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IoT in Agricultural Field

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ABSTRACT: Agriculture field being the backbone of Indian economy deserves security in terms of resources but also agricultural products needs security and protection at initial stages .Agricultural modernisation can be achieved using latest technologies such as internet of things and wireless sensor networks. Keeping this scenario in mind , an ”internet of things” based sensor network which is capable of analysing the sensed information and then transmitting it to the user has been designed, tested and analysed. This sensor consists of soil ph. sensor, soil temperature sensor and moisture sensor for soil. All these sensors are connected to one another by a wireless sensor network xbee and will convey data to station pic in the control room. From control room, it will be uploaded to websites where farmers can access all these data on his smartphones or tablets. Using the sensor data, the system controls water and fertilizer requirements for different types of crops in different time of the year. The stored sensor data can be farmer can plan accordingly. Also IOT provides atomised irrigation and fertilizers to the users in real time to farmers further analysed for future uses such as in which condition we get maximum yield from the crops so that.

KEYWORDS: IoT, Sensor, xbee, Wi-Fi.

I. INTRODUCTION

The new concepts in technologies nowadays are internet of things and wireless sensor network. The internet of things (IOT) is a network in which real world objects are connected to each other to form many embedded systems through which data can be transferred or received reliably. A real world thing in IOT in terms of animal farming can be an animal with biochip transponder which when assigned with an IP address and ability to reliably transfer data over the network is useful to farmers. Also the use of application on mobile phones, sensors and transfer to useful data generated by the system will make it easy to use. The system has wide area of applications like open farm, Greenhouse Farming, irrigation, water level etc. Can be managed with system and in Greenhouse Farming, temperature and moisture control are the applications of this system.

II. WHY IoT IN AGRICULTURE

The agricultural industry will undoubtedly become more important than ever before in the next few decades. The world needs to produce 70% more food in the year 2050 in order to feed the growing population. To meet this demand, farmers and agricultural industries are turning to Internet of Things (IoT) analytics and greater production capacities [1]. The internet of things is transforming agriculture industry and allowing farmers to compete with numerous challenges they face. This is set to promote the future of farmers to next level. Smart agriculture is already becoming more customary among farmers and high tech farming is quickly becoming a standard thanks to agricultural drones and sensors. The IoT technologies support precision agriculture, a type of agriculture whose main aim is to maximise return on investment in agriculture. Irrigation, water detection, soil detection sensors give alerts to help farmers protect their crops and wirelessly transmit information to water reserve points on when to irrigate. In areas where there is water scarcity, farmers can adopt drip irrigation. This can be achieved by linking the data from various sensors which not only controls where the water is released but also how much is needed.

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Fig. 1: Agriculture IoT

Sensors are also built to monitor their crops or fires detected before they spread. Furthermore, the system that uses IoT technologies, track and monitor farm animals and detect probable signs of diseases. Such technologies can be integrated with a central system and help propagate relevant advice to farmers. These inform the farmers about any attack on, sensors that use IoT technologies such as GPS and RFID can be used to track and monitor the farm products during transportation and storage. IoT systems can also track farmers who need transport to carry their farm products to the final destination. Smartphones are equipped with IoT technologies such as Near-Field Communications (NFC) that allows purchasing of products without using cash. Electronic transactions that debit or credit bank accounts for both buyers and sellers rather replace exchange of cash. Mobile internet and low cost sensors could allow farmers to interact directly with customers without taking help from a middleman.

Fig. 2: Wireless sensors

Applying IoT in agriculture also helps in

•Saving fertilisers and chemical crop protection agent

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• Boosting soil fertility due to "SMART" correction.

• Controlling crop state and preventing its loss when stored

• Increasing machinery efficient

• Monitoring state and location of farm animals

•Tracking processing line equipment condition

III. SMART AGRICULTURE

Smart farming is a concept that is developing rapidly in the agriculture business offering high accuracy in crop control. Useful data collection and automated farming techniques.one way to solve all the issues is to increase the quality and the volume of the agricultural production , is by using sensing technology to make farms more intelligent and more connective to the so called "Precision agriculture" also known as the smart agriculture[2]. Smart farming which represents application of information and communication modernization has led to third green revolution. Smart farming has a real ability to deliver a more productive and sustainable agriculture production, based on more accurate and resource efficient ways. This efficiency will improve in the coming years as farms became more connected [3]. Given all the possible benefits of the IOT application in this agriculture, it is undoubted that all the farmers are turning towards smart agriculture which comprises agricultural drowns and satellites for the future farming.

