

## ENHANCING AGRICULTURAL PRODUCTIVITY WITH IOT

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**Abstract:** Meeting the food demand of a global population expected to reach 9.1 billion in 2050 and over 10 billion by end of the century will require major changes in agricultural production systems. Improving crop land management is key to increase crop productivity without further degrading soil and water resources. At the same time, sustainable agriculture has the potential to deliver co-benefits in the form of reduced GHG emissions and increased carbon sequestration therefore contributing to climate change mitigation. The paper synthesizes the results of a literature review reporting the evidence base of different sustainable land management practices aimed at increasing and stabilizing crop productivity in developing countries. It is shown that soil, water and climate characteristics are key in interpreting the impact on crop yields and mitigation of different agricultural practices and that technology options which are most promising in enhancing food security at smallholder level are also effective on increasing system resilience in dry areas and mitigating climate change in humid areas by using IoT.

Water management plays a vital role in the agricultural productivity and agricultural growth. The most of renewable water resources worldwide are being presently utilized for irrigation purposes. However, the average water use efficiency of irrigation project is too low. Innovative approaches in agriculture water management can enhance water efficiency, gaining and economic advantage while also reducing environmental problems. In some cases, the necessary knowledge has been provided by extension services, helping farmers to adopt and implement viable solutions, thus gaining more benefits from irrigation technology.

**Keywords:** Class Equipment, Phenonet, Climate, Irrigation technology and IoT

### I. INTRODUCTION

Agriculture is the main source of India's Economical growth. The most important barrier that arises in traditional farming is climatic change. The number of effects of climatic change includes heavy rainfall, most intense storm and heat waves, less rainfall etc. Due to these the productivity decreases to major extent. Climatic change also raises the environmental consequences such as seasonal changes in life cycle of plants. To boost the productivity and minimize the barriers in agriculture field, there is need to use innovative technology and techniques called Internet of Things. Now a days, the Internet of Things (IoT) is transforming towards agriculture industry and enabling farmers to compete with the enormous challenges they face. Farmers can get huge information and knowledge about recent trends and technology using IoT.

### II. INTERNET OF THINGS (IoT)

The Internet of things (IoT) is the most essential techniques for development of solutions to the problems. IoT evolve from different building blocks which includes lots of sensors, software's,

network components and other electronic devices. Also it makes data more effective. IoT allows exchanging the data over the network without human involvement. In IoT, we can describe the things with natural way just like normal human being, like sensor, like car driver, a smooth flow of agricultural logistics etc. This thing is assigned an ip address so that it can transfer data over a network.

The IoT technology is more efficient due to following reasons:

1. Global Connectivity through any devices.
2. Minimum human efforts
3. Faster Access
4. Time Efficiency
5. Efficient Communication

### III. REVIEW OF LITERATURE

**Fan TongKe,** he studied Based on major features of cloud computing and key techniques of internet of things, cloud computing, visualization and SOA technologies can build massive data involved in agricultural production. Internet of things and RFID technologies can help build plant factory and realize automatic control production of agriculture. Cloud computing is closely related to internet of things. A



perfect combination of them can promote fast development of agricultural modernization, realize smart agriculture and effectively solve the issues concerning agriculture, countryside and farmers.

**Sun ZhongFu; Du KeMing; Zheng FeiXiang; Yin ShouYi,** This paper introduced the background of the big data together with presenting the relation between big data and IOT, basic connotation and key technology, and then analyzed the demands of big data in the main applicable fields and its influence on the smart agriculture. Finally, some suggestions and thinking were put forward for the future development of big data and smart agriculture in China.

**Lee, Joonyoung; Kim, ShinHo; Lee, SaeBom; Choi, HyeonJin; Jung, JaiJin,** In this paper Korea has high quality level of ICT Technologies, however it still have a long way to go before invigoration of ICT in agriculture industry. The government of Korea supply to agriculture ICT systems, however these are the enclosed type and insufficient the level of connectivity, compatibility, and integrity between ICT systems.

