AUTOMATIC POLYHOUSE MONITORING AND PEST CONTROL SYSTEM

[1]Dr.Sujatha Anand , [2]T.Arockia Ashlin kansha , [3]A.Emimal , [4] I.Fousiya

[1](Principal, Loyola Institute of Technology)

[2,3,4] (Final Year UG Student Department of ECE,Loyola Institute of Technology)

Abstract— : **Polyhouse is a methodology used to grow plant under controlled environment for increasing yield and quality of the crops. The development and growth of crop depends on internal environment of polyhouse such as temperature,light intensity and soil moisture. It replaces the direct supervision of the human. In polyhouse, for proper plant growth soil nutrient parameters are equally important. Light is the most important source for photosynthesis and the light intensity is monitored using LDR. The temperature inside the polyhouse can be monitored through temperature sensor and DC fan is used to increase or decrease the temperature of the polyhouse farm.Large amount of crops are destroyed every year due to pests.Pest detection and identification Is needed to ensure good productivity in agriculture crops.Early detection of pest in image is very crucial for effective management of pest control. The acoustic sensors are utilized to distinguish the nearness of pests at a beginning period and avoid infestation in the plants.The whole farm is monitored through the WSN and the sensed data's are received by the arduino.The arduino is connected to the IOT wifi module which sends the reading from the sensors to the webpage.Utilizing this method the farmer will have the capacity to expand the yield. Automation in polyhouse avoids the manual error by the farmer and replaces the human intervention in polyhouse**

Index terms —: **Acoustic pest detection, soil moisture sensor,LDR,IOT.**

I)INTRODUCTION

India has vast area, but current status of agriculture management is not sufficient to provide everything to the population, which can be problematic. The solution to this issue is the practice of protected farming which includes the polyhouse farming. Polyhouse automation system is the technical approach in which the farmers in the rural areas are benefitted by automatic monitoring and control of polyhouse environment. It replaces the direct supervision of the human.Polyhouse is a methodology used to grow plant under controlled environment for increasing yield and quality of the crops. The greenhouse covered with simple polyethylene sheet is termed as polyhouse. The function of a polyhouse is to create the optimal growing conditions for the full lifecycle of the plants.

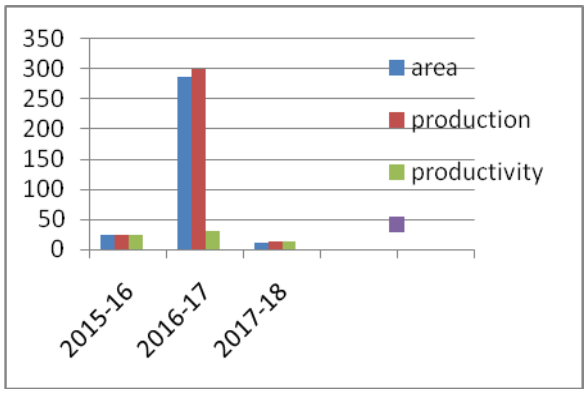

Fig (a): Agricultural production in conventional method

The development and growth of crop depends on internal environment of polyhouse such as temperature and humidity. The controlling and monitoring of polyhouse parameters play vital role in overall development of plant.The objective of our project is to design a simple, efficient 'arduino' based system for automation of polyhouse. The project features monitoring, recording and controlling the values of temperature, light intensity and soil moisture inside the polyhouse. The arduino used is a highly compact, durable and easily available. The values of temperature, light intensity and soil moisture are continuously communicated through various sensors to the arduino. Also Proper design, selection, construction and the management of the polyhouse using sensors would augur well to the growth of a crop.

a)Related works

Christina Mueller Blenkle and Sascha Kirchner designed a system in which the position and sound of hidden stages of insects are also detected.but the settlement sound of grain can be mistaken for insect sound[1].Frank Holzer and Frank Dieter Kopinke developed a design in which they performed Selective dielectric heating of the pest organism in the wooden matrix. But this work deals with larvae only [2].Shubhangi Bhosale has researched on automation in polyhouse to improve production and profit. The only drawback is there is no mechanism specified for protecting crops from pests[3].Jayaty has designed an system for automatic monitoring and controlling of polyhouse . Which

can avoid the human intervention . and the system consumes more power[4].Phanupong saeung and Samran santalunai developed a well known system in that dielectric heating is used for Pest control through SSPA which has high efficiency and low cost .but the dielectric heating using RF frequencies can affect the crops also.so the total yield can be reduced[5].

