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Soil Quality based Agricultural Activity through IoT and Wireless Sensor Network

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Abstract

In India, agriculture plays an important role in providing various goods such as vegetables, fruits, grains, etc. Farmers have been producing crops in the fields day and night. For producing these products. Now days, the production of the crops in the yields are reducing year by year. This is mainly due to industrialization effects, and using of harmful pesticides and chemicals, lack of water and insufficient water system in the fields, etc. are several factors on the less production of the yields in agriculture. So, our plan is to implement the Wireless Sensor Networks (WSNs) technology which plays an important role in the Smart Agriculture. The main aim of the article is about importance of WSNs in agriculture. The end of the relinquishment of WSNs in PA is to measure the different environmental parameters similar as moisture, temperature, soil humidity, PH value of soil etc., for enhancing the volume and quality of crops. Further, the WSNs are also helped to reduce the consumptions of the natural coffee is used in husbandry. As we have already mentioned about the Smart Agriculture and WSN, in this article we have to know about how the WSN is used and related important role in Smart Agriculture and various technologies used,what are the difficulties and challenges has to face while using these technologies, various factors played on the Smart Agriculture has been discussed in future.

Keywords: Wireless sensor networks, Agriculture, Smart Agriculture, Technology, IoT, Husbandry, Technology.

1 | Introduction

Wireless Sensor Networks (WSNs) can be defined as a tone-configured and infrastructure-less wireless network to cover physical or environmental conditions, similar as temperature, sound, vibration, pressure, stir, or adulterants, and to cooperatively pass their data through the network to the main position or Gomorrah where the data can be observed and analyzed. The devices which were communicated over the internet are called internet of things [1]. These devices are also called as smart devices. These devices will we used in every industry. Smart Agriculture is defined as the usage of technology like Internet of Things (IoT) and some smart applications in the Agriculture [2]. With the usage of new technologies are being evolved, there is having usage of smart devices in agriculture in which these devices are used to detect the climate, insects, condition of the crops, etc. information is shared to the applications like mobiles, tablets, PC, etc. WSN is used as when the sensor is implanted in the field, the sensor node gathers the information like PH of soil, temperature, water requirements, resources, etc. to the sink node through some communication happened between them

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and collected data is stored in a node; then we have to analyze the data of the sensor in time to time updated [3]. Although a few are aware on the unsafe of smart technologies, we have educated the farmers on these technologies which gives them for more information about their crops in the fields and results the implementation of new methods in the different agricultural crops such as paddy, wheat, grains, vegetables, plants, etc. We have to analyze the factors by cross checking these questions will give clarity on our crops and it wills we used to assess the information easily [4].

Table 1. Assessing the usage of the application.

S/N	Questions	Options	
1	Do farmers use the smart application?	YES	NO
2	Is the resources are available near the farmlands?	YES	NO
3	Was the production of the crops increased?	Before using the app	After using the app
4	Are you satisfied with the application?	YES	NO

IoT gives a new dimension in the area of smart husbandry and Agricultural sphere. With the use of Fog computing and WiFi-grounded long distance network in IoT, itis possible to connect the husbandry and husbandry bases situated in pastoral areas efficiently [5]. To concentrate on the specific conditions, we propose a scalable network armature for covering and controlling husbandry and granges in pastoral areas [6]. Compared to the being IoT grounded husbandry and husbandry results, the propose result reduces network quiescence up to a certain extent. In this, a cross sub caste architecture grounded channel access and routing solution for checking and actuating has been discussed [7]. We dissect the network structure grounded on content range, outturn, and latency based performance. Index terms—smart agriculture, internet of effects, Wi-Fi- grounded long distance network, fog computing, cloud services [8]. Technology holds tremendous part in adding the product and decreasing extra force. IoT has opened up as unsuitable results for smart husbandry and husbandry; however, it remains a dream until the connectivity isn't reached to rural areas [9]. The Wi-Fi grounded Long Distance (WiLD) network is successfully been used to connect the pastoral regions with low cost. There fore we have to check the best application for smart agriculture such that we can get more profits in the production of the crops.

$$P(A/B) = P(B/A) * P(A)/p(B) \ \ldots \quad (1)$$

$$P(A \mid B) = P(A \cap B) / P(B) \ldots \quad (2)$$

A = actual produced crop, B = expected production of crop this is used in the various categories.

