

**SMART AGRICULTURE AND WATER MANAGEMENT****Manasa Bandari¹**

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Abstract: The world population is expected to increase to 9.6 billion by 2050. India is the second largest agriculture producing country in the world after the United States and majority of its population depends upon agricultural income as Agricultural sector is the backbone of the Indian economy. The increase in the population in near future will eventually lead to increase in food demand and with the use of traditional farming techniques the demands are impossible to be met. By adopting smart farming and IOT as technology it is possible to increase the quality, quantity, sustainability of cost effectiveness of agricultural production and reduction in greenhouse gases. The farmers will be benefited with the use of IOT technology as this technology uses sensors as smart devices and provides knowledge to farmers about the various methods of cultivation, suitable environment and best tools to be used in agriculture activities. IOT provides real-time information and data about the soil, air quality, water levels etc. Which help farmers in making better decisions about planting and harvesting crops which thereby would help in getting better yield, productivity and earning profits. Water management is another aspect which contributes for development of agriculture activities. Water management and IOT will help boost the agriculture growth in India.

Keywords: population; smart farming; IOT as technology; sustainability; greenhouse gases; real time.

I.INTRODUCTION

Agriculture is the keystone of the Indian Economy and serves as the main source of income to the people. It contributes to 18% of the GDP and 10% income comes from export of agricultural products. The major income of the Central and State government of the country comes from the agriculture sector which helps in meeting its planned expenditure and also in economic planning. 70% of the people in India depend on the Agricultural sector to earn their bread and butter. Farming is the technique followed generally, but traditional way of farming is the task wherein the cultivation is not giving us high productivity, cost effectiveness and good water management. As India's 70 % of the population is engaged in agriculture activities, agriculturist has to adopt modern techniques to cultivate the crops, grains, vegetables, fruits and other food items. Not only the farming activities but also the irrigation, infrastructure, technology and tools of equipment and machinery should be developed in agriculture sector. Since the world population is increasing at a fast rate the demand for food supply is also increasing, the use of traditional methods of farming will not meet the needs of the people and the economy on the whole and there is the need for adopting modern technology in the form of IOT and smart farming for greater production capabilities. The main aim is to make the agriculture sector boost its activities with productivity, efficiency and effectiveness with the use of modern technologies.

II. LITERATURE REVIEW

Agriculture is considered as the basis of life for the human species as it is the main source of food grains and other raw materials. It plays vital role in the growth of country's economy. It also provides large ample employment opportunities to the people. Growth in agricultural sector is necessary for the development of economic condition of the country. Unfortunately, many farmers still use the traditional methods of farming which results in low yielding of crops and fruits. But wherever automation had been implemented and human beings had been replaced by automatic machineries, the

yield has been improved. Hence there is need to implement modern science and technology in the agriculture sector for increasing the yield. [1]

Water management is defined as the activity of planning, developing, distributing and managing the optimum use of water resources. This impacts on several key matters of human lives, such as food production, water consumption, sewage treatment, irrigation, purification, energy generation and utilization, etc. The lack of water ICT (Information and communications technology) standards prevents an effective interoperability, and increases the cost and the maintenance of new products. Nowadays there are many small and local producers of specific solutions in a weak and fragmented market. The almost no adoption of complex and interoperable systems jeopardizes the control and monitoring of water distribution networks, preventing also their evolution and necessary improvements, as an adoption of IOT (Internet of Things) paradigm. [2]

There are number of other factors that decrease the productivity to a greater extent. Hence automation must be implemented in agriculture to overcome these problems. So, in order to provide solution to all such problems, it is necessary to develop an integrated system which will take care of all factors affecting the productivity in every stage. [3]

Good agricultural water management means using water in a way that provides crops and animals the amount of water they need, enhances productivity, and conserves natural resources for the benefit of downstream users and ecosystem services. [4]

Agriculture plays an important role in the growth of the economy and also serves as a basis for human life. Agricultural sector provides employment to people which will lead to the development of the economic conditions. The use of traditional methods and techniques by farmers do not contribute to the yield and so the adaptation of modern services is necessary.



Water is required at every stage of human life. The use of water in an effective manner is very important in order to reduce the cost and maintenance of new products.

and forecasting, smart logistics and warehousing and many more services.

