# Monitoring of Plants in Poly House using Automation

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**Abstract:** Current period has made a major global food inadequacy due to climatic changes in the world. So, in order to overcome this issue, households may need to grow a conservative area of vegetables and other crops using artificial poly houses. Poly house is a controlled area in which plants are grown according to their requirements. Some of the parameters considered during maintaining a poly house are temperature, humidity, soil moisture, air movements etc. This paper describes the technique used to discern the plant disease using NDVI (Normalized Difference Vegetation Index). It is an image processing algorithm, which analyze the condition of plants from their appearance. Determining plant disease manually is challenging, so image processing is used.

**Keywords:** IoT, NDVI, DHT11, Arduino UNO, LDR.

## 1. Introduction

The primary occupation of India is agriculture, where most of the people depend on it. Agriculture gives the major contribution for the economic development of India. The aim of agriculture is not only to feed ever growing population, but it is also an important source of energy and a solution to solve the problem of global warming. There are various ways of developing plants. One of them is poly house. Poly house is the strategy which is used to grow the plants under controlled environment for rising yield and quality of the crops. Poly house uses an ultra violet plastic sheet, of thickness 1501m, which lasts for at least 5 years. It is built using iron pipes or bamboos. In general, the length of poly house is 25-30 feet and width is 4-5 feet. The progress of poly house and growth of crops depends on the internal environment of poly house such as humidity, temperature and soil moisture level. Poly house system monitors ecological conditions, to raise plant development with improved production in least conceivable time, which is one of the major objective of the modern cultivation framework. Automation in poly house provides data acquisition. It also majorly reduces the labour or manpower required for its upkeep. Along these lines making the framework helpful for little scale farmer, plantsman and horticulture analysts. Poly house is optimal solution for proper plant growth and high production of the crop.

**BLOCK DESCRIPTION:**

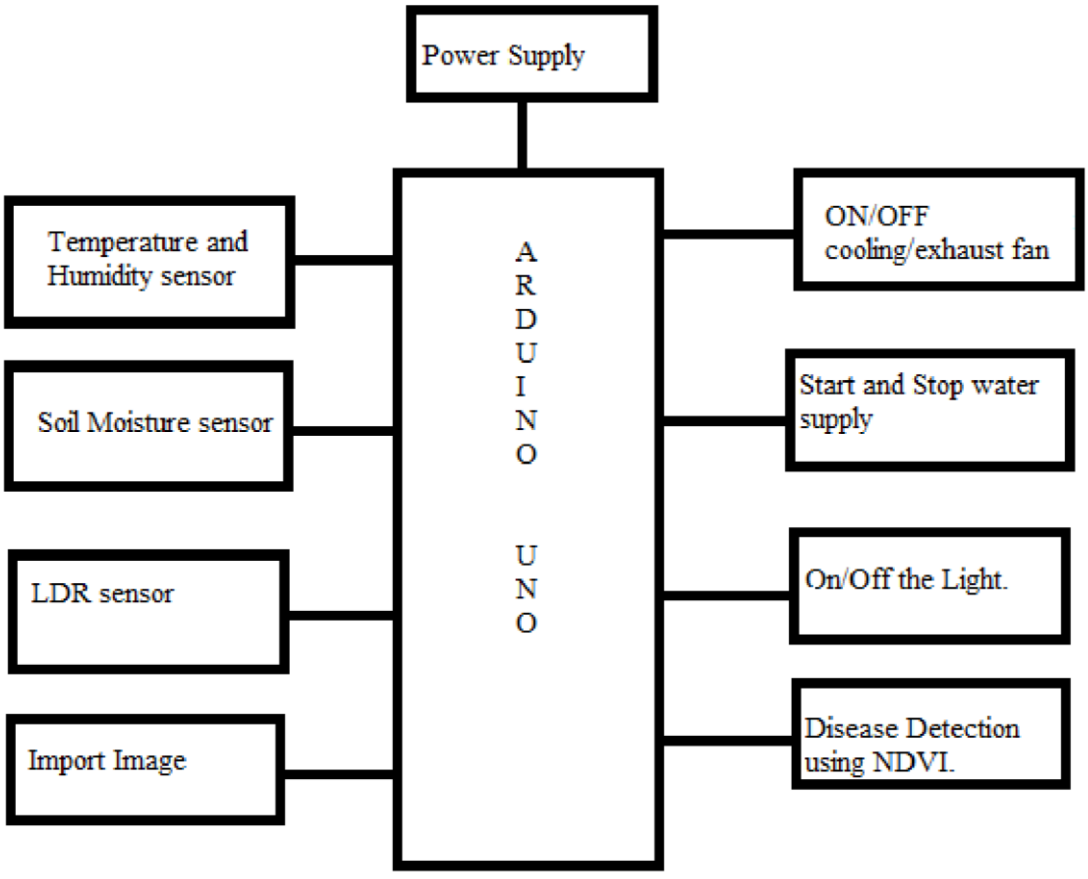


**Figure 1. Block Diagram**

## 2. Literature Survey

**Table 1. Literature Survey**

| SR. NO | Title | Author and Year | Methodology | Limitations |
|---|---|---|---|---|
| 1. | Automated monitoring and controlling of poly house environment | Shubhangi Bhosale, S.Sonawane. (8 August 2016) | Collects and control the poly house environment. | It only give soil nutrient parameters in the green house to solve problems of plant disease. |
| 2. | Controlling and environmental monitoring of poly house farm through internet | Shubhangi Bhosale, S.Sonawane. (3 June 2016) | Collects and automatically controls the condition of poly house environment by using sensors. | It only control and monitor the temp,humidity,s oil moisture and not plant disease actually. |
| 3. | Automated poly house using image processing | A. Saranya, P. Vijayalakshmi, K. Sushmita, R. Swetha(3 March 2017) | Poly house makes the farmer's work easy and it can be achieved by using image processing. | It detects the disease of plant only for the limited region. |
| 4. | IOT based poly house monitoring and controlling system | Jayaty, Dhruv Binani,S.Nagade v (2018) | It reduces the direct supervision of humans. | Light is the most important source for photosynthesis but the light intensity is not measure. |

