

# **Monitoring and controlling greenhouse environment**

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## **I) Abstract-**

The objective of the project is to build a miniature greenhouse which is equipped with automatic monitoring and controlling system for organic farming. The Arduino used will automatically control the environmental conditions within greenhouse allowing any type of plants to be grown all year round for organic farming, ensuring that it remains at a preset temperature, humidity, light, moisture and water levels.

## **II) INTRODUCTION-**

We live in a modern world where everything can be controlled and operated automatically, but there are still a few important sectors in our country where automation has not been adopted or not been put to a fully-fledged use, perhaps because of several reasons. Growth in the agricultural sector is necessary for the development of the economic condition of the country. Unfortunately, many farmers still use the traditional methods of farming which results in low yielding of crops. But wherever automation had

been implemented and human beings had been replaced by automatic machinery, the yield has been improved. Hence there is a need to implement modern science and technology in the agriculture sector for increasing the yield.

The environmental condition has been a significant effect on plant growth. The greenhouse structure represents both the barrier to direct contact with the external environment and the containment of the internal environment to be controlled. Due to global warming, the environment cycles are changing, affecting the variation of temperature in all regions. Also, water resources are getting depleted. A day is not far off when we have to save every drop of water. In farms, there is a loss of crops due to unawareness of manpower. This needs the farmer's effort to attend it religiously but this does not happen in the real-time without automated control.

Agriculture plays a vital role in the development of an agricultural country. Agriculture has been one of the primary occupations of man since the early civilizations and even today manual interventions in farming are inevitable. In our country, as they can be used to grow plants under controlled climatic parameters which directly or indirectly govern the plant growth and hence they produce. Greenhouse agriculture needs to control the environmental factors to obtain the optimum growth conditions for the crop. Currently, artificial management is the major way to detect and control the environmental factors, wastes lots of

manpower and relatively large monitoring error, affecting the growth of crops. To achieve the intelligent monitoring of greenhouse environment parameters like temperature, humidity, soil moisture and light intensity and keeping the user continuously informed of the conditions inside the greenhouse using IoT technology.

### III) Feature-

The controller used is a low power, cost-efficient chip manufactured by ATMEL having 8K bytes of on-chip flash memory. It communicates with the various sensor modules in real-time to control the light, aeration and drainage process efficiently inside a greenhouse by actuating a cooler, fogger, dripper and lights respectively according to the necessary condition of the crops. An integrated Liquid crystal display (LCD) is also used for real-time display of data acquired from the various sensors and the status of the various devices. Also, the use of easily available components reduces the manufacturing and maintenance costs.

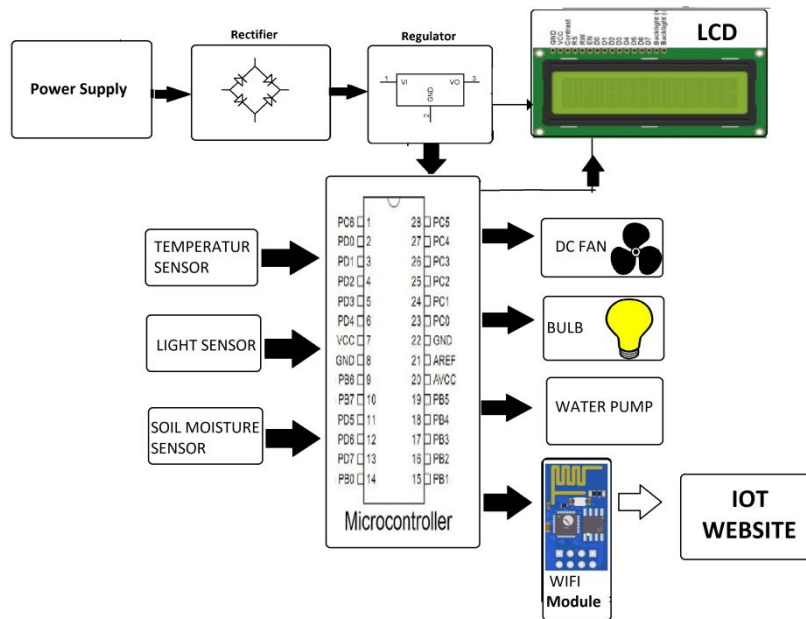
- 1) Detects and maintains the temperature between -40'C to 125'C.
- 2) Detect and maintain the humidity level between 5 %RH and 95% RH.
- 3) Detect and maintain the moisture level in the soil.
- 4) Detect sunlight and artificial light.