V. WATER MANAGEMENT

Without water, irrigation is not possible and without irrigation, agriculture is not possible since irrigation ensures proper plant growth. Water management is an important basic need for any agricultural activity; water management strategy should be in such a way wherein sustainability should be the main factor. Good agriculture management comes with proper water management strategy. Strategies should be in the way that provides the plants and animals as much water they need of, which enhances productivity, increases the quality and quantity of production, reduces the wastage and helps in sustainability, the animals survive for maximum years with good health conditions.

III.OBJECTIVES:

- 1) To study how IOT is being used in the agricultural sector.
- 2) To study the advantages of using IOT from the point of view of farmer.
- 3) To study the advantages of IOT in the economy.
- 4) To study the effectiveness of the use of IOT in smart farming and water management.

IV.CONCEPT

Smart farming has been developing from the past few decades i.e. in 18th century they had grain elevators, chemical fertilizers, and the first gas powered tractor, in late 19th century farmers started using satellites to plan their activities. IOT is an up growing technology which uses small sensors to provide real-time information to the farmers relating to the rainfall, crop yields, soil moisture, air temperature, air humidity, sunlight intensity, pest infestation, and soil nutrition. They can monitor their equipment, livestock and also get information relating to their livestock produce. IOT helps the cultivator's extremely produce the productive crop and good results to market the goods for reasonable prices. Efficiency is what is offered by IOT, it helps in saving time and money.

Many companies have adopted this technology and some of the companies are:

Cow Tracking Project

The team behind the Cow Tracking Project attach a GPS device to each cow, and place sensors around their shed to monitor their movements and sleeping habits. The information will then be sent to the farmer's computer. Disruptions in a cow's regular pattern (e.g. sleeping more or moving around less than usual) could signal illness. Daily updates can help the farmer quickly catch these changes and take precautionary or necessary actions.

Stellapp is an app which provides certain applications to farmers to rely on Internet of things for better productivity. The services which this app provides are SmartFarms, smartAMCU, ConTrak, AgRupy, MooKare.

1. SmartAMCU: milk procurement app
2. AgRupy: Farmer wallet application
3. MooKare: cattle insurance application
4. Smartfarm: milk production application
5. ConTrak: cold chain management

Kaa is another company which deals with providing the smart farming products to the agriculturists. The products or services provided by them are sensor based field and resource mapping, remote equipment mapping, remote crop mapping, predictive analysis of crop and livestock, climate monitoring

The level sensors and equipment are specially designed sensors which are deployed across reservoirs and overhead tanks in order to establish the level of water present in the reservoir and also to communicate to the central servers about the effective water conservation and management. The amount of water consumed and used on a daily basis can be determined and also the water level present in the tanks can be determined. IOT is data-driven shift used to get the right amount of water at the right place and at the right time.

A government organization named WALAMTARI is serving the farmers in both Telangana and Andhra Pradesh States; it has been working on low cost sensors for water use efficiency, soil moisture and environmental parameters, through a project called Clima Adapt, supported by the Norwegian Government. This organization also provides training to the farmers regarding the drying and wetting methods in paddy.

The main problem that any farmer faces is the utilization and distribution of the water in the crop fields which is provided to them from the reservoir since they cannot measure the water required by the crops just by observing. The water content required by certain types of crops might differ and now the solution to this problem has been discovered which is with the help of IOT sensors. These sensors are placed in the crop fields and in the irrigation outlets in the fields for measuring the water flow, soil moisture, temperature and relative humidity and this information is been sent to the farmers mobile as a message for every two to three hours.

The big data analytics from IBM makes a big difference in Bangalore's water management. The Bangalore water supply and sewage board(BWSSB)uses IBM's intelligent operations centre to create systems for monitoring and managing the complex water distribution systems .Geo information system enables a real-time view of file meters .Of about 45% of water supplied by BWSSB goes unaccounted. The biggest challenge it faces is to distribute the water equally across various divisions since main sources of water aren't sufficient to meet the city's water demand.

Temboo is a company engaged in water resource management. They built a system that senses the water levels in the tank or reservoir and communicates the water levels to the horticulturist or the planter.