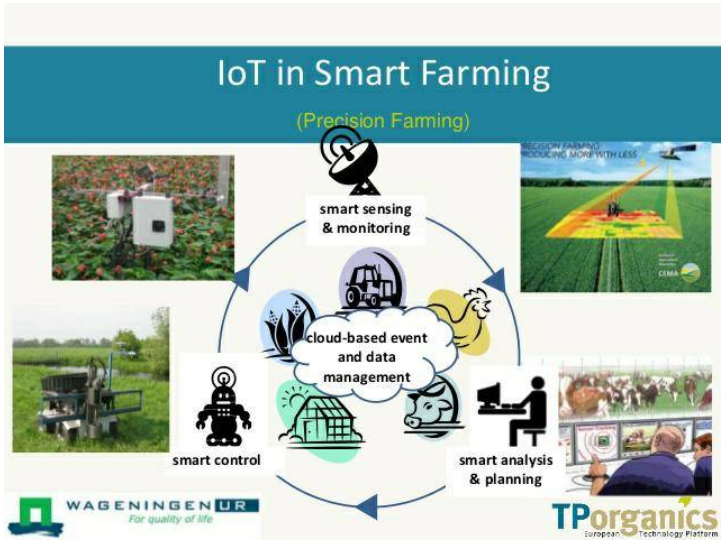

Fig 3: precision agriculture as a Smart farming

IV. MAJOR APPLICATIONS OF IoT IN AGRICULTURE

Climate control in Greenhouse: Soil moisture, humidity, light intensity and temperature can be monitored through various sensors. These can then be linked to systems to generate alerts or automate processes such as water and air control [4]. They can also be set up to check for early signs of pests or disease.

Logistics co-ordination: Goods such as vegetables can be tracked and monitored visually during transportation and storage through GPS, RIFD and other location based sensors. This can also allow scheduling and further automation in the supply chain.

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Food safety: From the farm, logistics and retail-the entire supply chain is set to become even more connected with information. Food products and ingredients can be tagged via RIFD for tracing and tracking, and help raise the level of transparency and consumer confidence.

Crop monitoring: A robot called Rosphere has been built, which is armed with sensors and can potentially monitor every single stalk on field. These robots can be configured to communicate to each other over the network. The data can be collectively used to build information sets such as crop yield maps, and further linked to information such as present crop prices.

Efficiency in livestock : The health of farm animals such as cattle or chicken can be monitored to find potential signs of disease, this can be linked to a central system which can generate relevant advice to be sent to farmers, and contribute towards analytics that can be used to identify any outbreaks or trends. Some of the existing solutions that help facilitate agricultural workflows and business in general

Water Bee: It is an intellectual irrigation system that collects data about soil moisture and other environmental factors by means of wireless sensor networks. Therefore, it allows for a significant water loss decrease.

Smart Bob: It is a device for measuring and reporting the level of grain and other food products contained in agricultural hoppers and hutches electronically on the farms.

Check It Now: It allows for online instant in-hutch temperature monitoring and sends automatic alerts in case the temperature crosses the pink limit.

Yellow Box: It is a device that allows farmers to use their smartphones for remote control of their hutches.

Z-Trap: It is an electronic insect trap that helps farmers monitor insect's population remotely and protect seeding from them.

Fig. 4: Solutions for agricultural system using Advantech's Gateway and Sensor node Integration.

V. CHALLENGES FACED IN IoT APPLICATIONS

Though IoT has been trend in developed nations, in spite of being an agricultural nation, countries such as India has faced various challenges while applying IoT in agriculture. Internet connectivity and availability is one of the major

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challenges. There are several other aspects such as presumption amongst the vendors about Indian consumers not being ready for advanced products. This results in drastically low awareness of IoT devices and systems amongst consumers.

VI. IoT RESEARCHES IN AGRICULTURE

Kindle e-books: Relevant documents on crop farming, livestock, irrigation, natural resources etc. are uploaded to each of the e-readers. The documents include scientific research outputs, guidelines, best practice stories and resources. The goal of this project was to empower agricultural extension workers in their ability to advise farmers and support them in their agricultural activities [5].

Drones: These are introduced to monitor crop performance in farms and alert the farmers on what action has to be taken in various parts of the farm in order to maximise productivity and also to minimise crop or animal losses.

Mobile Application: A mobile application advices farmers in the latest prices of commodities in various markets help farmers to tackle emerging pests and diseases problems, daily weather forecasts for timely action by farmers etc.

Site-specific nutrient management: This is achieved with the help of sensors, GPS monitors [6].

VII. CONCLUSION

Internet of things has a huge potential in the agricultural field. Smart agriculture is constructed with combination of IoT and RIFD. This paper introduces the concept of IoT, agriculture internet of things and its applications. It also talks about why we need IoT in agriculture in detail. IoT could be utilised to make the best out of our agricultural potential.

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