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Implementation of Smart Green House for Cultivation of Cash Crop Using IOT

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Abstract:

In order to maintain sustainable agriculture and a sufficient supply of food in the future, new strategies are required given the rapid change in the climate, the populationexplosion, and the shrinkage of arable areas. The key issues facing greenhouse farming, such as greenhouse local climate control, crop growth monitoring, crop harvesting, and other issues, are thought to be best addressed by the evolving Technologies related to the Internet of Things (IoT), such as smart sensors,gadgets, network topologies, big data analytics, and intelligent decision-making. This study examines modern IoT technology for smart greenhouse farms as well as current greenhouse growing techniques.

Keywords: Internet of Things, Green House, Agriculture, Weather Forecast, Automation, Plant Need, Renewable Energy, Green House, Innovation.

Objective:

Our main objective over here is to build a low cost automatedgreenhouse system for cultivating cash crops in India, which can be afforded by all groups of farmers in Indiafirst we introduce the concept of Internet of Things (IoT), in the field of science and technology and describe the models, i.e. the connection of end users, devices to the Internet and the cloud.Procedures which can yield them much more profit than expected and help the farmers of India have a standard and healthier living.

Introduction:

With the fast growth of population, industrialization, climate change, the spreading of environmental pollution, the arable land around the world is decreasing year by year. A greenhouse is a building like a house that is made of glass or plastic and used to grow a variety of crops year-round. One of thepractical and sustainable alternatives to assure food security and socio-ecologicalsustainability in the future is greenhouse agriculture or farming technology. The advantages of these greenhouse farms are that it can help the farmers to produce different types of crops by changing the local environmental conditions according to the plant's requirement (temperature, light, moisture, nutrients)Greenhouse farms can prevent plants from harsh environmental conditions, such as heavy rainfall or high solar radiation. It prevents the plants to be infected by aerial borne diseases as it provides a protected environment for plant growth.

Problems faced in Agricultural Sector:

The problem of soil salinity is present in places like Punjab, which receive adequate water through irrigation systems along rivers and canals. A severe water deficit for agriculture exists in areas with limited water supplies, such as Rajasthan.

- Excessive use of fertilisers, insecticides, and pesticides renders the soil dependent on them, reduces fertility, boosts insect and pest resistance, and contaminates surrounding water sources and ground water whenever it rains.
- varied plants require varied levels of moisture, humidity, temperature, and light wavelength, and a cultivator's ignorance of these requirements or neglect might result in plants dying before they reach maturity.
- After the harvest, middlemen continue to exploit farmers in Agricultural Produce Marketing Committee (APMC) markets

(mandis), earning truckloads of money while forcing farmers to sell their products at throwaway prices, particularly during the Zaid season when they grow perishable vegetables and fruits.

Aim of the Project:

The main purpose of our research is to produce ideal growing conditions and to protect crops from harsh weather in the past. Furthermore, some types of greenhouse farming (controlled heating greenhouses) allow farmers to extend the growing season or even grow crops outside of the usual season. Greenhouses with additional characteristics allow for complete control over crop production, resulting in faster growth and higher yields.

Literature Survey:

Although India receives ample amount of precipitation and have many large river systems but still only one third of the total agricultural land is connected via canal irrigation system. The remaining fraction is reliant on monsoons or tube wells. Land sanity is a concern in places with surplus water owing to excessive irrigation and water logging. Water collected on the surface also blocks pores in the soil and kills beneficial microorganisms. Alternatively, places with limited supply of water cannot do irrigation throughout the growing season because the requirement of water often exceeds the supply due to conventional type of irrigation like sprinkler irregular irrigation

- Increase sanity
- Water logging
- Reduction in temperature to soil
- Land become marshy
- More nitrate formation in soil

The mismanaged usage of water is the problem. Our drip irrigation system makes the best use of water. It is an irrigation technique that uses water sparingly by directing water to plant roots. All water from canals, tube wells, rainwater collection systems, and other sources must first be stored in an underground tank before it can be used to irrigate fields. An ultrasonic sensor included inside the tank continually monitors the water level and sends the user an SMS message anytime the water level drops below the threshold. Relative Humidity (RH) has an impact on photosynthesis, pollination efficiency, leaf growth, and ultimately crop output. Long-term dryness or high temperatures may cause the fragile sepals to dry out fast and cause the flower to die before it has reached maturity. Controlling air humidity and temperature is so essential. In order to detect temperature and humidity, we attach sensors within the smart greenhouse. When the temperature reaches a specific point, a microcontroller will activate a switch connected to a fogger, which will spray microscopic water droplets that will stay suspended in the air and lower the temperature. predetermined value.

Methodology

1. Irrigation System

We employ drip irrigation to make the most use of the water. It is an irrigation technique that uses water sparingly by directing water to plant roots. All water from canals, tube wells, rainwater collection systems, and other sources must first be stored in an underground tank before it can be used to irrigate fields. An ultrasonic sensor included inside the tank continually monitors the water level and sends the user an SMS message anytime the water level drops below the threshold. After that, the user sends an SMS to the GSM module, which receives it and activates the relay to turn on the tube well. The pump is turned off by a microprocessor once the subterranean tank is full. This above tank is controlled by a solenoid valve and is attached to a system of drip irrigation pipes. The field-deployed moisture sensors assess the soil's moisture content and open the valve if the moisture level falls below a threshold.

