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Smart Agriculture using Internet of Things

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Abstract:
This project aims to revolutionize the face of agriculture by providing farmers with accurate real-time analysis over various aspects of the farmland. "Smart Agriculture" system proposes to make use of the yet to be evolved technology of automation in the field of agriculture. To emphasize on the novel methods of innovative farming like Greenhouse farming automation which monitors the temperature and soil moisture levels with the help of sensors. The sensors used in Smart Agriculture are broadly classified into digital and analog sensors which includes pH sensor, dht11 temperature sensor, hygrometer moisture sensor and many more. Cameras too are utilized for live image detections. The weather alarm, live stock monitoring and Maarufu Greenhouse farming which is integrated with smart sprinklers are administered by this project. Smart Farming system garners the use of solar panels which provides power to the embedded devices. These solar panels facilitates the modules on being placed anywhere on the field. It is ideally designed to obtain highly efficient agriculture production and not only helps the farmer to survey a vast field in an instant but also cuts down on the unnecessary labor costs and support. Also, this Smart Agriculture system is prepared considering the economical state of the farmers and hence the project is being delivered at reasonable costs.

Keywords: Agriculture, Smart farming, Sensors, Wireless technology, IOT, Economic development.

1. INTRODUCTION

The major source of income for india is farming. Yet there's no advancements seen in this field as farmers still resort to the old conventional methods of farming without realizing the perils of modern farming or aptly called as "Smart Farming." The farming and agricultural industry relies on innovative ideas and technological advancements to help increase yields and allocate better resources. The late 19th century and the 20th century brought a number of mechanical innovations, like tractors and harvesters. Today, a driving force in order to attain an increased agricultural production at economical costs will be the IOT. With various factors like monsoons being predominantly irregular, improper irrigation methods, lack of mechanization, soil erosion, cost factors etc, resulting in inadequate yield and low productivity.

The implementation of technological methods in the field of agriculture can bring about radical changes in the productivity of crops, due to improved efficiency in the farming techniques. It is essential to create effective intervention in agriculture to which the solution is lOT in integration with Wireless sensor networks. It has potential to change the way of development in agriculture and gives great contribution to make it smart agriculture. The internet of things involves a three-tier system. It includes perception layer, network layer and application layer. Perception layer includes sensor motes. Information communication technology (lCT) enabled devices, sensor devices are building blocks of sensor technology. It includes cameras, RFID tags, sensors and sensor network used to recognize objects and collecting real time information. The network layer is an infrastructure of the lOT to realize universal service. It directs towards the combination of the perception layer and application layer. The application layer is a layer that combines the lOT with the technology of specific industry. Agriculture is one of the important areas which targets millions of people.

2. PROBLEM STATEMENT

Seed is a critical and basic input for attaining higher crop yields and sustained growth in agricultural production. Distribution of assured quality seed is as critical as the production of such seeds. Unfortunately, good quality seeds are out of reach of the majority of farmers, especially small and marginal farmers mainly because of exorbitant prices of better seeds. Indian soils have been used for growing crops over thousands of years without caring much for replenishing. This has led to depletion and exhaustion of soils resulting in their low productivity. The average yields of almost all the crops are among t e lowest in the world. This is a serious problem which can be solved by using more manures and fertilizers. Although India is the second largest irrigated country of the world after China, only one-third of the cropped area is under irrigation. Irrigation is the most important agricultural input in a tropical monsoon country like India where rainfall is uncertain, unreliable and erratic India cannot achieve sustained progress in agriculture unless and until more than half of the cropped area is brought under assured irrigation. In spite of the large scale mechanization of agriculture in some parts of the country, most of the agricultural operations in larger parts are carried on by human hand using simple and conventional tools and implements like wooden plough, sickle, etc. Large tracts of fertile land suffer from soil erosion by wind and water. This area must be properly treated and restored to its original fertility. Agricultural marketing still continues to be in a bad shape in rural India.

In the absence of sound marketing facilities, the farmers have to depend upon local traders and middlemen for the disposal of their farm produce which is sold at throw-away price. Agriculture is an important industry and like all other industries it also requires capital. The role of capital input is becoming more and more important with the advancement of farm technology. Since the agriculturists' capital is locked up

in his lands and stocks, he is obliged to borrow money for stimulating the tempo of agricultural production.

3.EXISTING SYSTEM

Agricultural research and extension functions are generally organized under a ministry of agriculture. However, within the ministry there are separate institutions or departments for performing these functions.[2] These institutions or departments may have different organizational structures and operational procedures. Universities and national research institutes are generally research centres, while the agriculture department performs the extension function. In this conventional system, most emphasis is laid on breeding, testing and distributing activities. A top-down system is followed in generation and technology transfer, where researchers are expected to come up with better varieties and hand over them to extension for demonstrations and diffusion to farmers. In this set-up, each function develops its own programme more or less independently, leading to duplication of programmes. This is not only a waste of resources but also creates confusion among producers regarding which organization to approach. This type of research and extension system is hierarchically structured from national level to field level. Internal communications from upper to lower levels within the organization may be easy, but communication between organizations takes a circuitous route and hence is often ineffective. Coordination at lower levels is possible only with specific directives from higher levels.

