

# SOLAR POWERED CROP NOURISHING BOT USING ARDUINO

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## **Keywords:**

Crop Nourishing, Solar Powered, NPK Sensor, Soil Moisture Sensor, Automated.

## **Introduction/Background:**

Irrigation is the most important cultural practice and major labor task in daily agriculture sector. By using the concept of modern irrigation system, a farmer can save water up to 50%. The history of the farmer started with intensive cultivation of early-maturing, high yielding varieties without paying much attention to the soil-nutrient status and soil health. Continuous cultivation with inefficient management of fertilizers inputs has resulted in effect on the consumer malnutrition, environmental concerns and decrease in yields-qualitative and quantitative. Automation involves improving the speed of production, reduction of cost, effective use of resources. This method of modernized agricultural system is called 'smart irrigation system' which allows to maximize the field using minimum resources such as water, fertilizers and pesticides. By deploying sensors and mapping fields, farmers can begin to understand their crops at a micro scale, conserve resources and reduce impacts on the environment. Optimum nutritional conditions can vary for different crops and for same crops at different times of their life cycle. The ultimate goal is to minimize the wastage of fertilizer and water and producing the most output with the least amount of water and nutrients in other words, cultivating crop "timely" and "appropriately".

## **Objectives:**

- To design a portable vehicle where it can feed water, manure and pesticides on time to time basics based on crop requirements.
- The ability to conserve the natural resources as well as giving a splendid boost to the production of the crops is one of the main aims of incorporating such technology into the agricultural domain of the country.
- To reduce the wastage of water and fertilizers with respect to crop requirement to grow effectively.
- To increase the crop yielding efficiency.
- To reduce the man handling of available resources by using Arduino.

## **Methodology:**

Agriculture and Gardening works are not trivial. There is a wide range of crops and plants and many varieties of each plant or crop. Various plants and crops have different requirements for water, fertilizers and sun. Soil fertility for any strain or gardening culture is

generally judged by the level of nutrients and moisture in it. A number of times farmers and gardeners are not able to nourish the soil with enough fertilizer or water, while many times only you do it.

Agriculture using automation techniques like Automatic moisture detection and water sprinkling system and fertilizer spray system according to predefined time interval and fertilizer spray cut off due to high or lower pH value than the optimum pH value for healthy plant growth, by this system agriculture can be done efficiently and lead to increase in crop production and quality.

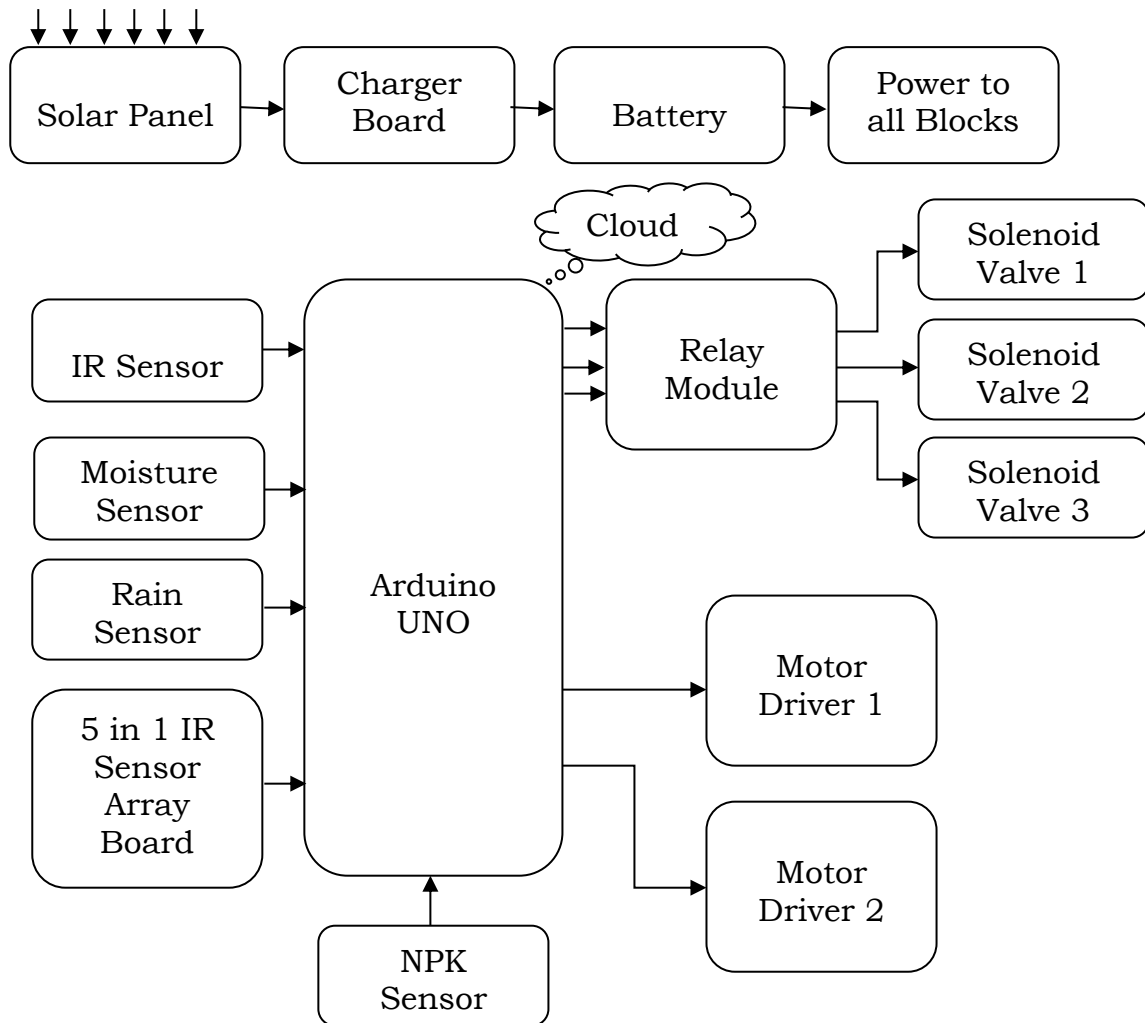
The whole process of irrigation is strictly controlled. The farmer must determine the exact amount of water required by the crop. Too little water will dry out the plants, whereas too much water may damage the root. In addition to watering the crops, irrigation also entails watering the lands before planting seeds to create a favourable habitat for crops. It also needs to be done carefully. Thus, irrigation is a much more complicated process than just watering plants.

