know the factor influenced the crop growth can be temperature,moisture,humidity. For that the sensors are provided in this field. These sensors and solenoid valves along with submersible pump is controlled with help of Peripheral Interface Controller (PIC) microcontroller.

The factors like humidity, moisture and temperature measured by the sensors H7635, BL-5311 and LM35 respectively are connected to the input port of the PIC controller.

The output data from PIC controller is connected to the solenoid valve, light and sprayer.

IV. SYSTEM LAYOUT

The green house field is divided into several portions according to the crops. The submersible pump is inserted into the tank where the water is stored either from well or bore well. The sprayer knob is placed inside the green house at the roof to maintain the humidity. Artificial light is placed at the inside roof of the green house to maintain the temperature. H7635 and LM35 sensors are fixed at the side wall of the green house. BL-5311 is placed in each portion of soil. Solar panel is placed on outside roof of the green house. The separate control unit is placed outside the green house

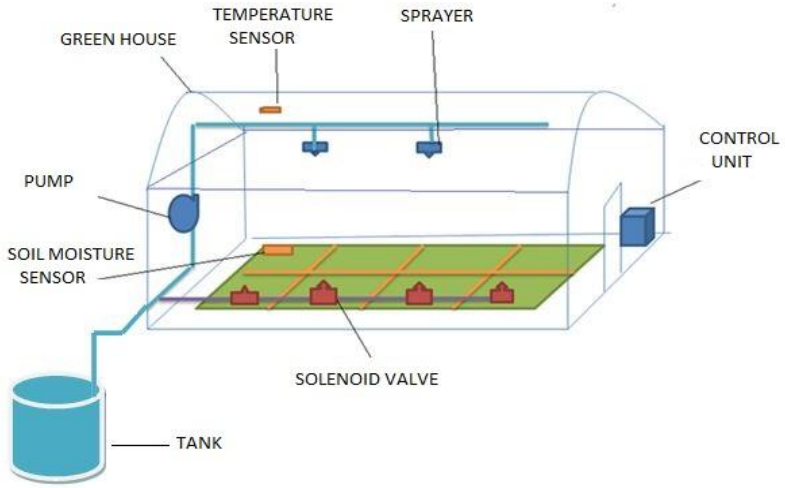

Fig no 2. Layout of green house

V. WORKING

Solar panel is mounted at roof of the green house and it connected to the battery through diode. Battery charged by solar power. Solar panel able to charge 12V and 7Amph. All devices are operated in 12Volt DC supply from battery.

In this system peripheral interface controller (PIC) microcontroller place a major role by controlling and monitoring the green house system. Controller is interfaced with the 16*2 character LCD display. It helps to show parametric values and user can set or reset the values of parameters.

Inputs are connected to I/O ports of controller. Soil moisture sensor is used for measure water content in soil. This is working under the principle of dielectric. Sensor will fix at 3cm depth of soil. When the soil moisture level is low sensor should give signal to the controller and the solenoid valves are actuated through relay. If moisture

level is attained the maximum value solenoid will be stopped. In this method we controlled the required water level for crops.

Humidity sensor is used to measure water content in atmosphere. Humidity level maintenance is important for healthy crops so we controlled humidity by using sprayer. The sprayer is used to spray water in mist form. This will be maintaining humidity. This is maintain a humidity level from minimum to maximum level Sprayer is actuated by submersible pump.

Temperature sensor (LM 35) is used to measure the temperature inside green house. This is used to maintain certain range of temperature inside green house. Whenever temperature rise at high then sprayer is actuated to reduce temperature. If the temperature is low then artificial light will glow to increase temperature. In our project we maintain temperature at optimum level Submersible pump is used to increase discharge of water from tank.

So there is no human resource often required to monitor and irrigate the field. Through maintaining optimum conditions inside the greenhouse yield of the crop is increased

The entire working of the green house is demonstrated through a flow chart given in the figure 3.

