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PRECISION IN AGRICULTURE USING IOT AND AI

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ABSTRACT

On every passing day population is increasing and lands are decreasing due to too much civilization and infrastructure development, to feed increasing population agriculture industry need to revolutionize. So IoT has a great potential to improve crop production. In Agriculture industry weather change, diseases, insects damages of crops are majorly analyze by different methods but some of them are unable to proceed properly with precision. Our primary objective is to safeguard the future of the Indian agricultural and food industry, and give our farmers a global competitive advantage. To do this, we provide farmers with the information needed to run their businesses more profitably. In this paper we are proposing precise decision support system using IoT and AI for the proper and sustainable development of crops.

Keywords: *IoT, AI, Sensors.*

I. INTRODUCTION

[1] Convergence of Internet-of-Things and Artificial Intelligence are used in last few years and these technologies exist in many applications that being developed in various domains. Sensors network with ability of decisions are a modern agricultural technology, developed to help farmers obtain faster and better results with precision, assisting in the determination of various soil characteristics. They can be used to measure in real-time thus controlling the variable rate application**.** Sensor technology has also been advanced and many types of sensors like humidity and temperature sensors, soil moisturizer sensor, analog nitrate sensor, analog potassium sensor, analog pH sensor, Environmental sensor are developed and used in applications as per the need. Cloud-Computing and Big data are well used technologies and its applications based on those technologies are exists in almost every field. When we think about artificial intelligence (AI), we probably don't imagine using it for a farm. But IBM is bringing data and AI together with the global release of the Watson Decision Platform for Agriculture to help growers and enterprises make better decisions. This new platform is an innovation that draws upon IBM's most advanced capabilities in AI, analytics, IoT, Cloud, and weather to create a suite of solutions that span the farm-to-fork ecosystem.

Farming has always been a complex undertaking that requires growers to manage an interconnected web of pre-season and in-season decisions while at the mercy of mother nature. With the explosion of data from farm equipment, environmental sensors, and remote input, it's impractical to rely on intuition or traditional technology to understand what drives variation in yield or provide guidance to growers. IBM is filling this gap by applying Watson AI to help growers make confident, evidence-based decisions.

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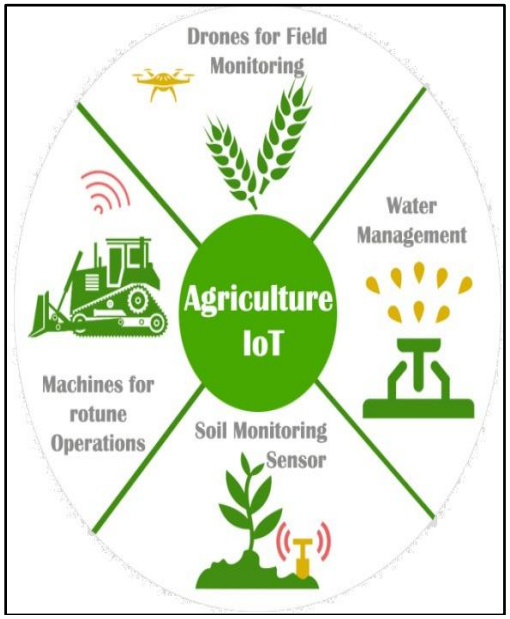

Figure. 1 IoT in agriculture

In parallel, food companies are looking for ways to meet consumer demand for better food quality and sustainability. IBM's solution will bridge food companies and their grower suppliers to better manage the inputs and farming practices that can deliver on the promise of improved food quality. IBM is drawing on its experience with improving products ranging from wine to tomatoes to make this vision a reality.

II. SIGNIFICANCE OF IOT IN AGRICULTURE DOMAIN

A. Weather prediction

90% of all crop losses are due to weather. With the IoT platform that can integrate IoT and weather data, farmers would be able to build predictive weather modeling. It can provide the insights that help farmers to make strategic decisions on planting crops and take necessary actions to prevent the damage caused by extreme weather. With weather data, farmers can even build advanced irrigation systems to save water and prevent pesticide waste by predicting rain.

