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Smart Farming – IoT in Agriculture

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ABSTRACT

IoT is a revolutionary technology that represents the future of communication & computing. These days IoT is used in every field like smart homes, smart traffic control smart cities etc. The area of implementation of IoT is vast and can be implemented in every field. This paper is about the implementation of IoT in Agriculture. IoT helps in better crop management , better resource management, cost efficient agriculture, improved quality and quantity , crop monitoring and field monitoring etc. can be done. The IoT sensors used in proposed model are air temperature sensor, soil pH sensor, soil moisture sensor, humidity sensor, water volume sensor etc. In this paper I surveyed typical agriculture methods used by farmers these days and what are the problems they face, I visited poly houses for further more information about new technologies in farming. The proposed model is a simple architecture of IoT sensors that collect information and send it over the Wi-Fi network to the server, there server can take actions depending on the information.

Keywords: *IoT, Agriculture, Smart farming, Poly House, Sensor,*

I. INTRODUCTION

Smart farming is the implementation of various technologies and devices like internet, cloud and the IoT devices. As in today's world the population is increasing and it is supposed to be around 9.7 billion by 2050 and to feed those billion peoples we need to improve the production of crops. The population is increasing and on the other hand the agricultural land is decreasing due to various reasons like industrialization, commercial markets and residential buildings are being made on those agricultural lands and to feed these billions we need to increase out production and this can be done by implementing IoT in farming. Smart Farming is also known as precision farming.

In The present scenario the fruit of farming is not enjoyed by the farmers due to various reasons like insects attacks, plant disease, not having proper knowledge of essential supplements for the crops and there are also other various obstacles. In order to get rid of these obstacles and make farming more profitable and smart and friendly for farmers they need technological advancement.

Traditional Farming & Precision Farming are very different from each other in every way. Traditional Farming uses the old and traditional methods of agriculture and using those old devices for work and growing seasonal crop without any pre assessment of demands in market, rates, weather reports of weather department etc. smart faming uses new technologies like smart connected devices , IoT sensors , Internet , Farmers chatting community , time to time assessment of various factors like best conditions for plant to grow, how much nutrients are needed , soil quality , water quality check etc. .Smart Farming makes farming easy, economical (cost effective), minimize labor cost and improve crop yielding and provide better production.

II. PROPOSED MODEL

a. Poly House

Poly house is a fully covered steel structure and polythene is used as the cover the structure. This polythene protect the crop from harmful sun rays, heavy rainfall , storms and other outside factors that can harm the crop and effect the production. In poly house the farming is done in a fully covered and controlled manner. The production and quality of the crop can be increased almost twice with the help of poly farm house but still there are some of the ways the production can be increased and this can be done by implementing the IoT devices in Poly House.

b. Water Volume Sensor

Water Volume sensor is an IoT device that will keeps the track of the volume of water flowing through the pipe and if we provide more water than need then that will result in bad production and wastage of water is also there. This water volume sensor device send the information to the server and the server will perform the necessary action like switch off the pump etc.

c. Soil pH sensor

Soil pH sensor is the device that senses the pH of the soil as we need to maintain a good pH for a particular type of crop. This pH sensor keeps the track of the soil pH and sends the data to server where the user can see the collected data and can use chemicals to maintain the right pH for that crop.

d. Soil Moisture Sensor

Soil Moisture Sensor works similar to soil pH sensor. The collected data is then sent to server and server will then perform required action like if the moisture is less than needed then spray pumps will be used to moisturize the soil and if the moisture is more than needed than server will adjust the temp inside the poly house to make the moisture level normal.

II.I Algorithm for Soil Moisture sensor

Step 1: Read moisture level (m_l) value from the assigned sensor.