**VI. ADVANTAGES:****To the Farmers:**

- **Increased production:** Optimized crop treatment such as accurate planting, watering, pesticide application and harvesting directly affects production rates and help in increasing the overall production.
- **Weather forecasting:** With the help of IOT techniques, data will be available in real time on a web app using GPRS communication. Therefore farmers can anticipate the certainty and uncertainty in weather forecast.
- **Water conservation:** The sensors related to weather predictions and soil moisture provide information about the water and helps in deciding when and where the water is required.
- **Real-time production and data insight:** The farmers can make decisions as they can visualize production levels, soil moisture, and sun light intensity more in real time.
- **Lower operational cost:** The automating processes in planting, treatment and harvesting will reduce the resource consumption, the human error and the overall cost.
- **Automated Tractors:** Automatic tractors and agriculture drone have made its significance in agriculture yields or fields for enhancing the production level with less time consuming.
- **Improved livestock farming:** Sensors and machines can be used to detect reproduction and health issues earlier in animals. Geofencing location tracking can also improve livestock monitoring and management.
- **Accurate farm and field evaluation:** Accurately tracking production rates by field over time allows for detailed predicting of future crop yield and value of a farm.
- **IOT facilitates the peasant with Smarter Irrigation facility as an innovation of technologies in irrigation field.**
- **Agriculture warehouses or green houses:** With the use of drop battery powered, low powered wireless sensor nodes as IOT techniques it ensures proper maintenance of goods or products in green houses with proper care.
- **Increased quality of production:** In order to increase the quality of production the farmers may be taught about analyzing the production quality and results in correlation to treatment.
- **Reduced environmental footprint:** All conservation efforts such as water usage and increased production per land unit directly affect the environmental footprint positively.
- **Innovative product usage:** Farmers are adopting new innovative techniques like home gardening, remote control machines for farm irrigation, and upgraded tools for cultivation activities.

□ **Remote monitoring:** Since decisions can be made in real-time and from any place the local and commercial farmers can use the internet connection to monitor multiple fields in multiple locations around the globe.

□ **Equipment monitoring:** According to production rates, labour effectiveness and failure prediction farming equipment can be monitored and maintained.

□ **Livestock application monitoring:** This is used to monitor the animal transactions, animal products, monitor milk and milk products, monitor animal disease, transportation and trace passing of unwanted animal.

To the Economy:

□ **Sustainable development:** The livelihood of millions of people depends upon agriculture. In such a case sustainability of resources is a crucial task. To maintain the sustainability in resources, the innovative IOT techniques have been adopted and made the resources sustainable or reserved for future decades. In simple way, IOT has made the water resources and other natural resources sustain for future development.

□ **Employment generation:** The development in agriculture sector with adoption of smart farming with innovative techniques leads to increase in the employment opportunities with less skill tasks. Thus migration of people from other sectors to agriculture sector will be seen.

□ **Increase in GDP and National Income:** Adoption of internet of things in agriculture and water management has a significant role in every economy. The economy which adopts the techniques can boost gross domestic product and also growth in national income will be possible.

□ **Economic development:** As the development in smart farming and water management is seen in majority of the states in the country, which leads to increase in productivity in agricultural sector and intend growth in GDP and national income. Therefore, ultimate growth and development in economy can be achieved.

□ **Reduction in Global warming:** Internet of things and smart farming increases the population working in primary sector. Thus, there will be increase in growth of the crops, trees, plants etc. and which ultimately reduces the global warming and the global warming situations in economy.

VII.CONCLUSION:

Smart farming plays a vital role in this growing economy and the techniques adopted in this method by the farmers have a good scope and help in the development of the agriculture sector. It made the economies from underdeveloped stage to developed stage. Smart farming has an excellent scope in future. Men and women globally agree that smart farming gave them good results of production with high productivity and effectiveness. Government of India has also taken initiatives for the development of primary sector activities and provides incentives, low cost equipment purchase, financing capital for adoption of innovative techniques. Women population is basically showing more initiative in adopting IOT techniques rather than men population. On the other hand

the age group of 30-50years population is effectively adopting the smart farming and IOT techniques in their cultivations. The internet of things which provides real time information to farmers has made the farming activities highly productive and helps in producing quality products at reasonable price.

On the other hand water management has also gained its importance, as without sufficient water there is no proper irrigation, and without proper irrigation there is no proper cultivation. Animals and plants should get appropriate water availability as much as is needed and required nothing in excess and nothing less. IOT technology helps the water management in irrigation and also in providing sufficient water by centred sensors deployed in the reservoirs or tanks which provides sufficient water supply as when as required. Many of the agriculturists or the farmers who are engaged in other allied activities are benefited with excellent irrigation and water management. Sustainability of natural resources and high productive are the results gain from adoption of IOT in water management.

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