B. Plant and field real-time monitoring

The IoT platform can integrate drone imagery and sensor data from soil and environment sensors. The insights generated from that data can help farmers make better decisions and therefore drive high performance.
Infosys and Skata Seed have built the Precision Crop Management Testbed. This solution can monitor the plant environment 24/7 in real-time, analyzing drone aerial imagery and sensor data from soil and environment, getting information such as plant health, soil moisture, CO_2, sunlight, rainfall, air, humidity and more. It helps farmers to improve crop productivity and operational efficiency by taking strategic actions guided by these insights.

C. Disease & Pest Indicators for Corn

This API service predicts the risks in corn production, leveraging hyper-local weather forecast details (temperature, relative humidity, precipitation, etc.) from The Weather Company and crop specific inputs (sowing date, growth stage, etc.) to model the outbreak probability of various pests and diseases. It also considers transport of the spore that triggers the disease. The advance notice for disease could help farmers reduce pesticide usage and take preventive or curative measures to avoid any unexpected yield loss.

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III. SMART AGRICULTURE Using LoRa

LoRa (**Lo**ng **Ra**nge) is a patented[1] digital wireless data communication technology developed by Cycleo of Grenoble, France, and acquired by Semtech in 2012.[2] LoRa uses license-free sub-gigahertz radio frequency bands like 169 MHz, 433 MHz, 868 MHz (Europe) and 915 MHz (North America). LoRa enables very-long-range transmissions (more than 10 km in rural areas) with low power consumption.[3] The technology is presented in two parts — LoRa, the physical layer and LoRaWAN (Long Range Wide Area Network), the upper layers.Semtech'sLoRa devices and wireless radio frequency technology is a widely adopted long-range, low-power solution for IoT that gives telecom companies, IoT application makers and system integrators the feature set necessary to deploy low-cost, interoperable IoT networks, gateways, sensors, module products, and IoT services worldwide. IoT networks based on the LoRaWAN™ specification have been deployed in over 100 countries and Semtech is a founding member of the LoRa Alliance™, the fastest growing IoT Alliance for Low Power Wide Area Network applications. To learn more about how LoRa enables IoT, visit Semtech's LoRa site and join the LoRa Community to access free training as well as an online industry catalog showcasing the products you need for building your ideal IoT application.

IV. PROPOSED ARCHITECTURE

The sensor input module is the heart of this architecture, as it does half of the work of module. sensor input module is responsible for communications between sensor and internet as well as communication with the mobile app. sensor input module consist of three main entities those are Communication internet, mobile app, IBM watson.[7]

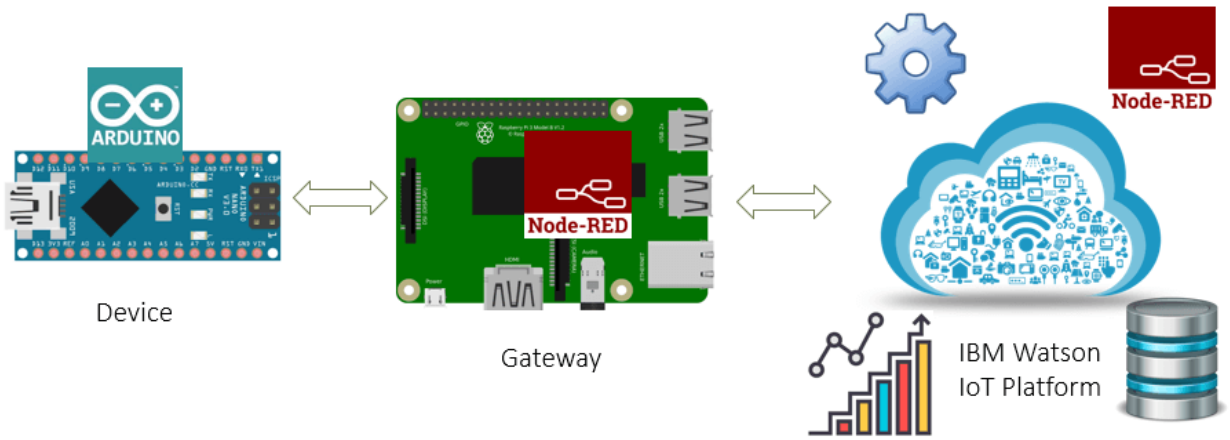

Figure 2 Basic Architecture of Smart Farming using IoT

Sensor Kit module is portable IoT device with soil and environment sensors. Mobile App module provides interface to the users. Agro Cloud Module consists of storage, Big-Data mining, analysis and knowledge building engine and application module to communicate with the users.