2 | Literature Review

As, we have seen the references form the work done by Krishnan and Arun Kumar [34]. They have analyzed about the usage of WSN and different technologies. There are numerous problems faced by the Indian husbandry community in order to maximize crop productivity. The success of a crop rest on the degree of avoiding the effect of the factors that disturb the crop [10]. The authors proposed a model consisting of a wireless confluence knot, detector bumps, and the garcon. A detector knot comprises a data slice module that finalizes the real-time dimension of temperature and moisture, and a wireless transceiver module that obtains the data tried by the data slice module and directs the data to the confluence knot. Knot failure is a major challenge [11]. The limitation of this work is that a single point of disaster may do and data loss also may be due to blocks at garcon. The soil PH value gained from the detector is poised by the base station knot and reported to the PC attached to it. The proposed WSN system will be suitable to connect data poised to the planter's mobile via GSM technology and to spark the water sprinklers during the period of water failure [12]. The limitation of this work is that the traffic of data from sensor nodes isn't addressed. Queuing fashion may be used to avoid data clogging. This script may be a failure if there's no mobile network. The wireless connection is enforced to acquire data from the colorful detectors. The limitation of this work is that data clogging may do. Queuing fashion might be used and precedence can be assigned for packets [13].

As the cost for detectors and dispatches structure trends over, further farmers are enforcing WSNs for their crops. This is getting more current with lower granges, micro-farms and civic granges. In each of

these situations, the crop yields are critical as farmers may only have a veritably small area and unique space conditions to contend with [14]. In some cases, ranch areas are being constructed on perpendicular casinos which are only 4 to 8 bases high, and placed on high-rise roof- covers, or alongside domestic casing. WSN technology makes it possible to cover and specifically target each crop, making it practical and cost effective to apply Precision Agriculture anyhow of the growing area. This approach is also fluently scalable by adding fresh communication capitals and detectors [15]. Authors have proposed a water trickling scheme that will fit water directly into the root base of a factory. The system uses Jeer PI and Arduino boards with Zig-freak modules. The system is cost effective and scalable and uses star Zig-freak topology for communication between biases. All bias is connected to the Jeer PI which acts as the central fellow. They enforced it for a small house theater of 50 factory pots which is all connected together using a small water channel network in the base of all factory pots. So that the water sprinkled will be directly fed to the roots of the factory under the clod position. Watering can be done by transferring a dispatch communication to the GPS module bedded with the central system. They use ultrasonic detectors and solenoid faucets to design the smart irrigation system. Ultrasound detectors are used to measure the water position in the tank [16]. But the limitation of this system is that it is not seeing the humidity content in the factory pots. Hence the stoner should manually initiate conduct regarding when to water-soak the system.

Advantages

By using the Snit can reduces the use of the chemicals in the form of pesticides used in agriculture. WSN can sense and collect the data and sends the information which is useful for analysis about the farmer's crop. Is will also helpful in cost estimation. This can also provide the feedback from the users and can suggest the information to the farmers [17].

Disadvantages

There are some disadvantages while using the WSN. These are some important factors-

I. Energy consumption.
II. Cost of the sensors.
III. Collection of data.
IV. Transmission range.
V. Securing the data.
VI. Errors in the data.
VII. Sensor deployments and replacements.

3 | Proposed Work

3.1 | Implementation of Wireless Sensor Network Technologies

I have thought some ideas on the smart applications using wireless technologies in the Husbandry / Agriculture fields. Those are listed in below: 1) wireless field monitor system, 2) precision agriculture using WSN, and 3) my field monitoring application [18].

3.2 | Wireless Field Monitor System

Rather of observing the productivity and quality of faming all the time, this paper proposes the design to cover the same attributes using wireless detector network. With the help of the information provided by the sensor and notifications provided to the mobiles, and devices. This proposed system will be able to detect the changes in environment and gives some important suggestions [19].

3.3 | Precession Agriculture Using WSN

This application will work based on the information being gathered like humidity, carbon dioxide level, availability of water–needed for the crop and temperature; we can take decisions on the analysis of the crop in previous years and production. So this application can give suggestions on the farmer about the crops and resources. This method can yields the results like high production of crops and high efficiency. We can also use several protocols like Zig-Bee, etc. will gather the required information through sensor and analyses the various factors and results the tremendous output [20], [21].