II.METHODOLOGY

a)Block diagram

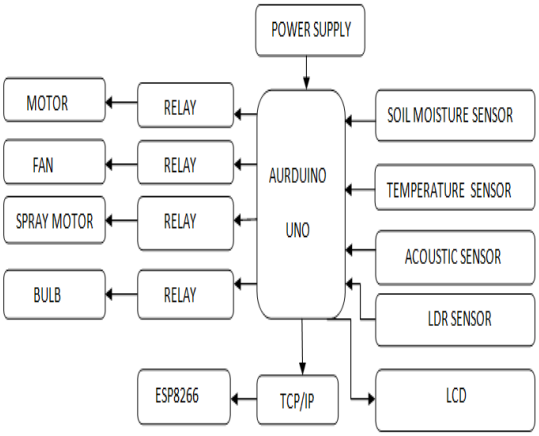

Fig (b):Block diagram.

Hardware

b) Arduino uno

Arduino is a single-board microcontroller, intended to make the application of interactive items or environments further useful. It involves the whole lot had to support the microcontroller; without problems connect it to a laptop with a USB cable or power it with an ac to dc adapter or battery to get began out. The Uno differs from all previous boards in that it does no longer use the FTDI USB to- serial using drive. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a USB connection, a vigor jack, a reset button and more. It includes everything needed to aid the microcontroller; conveniently join it to a laptop with a USB cable or vigour it with a AC-to-DC adapter or battery to get started.

c) Soil moisture sensor

Soil Moisture sensor is a sensor which detects the Moisture substance of the Soil. At the point when the Soil is dry, the current won't pass through it thus it will go about as open circuit. Subsequently the yield is said to be most extreme. At the point when the Soil is wet, the current will go from one terminal to the next and the circuit is said to be short and the yield will be zero. The sensor is metal covered to make the proficiency high. The scope of detecting is likewise high.

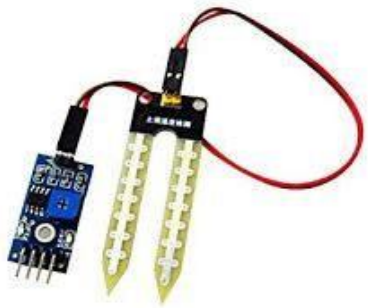

Fig (c): Soil Moisture Sensor

d)Temperature sensor

The LM35 is one kind of commonly used temperature sensor that can be used to measure temperature with an electrical o/p comparative to the temperature (in °C). It can measure temperature more correctly compare with a thermistor. This sensor generates a high output voltage than thermocouples and may not need that the output voltage is amplified. The LM35 has an output voltage that is proportional to the Celsius temperature. The scale factor is .01V/°C. The LM35 does not need any exterior calibration and maintains an exactness of +/-0.4°C at room temperature and +/-0.8°C over a range of 0°C to +100°C.One more significant characteristic of this sensor is that it draws just 60 microamps from its supply and acquires a low self-heating capacity. The LM35 temperature sensor available in many different packages like T0-46 metal can transistor-like package, TO-92 plastic transistor-like package, 8-lead surface mount SO-8 small outline package.

e) Light dependant resistor

A light dependant resistor also know as a LDR, photoresistor, 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. A LDRs can have a variety of resistance and functions. For example it can be used to turn on a light when the LDR is in darkness or to turn ou a light when the LDR is in light. It can also work the other way around so when the LDR is in light it turns on the circuit and when it's in darkness the resistance increase and disrupts the circuit.

Table I: Parameters value and their action

Parameters	Threshold value	Action
Temperature	Above 49°C	Cooling fan ON
	Below 49°C	Cooling fan OFF
Soil moisture	Below 20%	Motor ON
	Above 20%	Motor OFF
Light intensity	Below 1000 Lux	Bulb ON
	Above 1000 Lux	Bulb OFF
Acoustic level of pest	Above 20db	Fertilizer spray motor ON
	Below 20db	spray motor OFF

The reason they have a high resistance is that are very few electrons that are free and able to move because they are held in a crystal lattice and are unable to move. When light falls on the semi conductive material it absorbs the light photons and the energy is transferred to the electrons, which allow them to break free from the crystal lattice and conduct electricity and lower the resistance of the LDR.