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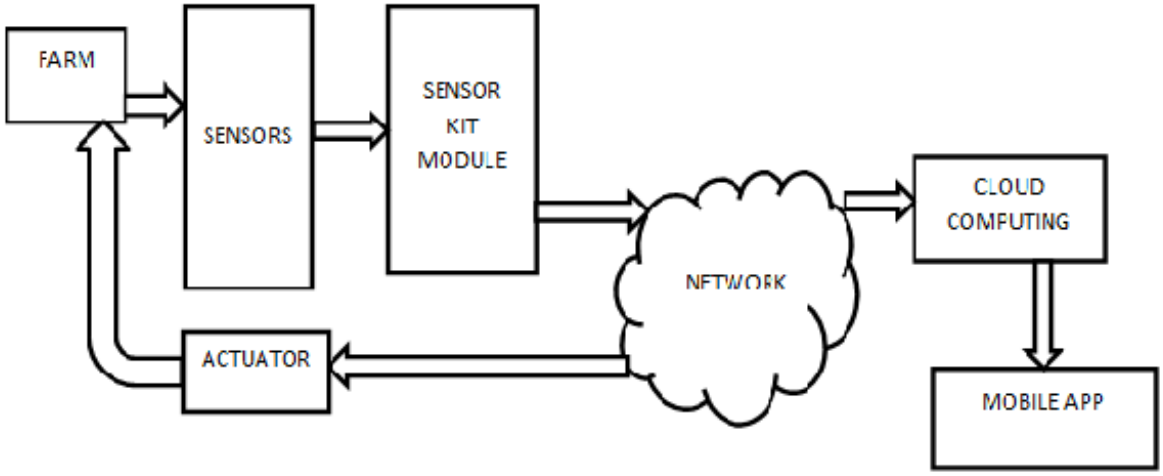

Figure. 3 Multidimensional module for smart IoT

A. Relevant Work:

4.1.1 IBM Watson

Together with IBM Watson and The Weather Company, it is possible tobuilt a suite of agribusiness tools and solutions to help the agriculture industry use the power of AI to make more informed decisions about their crops – the Watson Decision Platform for Agriculture.

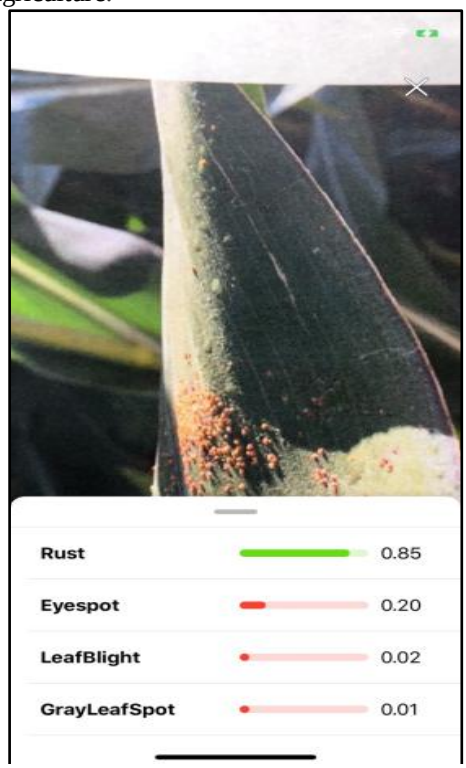

Figure. 4: A mobile app tapping IBM Watson's computer vision APIs

4.1.2 Mobile app:

Mobile app application need to be installed on end user mobile phone. Mobile apps contributing and playing vital role in development of farming based applications in IoT. Mobile apps made possible to use power IoT everywhere,

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anytime and at any place, with internet IoT is buttons away. The fact is getting established slowly but steadily that mobile apps are leveraging the IoT. [7]

4.1.3Actuator:
It perform important role in a multidimensional smart IOT agricultural. An actuator is switch or mechanism or device which converts energy into motion. In this paper we are using actuator to turning up motor, sprinkler, etc. [7]

B. Sensor Kit Module
This module is an important part of this agricultural and is responsible for soil sampling for period interval to get soil property values.