### **Working principle & operation:**

The time delay is uploaded in the programme based on requirement of the plant with respect to their water and fertilizer requirements per day are collected and programmed into Arduino using C. The Arduino is controlling the relay operation through switching 4 channel relay modules connected between valves and Arduino. The controller switching circuit of relay module is powered by battery, which is get charge by solar panel. The relay operation is automatic, based on the information given in programmed with time delay. The solenoid valve operation of water is also based on time delay, but during rainy season rain sensor used avoids water being fed from solenoid valve. The information from rain sensor is fed back to the Arduino to stop excess feeding of water to plant. After the process of feeding of water, manure and pesticide the vehicle will move automatically to the next plant through the motor driver and the above process will repeat for further plants aligned in the same line. In the whole process movement of the robot is guided by the output of the IR Sensor.

Firstly, the programme is done at software called Arduino IDE, then interface the programme with hardware. The programme dumped into the Arduino microcontroller. After the incorporate the programme, make the circuit and is energized by the battery, which is get charged by the solar power. The battery is connected to the L298 driver 12V pin and GND. From the 5V output pin connected to Arduino and the 4 motor wheels are connected to 2 ports of the motor. Here, the speed and direction of the motor wheels are controlled by the Arduino programme. The movement of the robot is based on the output of the IR sensor. The Relay module is interfaced with the Arduino by connecting VCC and GND from relay module to 5V pin and GND pin in Arduino. Here, we used the 12V relay module hence, to energize the relay 5V is not sufficient. Also, we connected the solenoid valves and water pump. The pins of the relay are connected to the Arduino. In order to control the flow of water as required by the plant based on the time delay. Similarly, mini water pump for pesticide and solenoid for manure are connected.

## Block Diagram



## Results & conclusions:

- Overcame the problem of lack of workers in agricultural field.
- Obtained uniformity in work.
- Gained the expected quality and quantity of the crop in lower cost.
- High efficiency.

This prototype is designed in such a way that it feeds water, pesticides, manure automatically in the required amount to the plants. Solar panel used here is used to trap the sunlight which in turn is stored as an electrical energy in the battery. This electrical energy is used to power up the entire module.

The IR sensor used in this module is used to detect the obstacle which comes on its way. When the IR sensor senses the obstacle which is termed as plants in this prototype, the vehicle stops its movement and starts its functionalities like firstly testing the moisture content in soil and testing the soils nutrient content using NPK Sensor then pumping of water, manure and spraying the pesticide to the plants based on the requirement.

**Scope for future work:**

- The Automatic portable crop feeding vehicle system can be implemented using Artificial Intelligence Technology.
- By installing the ultrasonic sensors in the tank of sources, it can send the message or give alarm to the farmer when it is being to empty in the tank through GSM and buzzer.
- Also, if the extra power from the solar can recharge another battery and then, it can be used to other domestic purposes to turn on the light in their own houses.