Step 2: if m_l<500
    Print "Moisture level Low"
    Actio n "Switch On the Pump"
    Else if m_l <1000 && m_l>500
    Print "Moisture level Medium"
    Else
    Print "Moisture level High"

Step 3: continue to read data

e. Air Temperature Sensor

Air temp sensor is an IoT device that senses the temp inside the poly house and the info is then sent to the main server and the server can perform necessary operations like Switching on the Air conditioner, (coolers, heaters (whatever needed)) exhaust fans , and spray water if needed. This will help to maintain an ideal temp inside the poly house.

II.II Algorithm for Air Temperature sensor

Step 1: Read air temperature (m_l) value from the assigned sensor.

Step 2: Initialize minimum and maximum air temperature needed for that particular crop.

Step 3: if a_t<min_t
    Print "Air Temperature Low"
    Action "Switch On the Heater"
    Else if a_t<max_t && a_t>min-t
    Print "Ideal Temperature"

    Else
    Print "Air Temperature High"
    Action "Switch on the Cooler"

Step 4: continue to read data

f. Motion Detector Sensor

Motion Detector can be used around the field (poly house). These sensors senses any unusual movement that's happening around and the data is sent to server and the server then perform an operation in that data and then after processing the info it give message to the another device that is also implemented on the boundaries of the poly house. This device is used to create noise and the animals run away after hearing the noise.

III. Proposed Model

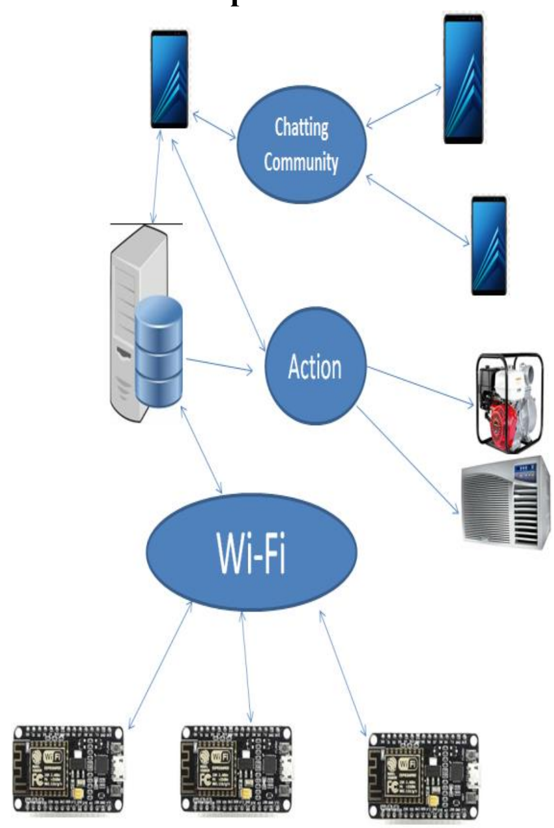

Figure – 1: Proposed Model

Figure - 2: Image of Poly House (without any IoT sensor)

Crop Management

The sensors get the info associated with crop observation and send to the server. The server can implement action such watering the plants if the soil wetness below the edge values. Such actions square measure done by the server mechanically while not manual intervention.

Use of Smart Phones and internet

Because of the low entrance rate of PCs in rustic families and high utilization of cell phones in India this model is created by taking the upsides of versatile Internet innovations. Portable clients can connect to our proposed system from anyplace whenever. Rural data is available to the ranchers moving or situated in any farming field. The versatile data benefit is omnipresent, convenient, and geological identifiable. This administration demonstrate is relied upon to overwhelm the future data scattering models. According to the Internet Development Statistics Report in India the 4G web scope in rustic territories will achieve 80%.