This model has been successful in meeting the demands of resource-rich farmers and producers of high value commodities, as they are able to communicate their needs to researchers. However, small-scale, resource-poor farmers, especially in less productive and heterogeneous agro-ecological areas, have been left out of this model. There is no feedback from these farmers to agricultural departments and thence to research centres

4.PROPOSED SYSTEM

The proposed system aims to achieve automation of signaling system, and completely remove the manual control of smart farming. Our system is an wireless network system that consists of many small devices called sensors which measure physical parameters such as temperature, pressure, from the environment. The system basically consists of components, a water moisture sensor, for recording the input from the soil if it is totally dried, and this module compatible with the Arduino .With this we also use components like Dht -11 to find out the room temperature, such that the crop which is growing is not getting spoilt ,finally the feedback for this process is reached to us using the user interface which is designed for the easy acess of these fields using app inventor, native languages are also implemented such that this product is user friendly and also customizable and can also be modified for the convenience

Greenhouse

Unlike the conventional Green house, Maarufu green house is an African style green house with smart sprinklers, temperature detection and automation. Such that the exhaust is switched on to reduce the temperature automatically. Hence creating an excellent environment for the plants growth. The sensors and devices used are DHT 11, Hygrometer, Exhaust fans."

Figure.1. Greenhouse

Smart Irrigation

Smart sprinklers are automatic water system that detects the soil moisture. When the soil is dry the sprinklers waters the plants automatically. There by removing the labor cost and hard work. With the water requirements in irrigation being large, there is a need for a smart irrigation system that can save about 80% of the water. This prototype aims at saving time and avoiding problems like constant vigilance. It also helps in water conservation by automatically providing water to the plants/gardens depending on their water requirements.[3] It can also prove to be efficient in Agricultural fields, Lawns & Parks. As technology is advancing, there is always a chance of reducing risks and making work simpler. Embedded and micro controller systems provide solutions for many problems. This application precisely controls water system for gardens by using a sensor micro controller system. It is achieved by installing sensors in the field to monitor the soil temperature and soil moisture which transmits the data to the microcontroller for estimation of water demands of plants.

Figure.2. Smart irrigation

Arduino:

An Arduino-Uno is an open sourced microcontroller having worldwide use and acceptance. It has sets of various analog as well as digital analog pins that can be interfaced with the other devices and circuits. It is programmed with IDE developed by Arduino and it can be powered with USB cables connected to a computer or easily through a set of external batteries**.** A program written with the Arduino IDE is known as a sketch.

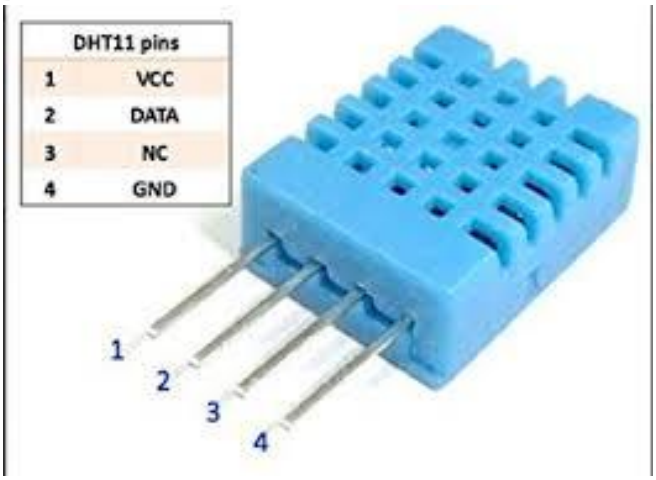
Figure.3. Arduino

Node MCU: Node MCU is an IOT platform that is Open Source and involves firm wares that runs on ESP8266. It is basically a Wi-Fi Module that is low cost and efficient. It is a System on Chip

Figure.4. Node MCU

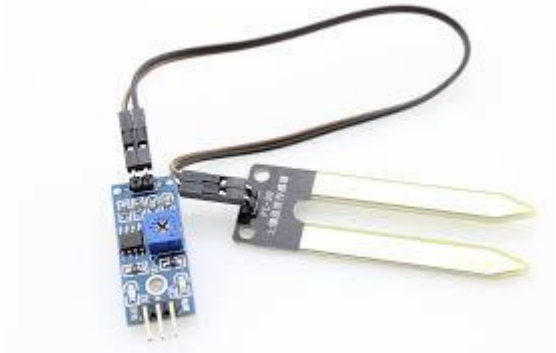
Particularly to provide full internet access in a small setup of sensor based networks. [4] It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espresso, and hardware which is based on the ESP-12 module.

DHT 11



DHT11 is a Humidity and Temperature Sensor, which generates calibrated digital output. DHT11 can be interface with any microcontroller like Arduino, Raspberry Pi, etc. and get instantaneous results [1]. DHT11 is a low cost humidity and temperature sensor which provides high reliability and

5. MOISTURE SENSOR



Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

6. CONCLUSION

Increase in population and demand for food requires some new methods that could increase the production multiple times utilizing the even lesser resources as shortage of water is increasing day by day and agriculture land is also decreasing. Use of advanced technologies could help us in this regard. [5]The concept of smart agriculture presented could be helpful in achieving the above mentioned goal. Smart agriculture concept is the utilization of different advanced technologies together with the experiences of people as well as the results of the historic events to engender better solution of the problems. The technologies that were highlighted are sensor network technology, wireless communication, IOT, cloud computing technology.

7. REFERENCE

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