5) Continuously update of statistics and parameters over the internet.

#### IV) Components-

- At mega Controller
- WIFI
- Moisture Sensor
- Light Sensor
- Temperature Sensor
- LCD
- DC FAN
- Bulb holder
- AC Pump
- Crystal Oscillator
- Resistors
- Capacitors
- Transistors
- Cables and Connectors
- Diodes
- PCB and Breadboards
- LED
- Transformer/Adapter
- Push Buttons
- Switch
- IC
- IC Sockets

#### V) Block Diagram-



## VI) HARDWARE DESCRIPTION:

### SENSORS:

The word 'sensor' is derived from the word meaning 'to perceive' and 'transducer' means 'to lead across'. This project we are using four types of sensors-

Temperature sensor

Humidity sensor

Light sensor

Soil moisture sensor

### A) TEMPERATURE SENSOR:

Several definitions of temperature have been proposed.

In a layman's language, one could define this as the degree of hotness or coldness of a body or an environment measured on a definite scale. Another simplified definition of temperature is based on its equivalence to a driving force or potential that caused the flow of energy as heat.

### B) HUMIDITY SENSOR

It is known that humidity plays a significant role in every part of the Earth in biology and automated industrial processes. To have a desirable surrounding atmosphere, it is essential to monitor, detect and control the ambient humidity under different conditions ranging from low temperature to high or in mixtures with other gases by precise and provident sensors .

#### C) LIGHT SENSOR:

A light dependant resistor also know as a LDR, photo resistor, photoconductor or photocell, is a resistor whose resistance increases or decreases depending on the amount of light intensity. LDRs (Light Dependant Resistors) are a very useful tool in a light/dark circuits. LDRs can have a variety of resistance and functions

#### D) SOIL MOISTURE SENSER:

Irrigation water management requires timely application of the right amount of water. Competition for water, high pumping costs, and concerns for the environment are making good water management more important. Managing irrigation water needs to combine a method of measuring soil moisture with some method of irrigation scheduling. Measuring soil moisture detects if there is a water shortage that can reduce yields or if there is excessive water application that can

result in water logging or leaching of nitrates below the root zone.

### VII) ADC:

Many of us consider the ADC to be a mysterious device. It can, however, be considered very simply to be the instrument that it is: a device that provides an output that digitally represents the input voltage or current level. Because the analogue-to-digital Converter (A/D Converter or ADC) has both analogue and digital functions, it is a mixed-signal device. Most ADCs convert an input voltage to a digital world, but the true definition of an ADC does include the possibility of input current. An ADC has an analogue reference voltage or current against which the analogue input is compared.

### VIII) RESULTS:

An experiment is done to record the temperature, humidity, light intensity and soil moisture readings in greenhouse. The reason for this experiment is to make sure that the system that was designed is functioning well and the data can be recorded correctly. Advantages of this system are: it is relatively simple to design and install. This is very useful for all-climatic conditions .It is economic friendly. This makes an

increase in productivity and reduces water consumption. This is safest and no manpower is required. Reduces soil erosion and nutrients leaching. May be concealed to maintain the beauty of the landscape, and to reduce vandalism and liability when installed in public.

#### IX) Benefits-

- 1) Arduino constantly monitors and controls the environmental conditions required by the plants to grow.
- 2) The project focuses on saving water , increasing efficiency and reducing the environmental impacts on plants production.
- 3) The user can see the atmospheric conditions of the greenhouse plants and control greenhouse from far away places.
- 4) Reduces labour costs
- 5) Customer will be able to define specific greenhouse conditions.

#### X) CONCLUSION:

Greenhouse prevents the plants from the effects of climate; inspect and so on, which makes great sense for agricultural production. The automation and high efficiency on greenhouse environment monitoring and control are crucial. Applying new technologies to greenhouse is a revolution for protected agriculture



which overcomes the limits of wire connection systems. Such a system can be easily installed and maintained.

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