Issues in Implementing IoT

Sectorial Issue

Heterogeneity of the area: There are an awesome wide range of sorts of performing artists in the sustenance system running from substantial (stores, seed and information sources providers, product brokers) to little (distinctive cheddar creators, microbreweries, roadside foods grown from the ground venders). Resultingly, no single arrangement, regardless of whether innovative, business show, or administrative, will fit or suit the requirements of all. Vineyards in Hungary require very extraordinary arrangements from arable ranchers in North America. In the EU, for instance, exactness agriculture rehearses in arable cultivating have been broadly embraced by vast ranchers in Central and North-ern Europe, keeping in mind the end goal to build generation and improve quality. In any case, in Southern Europe, the most recent financial weight in agribusiness, the high ranch division and scattering, and in addition the expanding water shortage requires the exploitation of accuracy water system strategies for the most part to minimize the use of assets.

Ranch sizes and capital venture costs: Larger more capital-concentrated homesteads are substantially more responsive to the take-up of IoT innovation, and furthermore are beneficiaries of such innovation as a major aspect of the consistent interest in new hardware (e.g., tractors and ranch gear). Existing driving shrewd cultivating mechanical arrangements have either been intended for extensive homesteads, for instance, My John Deere (John Deere™), or work just in constrained land spaces, for instance, Field-View (The Climate Corporation™) and En circa(DuPont™), which offer administrations for the most part in the United States and Canada. 365FarmNet is adjusting the cost and sort of offered administrations to the measure of the holding, however its market entrance is as yet restricted to Central Europe. The test is making IoT offerings adequately alluring to little scale ranchers with restricted venture accessible for new innovation and noteworthy feelings of dread of information abuse.

Plans of action and business privacy: Appropriate plans of action are required with the imperative level of secrecy and control over information for which agriculturists are asking, however permitting ranches and other agri-food on-screen characters to adapt the information they are delivering. This is a territory of con-tension, with huge players like John Deere trying to abuse the information caught by the machines they give, and agriculturists opposing this so far another loss of control and loss of significant worth. The American Farm Bureau Federation has been driving a battle for ranchers there to hold control and responsibility for information and as of late set up the Agricultural Data Coalition.

Client and societal acknowledgment: Education and preparing angles are important to help end clients comprehend the utilization and appropriateness of these new advancements. As indicated by , 71 percent of EU cultivate chiefs were all the while working based on down to earth understanding as of not long ago, trusting that they don't need such upgrades for their everyday occupations and don't have sufficient energy to learn. The reception of keen innovations will without a doubt be trying for non-innovatively educated per-children. Notwithstanding, there are as of now instruction and preparing activities running crosswise over Europe intending to scatter IoT culture among youths and all partners in the natural pecking order.

Technological Issues

Absence of interoperability: Common building pieces, information conventions, and benchmarks are require for billions of gadgets to interoperate, and they are different fitting guidelines in the agrifood space trying to achieve a general accord here. Such gauges exist for semantics and information displaying (e.g., AgroRDF, AgroVOC, agroXML), agri - hardware (e.g., ISO-BUS), climate information (e.g., SWEET), for the sup-handle chain (EPCIS from GS1), online business retail locations (e.g., Good Relations and Schema.org).

IV. Conclusive discussion

Farming can be made more efficient & accurate with the implementation of IoT device. IoT can be used in different domains of agriculture. Electricity and water are the main domains and their cost can improve or break the agriculture profession. Because of old leaky irrigation system water wastage is a way more than we think and water pump operates by using electricity so if we can control water wastage then we are automatically controlling electricity wastage also. Water volume can be measured by using a smart device with pump and duration of flow can also be measured. Other domains in agriculture are insecticide, fertilizers and pesticides as in this paper we are proposing use of IoT in a poly house and poly house is a fully covered structure so there is almost no effect of outside factors like insects do not enter and cannot harm the crop so there will be less need of insecticides. By using sensors the crop field that is connected to internet, an appropriate decision can be taken. Finally conclude that we need to develop and optimal IoT architecture for agriculture in order to enhance quality and quantity of production, save resources like water and electricity, economically efficient crop that cost less and make more profit as in country like India farmers play a major role in GDP so this way the overall GDP can also be enhanced.

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