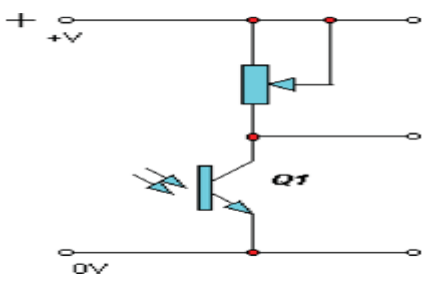

Fig (d): Circuit diagram of LDR.

f) *Acoustic sensor*

Literally acoustic or sound sensor is used to detect the sound. It is a small board that combines a microphone and some processing circuitry. The sound detector not only provides audio output, but also a binary indication of the presence of sound, and an analog representation of its amplitude. Early detection of pests in images is very crucial for effective management of pest control.but by using this acoustic sensor we can efficiently detect the pest at early stage.

Fig (e):Acoustic sensor

g)Relay

The SRD-05VDC-SL-C relay has three high voltage terminals (NC, C, and NO) which connect to the device you want to control. The other side has three low voltage pins (Ground, Vcc, and Signal) which connect to the Arduino .Inside the relay is a 120-240V switch that's connected to an electromagnet. When the relay receives a HIGH signal at the signal pin, the electromagnet becomes charged and moves the contacts of the switch open or closed.

Software

h)Arduino IDE

The open-supply Arduino application (IDE) makes it easy to put in writing code and upload it to the board. It runs on home windows, Mac OS X, and Linux. The environment is written in Java and established on Processing and other open-supply application. This program can be utilized with any Arduino board.

i)Cloud

Cloud computing is the on-demand delivery of compute vigour, database storage, applications, and different IT resources via a cloud offerings platform through the web with pay-as-you-use. With cloud computing, you don't have to make giant upfront investments in hardware and spend plenty of time on the heavy lifting of managing that hardware. As a substitute, that you may provision exactly the correct type and size of computing assets you have got to energy your most recent bright thought or function your IT department. You can entry as many resources as you need, close to immediately, and simplest pay for what you use. Ubidots cloud has been used to provide user in depth information about the farm land

III. WORKING

We are monitoring and control the temperature,soil moisture intensity of light in the poly house farm using various sensors.The whole farm is controlled using arduino .The whole farm monitored through the webpage is connected to the internet. The arduino is connected to the IOT wifi module which sends the reading from the sensor to the cloud.DC fan and light is used to increase or decrease the temperature of the polyhouse farm.motor pump is used for irrigation.It is easily monitored by the customer through the webpage from anywhere around the globe. Identifying the pest through image processing is a challenging and time consuming task. from this proposed system we overcome these difficulties and by using the acoustic sensor we can detect the pest in very early stage. By using this hybrid sensor network with IOT we can replace the direct supervision of the human in polyhouse monitoring.