#### IV. IoT IN AGRICULTURE

With the continuous increase in world's population, demand for food supply is extremely raised. Governments are helping farmers to use advanced techniques and research to increase food production. Smart farming is one of the fastest growing fields in IoT.

Farmers are using meaningful insights from the data to yield better return on investment. Sensing for soil moisture and nutrients, controlling water usage for plant growth and determining custom fertilizer are some simple uses of IoT.

##### *New applications of IoT in farming:*

1. **The Phenonet Project by Open IoT** – The Phenonet enables plant breeders to evaluate the performance of differentiated crop varieties with the help of measurements taken from remote sensors. These sensors are capable of monitoring various factors like soil temperature, humidity, air temperature, etc.

It aids in improving quality and plant breeders to monitor and promote plant growth under various climate conditions.

The Phenonet Project is a step ahead in the Agricultural IoT, driving improved quality by measuring on field environmental and plant

physiology parameters resulting in improved quality.

2. **CLASS Equipment** – CLASS is a leading manufacturer of agricultural machinery founded in 1913. The CLASS Agriculture Internet of Things equipment can be operated on autopilot and farmers can receive advice on ways to improve crop productivity and reduce grain losses.

CLASS has joined a partnership venture with 365FarmNet to facilitate the service to farmers, in which they can manage and control their agricultural plotting via a computer or smartphone;

It collects important pieces of information for further analysis. This information may be used in field mapping and in various planning programs like fertilization and nutrient planning.

3. **Precisionhawk's UAV Sensor platform** – Unmanned Aerial Vehicle (UAV) Sensors efficiently collect superior quality data, then analyze it to give farmers relevant information like wind speed, air pressure, etc. This platform can also be used in civil services like surveying, mapping and imaging of agricultural plots.

4. **Cleangrow's Carbon Nanotube Probe** – CleanGrow Ltd., founded 2009, make easier in making quick measurements of ion concentrations in a given liquid. In other words, the firm measures the various nutrient levels present in a given liquid on a field.

Cleangrow Ltd. Avails the Carbon Nanotube Probe as a transducing layer in the sensors, enabling the measurement or test for multiple ions in a solo device. This meter provides instant feedback to the user.

In addition, farmers can set alarms for various factors or situations related to temperature, humidity and vibration.

##### *The advantages of using IoT in upgrading farming are as follows:*

1. **Increased Production:** Optimized crop treatment such as accurate planting, watering, pesticide application and harvesting directly affects production rates.

2. **Water Conservation** – Weather predictions and soil moisture sensors allow for water use only when and where needed.

3. **Real-Time Data and Production Insight** – Farmers can visualize production levels, soil moisture, sunlight intensity and more in real time



and remotely to accelerate decision making process.

4. **Lowered Operation Costs** – Automating processes in planting, treatment and harvesting can reduce resource consumption, human error and overall cost.
5. **Increased Quality of Production** – Analyzing production quality and results in correlation to treatment can teach farmers to adjust processes to increase quality of product.
6. **Accurate Farm and Field Evaluation** – Accurately tracking production rates by field over time allows for detailed predicting of future crop yield value of a farm.
7. **Reduced Environmental Footprint** – All conservation efforts such as water usage and increased production per land unit directly affect the environmental footprint positively.
8. **Remote Monitoring** - Local and commercial farmers can monitor multiple fields in multiple locations around the globe from an internet connection. Decisions can be made in real-time and from anywhere.
9. **Equipment Monitoring** – Farming equipment can be monitored and maintained according to production rates, labor effectiveness and failure prediction.

## V. CONCLUSION

Weather forecasting accuracy and other dynamic data inputs can affect crop productivity to a great extent. More the level of precision, the less chances of crops being damaged; thus, more accurate weather forecasts can lead to higher profitability and productivity levels.

It ensures accurate and efficient communication to farmers of real time data related to dynamic agricultural processes (like weather forecasts, planting, harvesting, etc.), weather forecasts, soil quality, and availability and cost of labor. Farmers who have opportunity to use such important real-time information available to them can better plan their course of activities beforehand and take corrective or preventive measures in advance for the future.

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