## 3. Related work

**Table 2. Related Work**

| SR. NO. | Parameter | Threshold Value | Output Value |
|---|---|---|---|
| 1 | Temperature | Depends on plant Example- .30 degree | If temperature is greater than 30 fan will on Else Temperature value will display. |
| 2 | Humidity | Depends on plant Example- 30 | If humidity is greater than 30, fan will on Else Humidity value will display. |
| 3 | Soil Moisture | Depends on plant Example – 900 | If moisture level increases more than 900, then water pump will stop. Else water pump will start. |
| 4 | LDR | For on light=82 For light off=33 | If value < 33 Light will on If value >82 Light will on |

### 3.1 IOT in Agriculture

IOT represents Internet of Things. It is an arrangement of interrelated figuring gadgets, advanced and mechanical machines, articles, creatures or individuals that are provided with novel idents and the capacity to exchange human-to-PC or human-tohuman association. "Currently all over world, it is found that around 50% for the farm produce never meet the end user due to wastage and sub-optimal prices. IoT can be very effective when used in agriculture. It can be used to connect hardware devices such as sensors.

### 3.2 NDVI

NDVI stands for Normalized Difference Vegetation Index. Here, we are using this algorithm for detecting the affected area of the plants. It does quantification of vegetation by calculating the difference between near-infrared (which mainly does reflection of vegetation) and red light (which does absorption of vegetation).

NDVI has a range from -1 to +1. But for each type of land cover there isn't a unique boundary. When there is negative values, that means there are high chances of water.

And if we get a NDVI value nearer to +1, there's a high chance that it's dense green leaves. But when NDVI value is nearer to zero, it implies that there aren't green leaves and it might be an urbanized area.

Following formula is used to calculate NDVI:

$$NDVI = \frac{(NIR-RGB)}{(NIR+RGB)}$$

### 3.3 Temperature and Humidity Sensor

Here we are using DHT11 for calculating the temperature and humidity of the poly house. It generates the adjusted digital output. DHT11 can be connected with any microcontroller like Raspberry Pi, Arduino etc. and get accurate results. DHT11 is a low-cost temperature and humidity sensor, which provides high reliability and long term stability. It is a resistance temperature detector which detects the temperature changes. Being a mixed sensor, it provides the values of both temperature and humidity. DHT11 gives greater stability and higher reliability. It uses capacity humidity sensor to determine the encompassing air and parts out the advanced flag on the information stick.

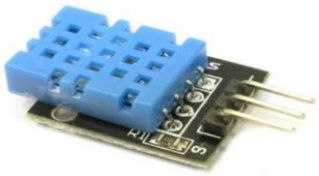

**Figure 2. Temperature and Humidity Sensor**

### 3.4 Soil moisture sensor

Soil dampness sensors measure the amount of water content in soil. It consists of two probes that are used to measure volumetric substance of water. These tests enable the current to go through the dirt and afterward it gets obstruction incentive to quantify the dampness esteem. At the point when there is more water, the dirt will lead greater power. Which implies that there will be less opposition. Hence, the dampness level will be higher. Dry soil is the bad conductor of electricity. So when there will be less water, at that point the dirt will lead less power. Which implies that there will be more opposition.

Thus the dampness level will be lower.

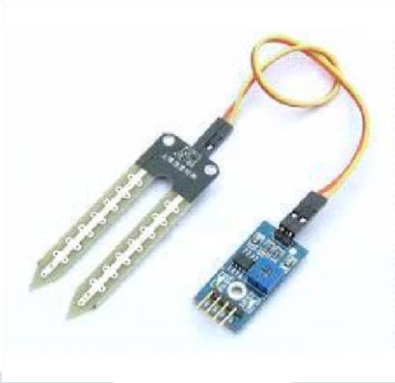

**Figure 3. Soil Moisture Sensor**

### 3.5 Arduino UNO

Arduino UNO is an open-source small scale controller board dependent on the Microchip ATmega328P miniaturized scale controller and created by Arduino.cc. The board is outfitted with sets of computerized and simple information/yield (I/O) sticks that might be interfaced to different extension sheets and different circuits. The board comprises of 14 Digital pins, 6 Analog pins. It is programmable with the Arduino IDE (Integrated Development Environment) by means of a sort B USB link. It tends to be controlled up by a USB link or by utilizing an outside 9-volt battery, however it acknowledges voltage somewhere in the range of 7 and 20 volts.


**Figure 4. Arduino UNO**

### 3.6 LDR Sensor

LDR stands for Light Dependent Resistor. It is a module that has an obstruction that changes with the light power that falls upon it. Therefore, it can be used in light sensing circuits.

Here, we are using LDR for measuring the light intensity inside the poly house. The obstruction of LDR commonly have the accompanying protections: Daylight = 5000Ω.

Dark = 20000000Ω.

**Figure 5. LDR Sensor**

**Advantages:**

1.Reduces human work.

2.Consumes less time for implementation.

3.Highly Efficient.

## 4. Conclusion and Future Work

Temperature, Soil Moisture and Light sensors are the three main sensors used in this project, which gives the exact value of temperature, humidity, soil moisture and light intensity respectively. These sensors give the result according to the plant's condition. These results can be seen on the software. We are also providing facility to detect diseases happened to the plants, if any. For this purpose, we are using image processing technique i.e NDVI algorithm. In future, we can develop android application for the same.

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