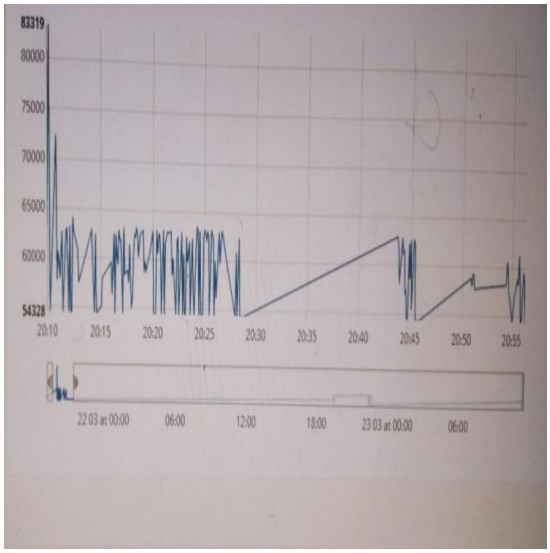

Fig (f): Graphical represenattion of soil moisture reading at cloud

IV .Results And Discussion

The proposed system has been implemented successfully. Automation in polyhouse will help farmers to grow any type of crop they wish inside the polyhouse irrespective of climatic conditions outside the polyhouse. Temperature sensor, soil moisture senor and light sensor,acoustic sensor read temperature, , soil moisture and light intensity,and detect the pests inside the polyhouse respectively. After reading the values proper action is taken according to the set threshold values with respect to the crop being grown inside the polyhouse. Different actions taken are starting irrigation, switching fertilizer spray motor on or off, switching lights on or off, switching fan off or on .and the complete information about the environmental parameters inside the polyhouse can be updated in the webpage that will be accessed by the farmers.

V.Conclusion

This project is used to automate the polyhouse with early detection of pest using acoustic sensor. This method yields more crops than the existing method. And yield product will enrich in their quality. The soil moisture, temperature, light intensity are measured and automatically controlled with IOT technology. It has been interfaced with arduino, thus the polyhouse has been automated.

VI. References

[1]A new approach to acoustic insect detection in grain storage. Christina Mueller Blenkle,Sascha Kirchner,Isabell Szallies,Cornel Adler.Germany 2018.

[2]Chemical free pest control by dielectric heating with radio waves heating. Frank Holzer,Frank Dieter Kopinke.Germany 2017.

[3] Automated Monitoring and Controlling of Polyhouse Environment. Shubhangi Bhosale,
Dr.S.S.Sonavane August 2016.

[4] IOT based polyhouse monitoring and control system. Jayatydhruv binani Mrs. s. Nagadevi
May 2018.

[5]Improved efficiency of Insect pest control system by SSPA . Phanupong saeung Samran santalunai
Thanaset thosdeekoraphat Chanchai thongsopa
2018 IEEE, Thailand.

[6]PrathibaJonnala, " Wireless Solution for Polyhouse Cultivation Using Embedded System", International Conference on Renewable Energy and Sustainable Energy, 2013.

[7]Purnima, S.R.N. Reddy, "Design of Remote Monitoring and Control System with Automatic Irrigation System using GSM- Bluetooth", International Journal of Computer Applications (0975 – 888) Volume 47– No.12, June 2012.

[8]Prashant R. Gade, a.k.lodhi, "microcontroller based polyhouse control system ", International Journal of Application or Innovation in Engineering & Management Volume 3, Issue 2, February 2014.

[9]S. Wang and J. Tang, "Radio frequency and microwave alternative treatments for insect control in nuts: A review," *International Agricultural Engineering Journal*, Article vol. 10, no. 3-4, pp. 105- 120, 2001.

[10]D. E. Khaled, N. N. Castellano, J. A. Gázquez, A. J. Perea-Moreno, and F. Manzano-Agugliaro, "Dielectric spectroscopy in biomaterials: Agrophysics," *Materials*, Review vol. 9, no. 5, 2016, Art. no. 310.

[11]R. S. Ferrari-John, J. Katrib, P. Palade, A. R. Batchelor, C. Dodds, and S. W. Kingman, "A Tool for Predicting Heating Uniformity in Industrial Radio Frequency Processing," *Food and Bioprocess Technology*, Article vol. 9, no. 11, pp. 1865-1873, 2016.

[12]S. O. Nelson, "Agricultural applications of dielectric spectroscopy," *Journal of Microwave Power and Electromagnetic Energy*, Article vol. 39, no. 2, pp. 75-85, 2004.

[13]S. O. Nelson, "Dielectric spectroscopy in agriculture," *Journal of Non-Crystalline Solids*, Conference Paper vol. 351, no. 33-36 SPEC. ISS., pp. 2940-2944, 2005.

[14] Yogesh R. Sonawane "Environment monitoring and control of polyhouse farm through internet".

[15]Purnima, S.R.N. Reddy, "Design of Remote Monitoring and Control System with Automatic Irrigation System using GSM-Bluetooth" International Journal of Computer Applications (0975 – 888)Volume 47– No.12, June 2012

[16]Neil Mattson article on "Substrate pH: Getting it Right for Your Greenhouse Crops"