Figure 1 soil moisture sensor

2. Air Temperature and Humidity Control

In order to detect temperature and humidity, we attach sensors within the smart greenhouse.Whenever the temperature exceeds a certain threshold, the microcontroller will trigger relay connected to the fogger, which will release microscopic water droplets that will stay suspended in the air and lower the temperature. Similar process will be activated and the tiny water droplets will maintain the relative humidity (RH) in the event that the air moisture falls below the predetermined value. The Peltier module, which may be powered by solar panels and can manage the temperature by cooling or heating as necessary, is employed if the relative humidity reaches the threshold and further cooling is needed. Glass greenhouse structure can hold the heat during night time, that prevents the leaves from frost bite in cold winter night in some cold and dry areas. In some cold and dry places, a glass greenhouse's construction can retain heat at night, protecting the leaves from frostbite during chilly winter nights.

Figure 2 Fan

3. Growing Light

Since various photosynthetic pigments inside plants use different wavelengths, distinct light spectrums play unique functions in plant development. Although leaves receive direct sunlight in the morning, to speed up their pace of development, We have installed plant regrowing lights in the greenhouse, which will switch on if the reading from the LDR sensor goes below the cut-off threshold. LED advancements have enabled the development of LEDs that generate light in a very particular spectral range to achieve extremely specific plant growth results

Figure 3 Bulb

4. Microcontroller

In this model, we utilised a microcontroller to regulate and process the sensor's data. Also, it controls rely module drives the high power device work. Arduino For specific small applications like GREENHOUSE automation, etc., Raspberry pi is a controller. The sensors in this project are sensing for resources that are available from the climate, human activity, temperature, carbon dioxide levels in parts per million, soil and air moisture, etc. Raspberry pi receives these sensed values and decides whether to activate the actuators

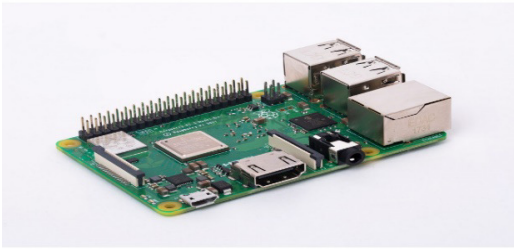
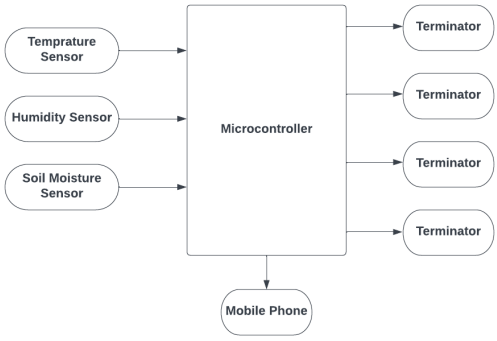


Figure 4 Raspberry pi

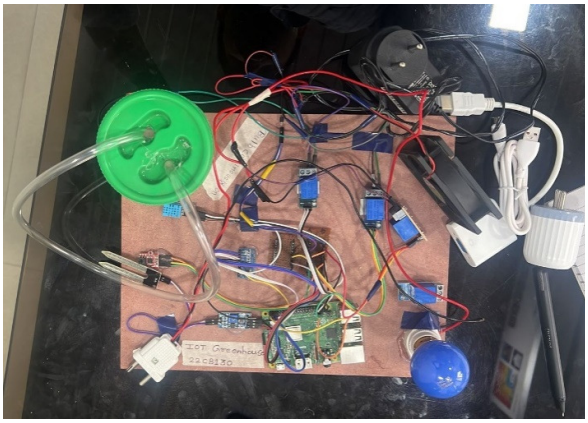
System Architecture:



Requirements:

1) Raspberry pie model b+
2) Relays for connecting pumps, fan, lights.
3) Fan
4) Bulb
5) Dht11 sensor ,LM25 sensor ,soil moisture ,
6) Humidity and temperature
7) Accessible wifi

Implementation of Smart Greenhouse:



Results:

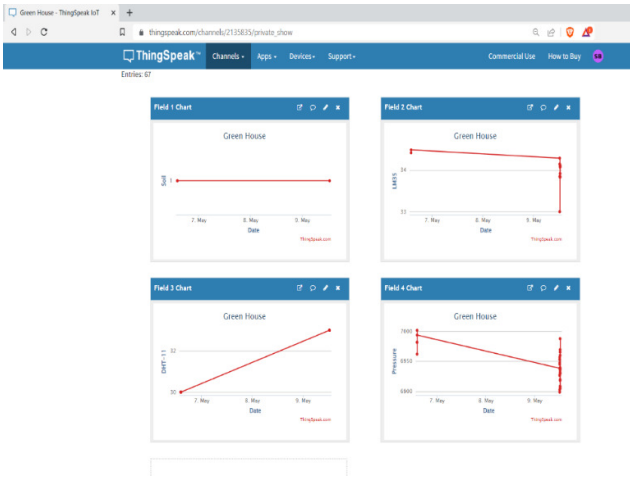


Figure 5 Result (readings of sensors)

Further Scope:

The Smart Greenhouse may be improved in several ways and is suitable for a variety of agricultural uses. It may be used in any environment and under any set of conditions to grow any form of plant. The autonomous greenhouse equipment is powered by non-conventional energy sources including solar panels, wind turbines, and Peltier cooling. It is possible to farm without using soil to further increase the nutritional content. IoT integration in farming may significantly increase its productivity and profitability. The agricultural sector has a bright future for Smart Greenhouse, which will revolutionise how India practises agriculture.

Conclusion:

The benefit of Smart Greenhouse over traditional farming is that we were able to produce crops free of insecticides and pesticides and to establish an environment that is conducive to healthy growth.also offers an additional source of income through apiculture, selling tube well water, etc. of plants. Moreover, even someone without agricultural experience may establish this system in his home (Rooftop greenhouse).Any kind of crop may be grown since any climatic condition can be maintained in this form of greenhouse. Because of this, we cultivate exotic plants like hibiscus. We can cut our water usage by 70% to 80%.

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