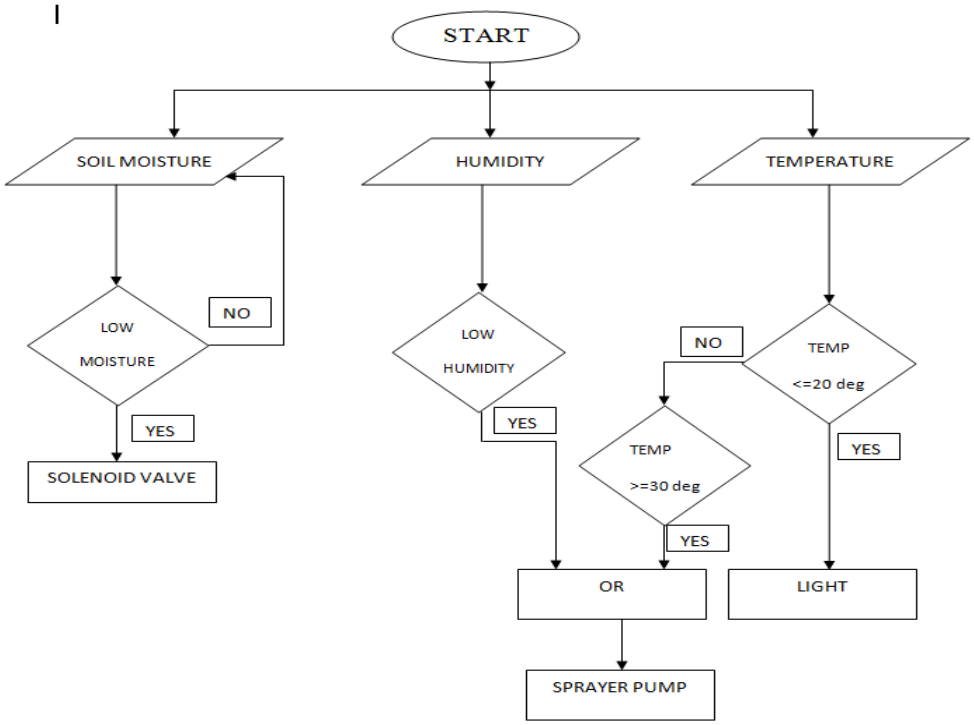

Fig no 3. Flow chart

VI. RESULT AND ANALYSIS

Implementing this technology in the field a farmer is able to produce a yield of 25 to 30 tonnes in quarter acre of land in which the system is implemented. Before implementing this system they were able to produce only 5 to 6 tonnes yield in quarter acre of land. This technology not only reduces the man power it also increases the yield of the crop.

Specifications:

1. Solar panel

   Rated voltage=12v

   Rated current=0.6Ah

2. Battery

   Rated output voltage=12v

   Rated output current=7.5Ah

3. Solenoid valve

   Operating voltage=12v

   Operating current=0.3A

4. Submersible pump
   Operating voltage=12v
   Operating current=0.1A
   Discharge =10L/min

We will obtain 10.8 watts power from solar panel of dimension (440*190*5)mm per hour. We have to install the battery of capacity 90 watts. Battery can be completely re-charged within 8 hours. And we used 2 solenoid valves. Each solenoid valve consumed 3.6watts. So 7.2 watts required for to actuate the solenoid valves. And submersible pump consumes 1.2 watts. And the circuitry consume negligible amount of power.so one complete recharge of the battery is used for 10 hours 45 minutes for continuous usage of pump and valves.

VII. APPLICATION OF THE PROJECT

Increases the involvement of modern people in agriculture.Farmers no need to depend on the electricity.The uniform spread of water to all crops.Decreases the production cost by avoiding labor and power supply. Wastage of water is avoided.Crops get constant and required amount of water.Farmers can concentrate on other business side by side.

VIII. CONCLUSION

The primary applications for this project are for farmers and gardeners who do not have enough time to water their crops/plants. It also covers those farmers who are wasteful of water during irrigation. The project can be extended to greenhouses where manual supervision is far and few in between. The principle can be extended to create fully automated gardens and farmlands. Combined with the principle of rain water harvesting, it could lead to huge water savings if applied in the right manner. In agricultural lands with severe shortage of rainfall, this model can be successfully applied to achieve great results with most types of soil.The greenhouse parameter control system for desired conditions is implemented. The sensor devices available are integrated with Microcontroller board is very useful. The setting needs series of observations and study inter dependency of various parameters, such as temperature, humidity and sun light intensity. Arduino board makes it easy to install and maintain the system. The system deployment in test green house is studied implies need of poly house structures study, inside, outside environment study, crop needs etc. Simply controlling given parameters is not enough. DC supply can be given in the form of a battery bank easy to charge with solar system. There are limitation in terms of seasonal measurements and crop needs. The user awareness of how to check system operation is a basic need to be fulfilled.

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