3.4 | My Field Monitoring Application

This application is mainly based on the smart irrigation of the cultivated crop in the field. This is based on the following parameters: 1) detect the GPS location of the field, 2) monitor the field and conditions, and 3) usage of fertilizers and natural pesticides in crops. These applications also uses the WSN which will be deployed the wireless sensors in the field. This will gather the information about the crop and the architecture of WSN can also secure the information of the field. This app can also provide suggestions and tips to the farmers by using Google voice assistant [22], [23].

Fig. 1. Sensors used in agriculture.

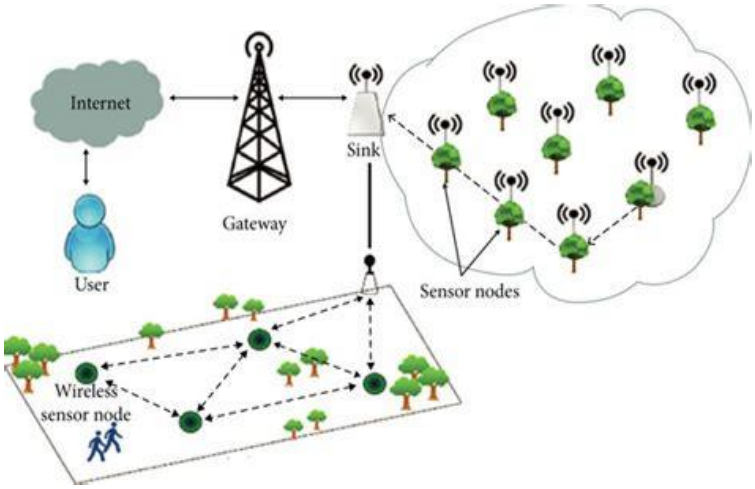

Fig. 2. Architecture of WSN in the field.

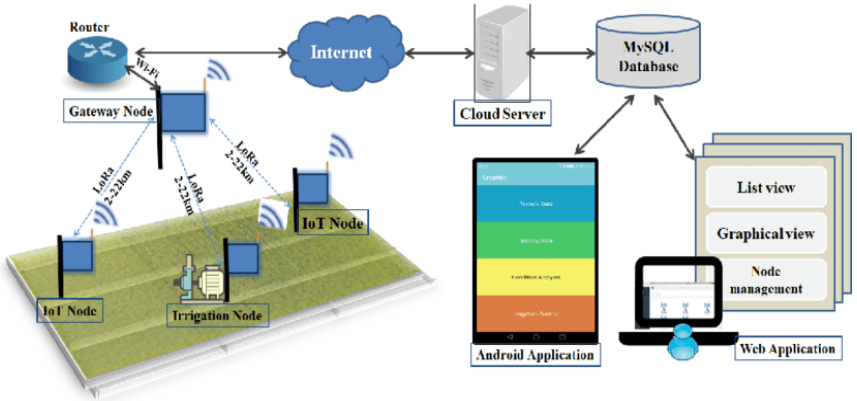

Fig. 3. The overall architecture of the proposed model.

4 | Result and Discussion

Results of using WSN in the Smart Agriculture is based on some estimations are as follows: 1) we can expect the production of the crops and results to the tremendous output is provide when compared to the last year's production [22], 2) we can estimate the profit/loss from the production of the yield. Next in the future we can use these data and the results, we can educate and create awareness to the farmers and this will be the step we can slowly change their mind set and have to implement these smart technologies; which can be helpful for the farmers, and 3) the collected data can be used for analysing and stored securely [23].

5 | Conclusion

In the future, we will have to adopt wireless technologies and smart technologies to maintain our life in an easy way. So, the farmers needed to learn these technologies to develop smart agriculture with adaptive technologies like WSN, IoT. This application is developed mainly to increase the production of yields. In agriculture, humidity, temperature, co2, water is the main factors playing a crucial role. WSN can make our lives easy; for that we need to know about precision farming and what the different countries adopted smart technologies. So, if we are able to use the precious technology, we can be able to see the agriculture sector on Top of the Indian Economy therefore we have known the importance of WSN in Smart agriculture.

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