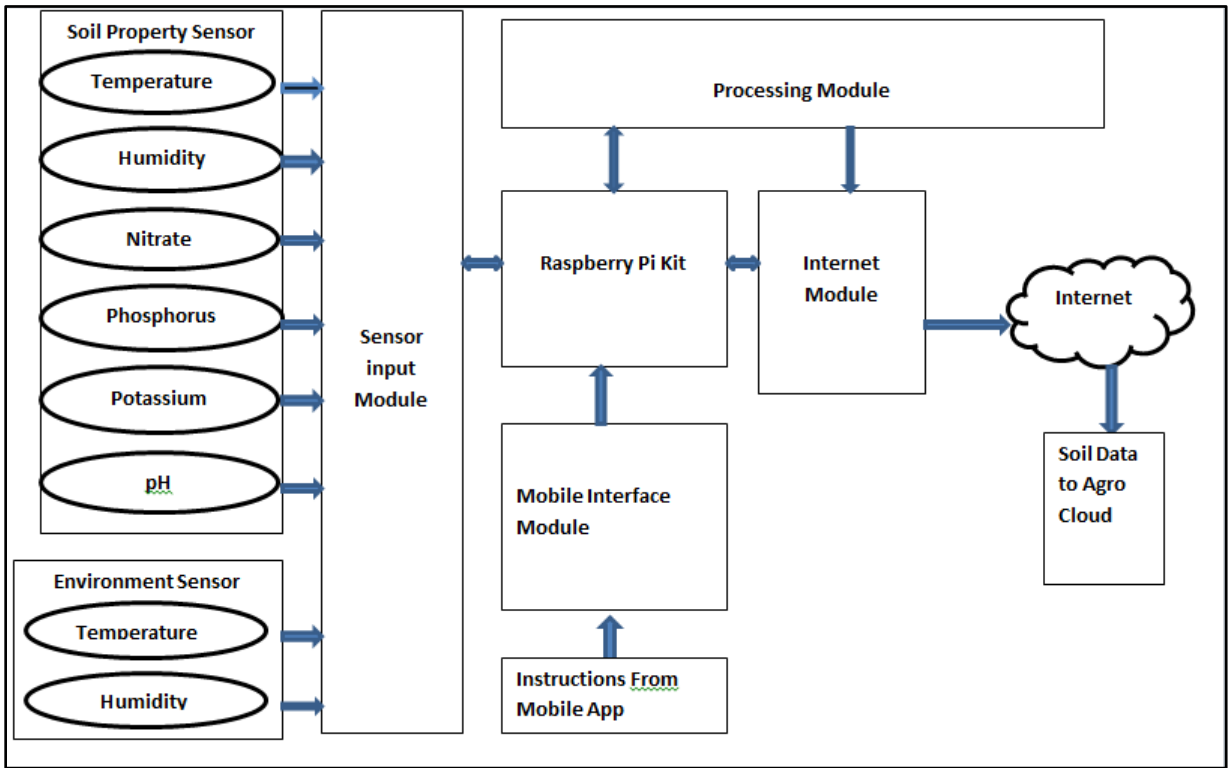

Figure 5: Sensor Kit Module

V. CONCLUSION

Farming is a complex task and it need to revolutionize and sensor networks IoT help us to achieve this by enabling interact with the real world objects. In this paper we are dealing with the sensor network design that enables connecting agriculture to the IoT. Sensors based on IoT continuously monitors soil and weather, on the basis of generated data AI system takes the appropriate decision according to data. The connection sets up the links among agronomists, farms, and thus improves the production of agricultural products. It is a sensor based network using IoT designed to achieve precision in agriculture.

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