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IoT Based Agriculture

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Abstract: *Internet of Things is referred to as IOT. It refers to using the Internet to access and manage commonly used equipment and devices. Everything in daily life that can be accessible or connected over the internet is referred to as "Things" in the Internet of Things. The Internet of Things (IOT) is a cutting-edge automation and analytics system that works with artificial intelligence, sensor, networking, electronic, cloud messaging, etc. to give comprehensive systems for the product or services.*

Keywords: Internet of Things

I. INTRODUCTION

The agricultural Internet of Things (IoT) has altered agricultural output in unprecedented ways. In addition to raising agricultural productivity, it may also significantly raise product quality, lower labour costs, boost farmer income, and actually achieve agricultural modernization and intelligence. In-depth summaries of agricultural IoT studies are provided in this study. The current state of agricultural IoT is first illustrated, along with a summary of its system architecture. [1]

Agrotechnology, often known as agricultural technology or agtech, is the application of technology in agriculture, horticulture, and aquaculture with the goal of increasing output, efficiency, and profitability. Agriculture-related goods, services, or software programmes that enhance various input-output processes are referred to as agricultural technology.[2]

With the Web of Things (IoT), we are entering a new era of invention. IOT functions as a sort of "all-encompassing global neural system" in the cloud.

connects various things. The Internet of Things (IoT) is a network of cleverly connected devices and frameworks that includes intelligent machines cooperating and speaking with other machines, conditions, items, and foundations. Radio Frequency Identification (RFID) and sensor network innovations will advance to handle this new challenge. [3]

The phrase "Web of Things" (IoT) refers to a broad concept for the ability of system devices to detect and collect data from throughout the world, and then offer such data online, where it can be packaged and used for a variety of fascinating applications.

The Internet of Things is a network of intelligent machines that communicate and collaborate with other machines, objects, circumstances, and foundations. Nowadays, everyone keeps in touch with one another through various forms of correspondence. Web is the most popular form of communication there, or, to put it another way, web connects social groupings.[4]

The world's population is predicted to increase to roughly 10 billion people by the year 2050. Agriculture must successfully integrate technology to feed such a vast population. Agriculture is yet another crucial IOT sector. IOT systems are crucial for crop and soil monitoring and provide the appropriate solution as a result. Smart farming is a result of IOT. Farmers may reduce waste and boost output by using IOT. The technology enables the use of sensors to monitor fields. Farmers can keep an eye on the region's condition.[5]

Issues facing the modern agriculture sector

The following is a list of the difficulties that the farming sector and agriculture face:

1) Lack of labour force and resources
2) Climate change and environmental issues
3) Large-scale manual intervention is necessary
4) Inadequate monitoring
5) Problems with large-scale unstructured data analysis

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In order to do automated decision-making and predictive analysis, the data from smart sensors can be further examined. Farmers will benefit from the use of machine learning and predictive analysis to manage adverse weather situations like floods and drought.[5]

Advanced agricultural techniques

- Drone-based uses
- Real time crop monitoring
- Smart irrigation system
- Livestock management
- Tank level management
- Smart greenhouse solution
- Data analytics

The Internet of Things (IoT) is a new paradigm that facilitates connectivity between devices. between technological gadgets and sensors via the internet to make our lives easier. Smart devices and the internet are used by IoT to offer creative solutions to a range of problems and concerns affecting various economic, governmental, and public/private enterprises. around the globe IoT is steadily growing in importance and is now pervasive throughout our daily lives. IoT, as a whole, is a technological advancement that combines a wide range of smart systems, frameworks, intelligent devices, and sensors.Additionally, it utilises quantum and nanotechnology to a degree that was previously unthinkable in terms of storage, sensing, and computing speed.[6]

Drone based uses

Almost every aspect of how we operate has been transformed by drones, and the possibilities for their use are only limited by our creativity. The number of drone applications, in particular, outnumbers all other potential uses in the agricultural sector. The latest research and application results linked to the usage of drones in agriculture will be shared in this section's forum. This Section aims to publish articles that discuss the most recent research, state-of-the-art research, andpotential future possibilities for creative drone use in agriculture. [7]

Real time crop monitoring

Many nations, including India, still practise traditional farming techniques. Our farmers' lack of proper information makes the status of the agricultural industry even more dire. Since farming methods heavily rely on weather forecasts and predictions, which may not always be accurate, farmers frequently suffer enormous losses that result in debt and mass farmer suicides. Because they have a significant impact on agricultural productivity, adequate soil moisture, good soil, clean air, and effective irrigation cannot be disregarded. Currently, the world's population is growing at an alarming rate, and agricultural production cannot keep up with the rising demand[8]

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Smart irrigation system

The FAO estimates that by 2050, there will be almost 9.1 billion people on the planet, which would greatly raise the already high global demand for food. Food output is predicted to rise by 70% globally over the next few years and by up to 100% if only developing nations are taken into account [9,10]. 70% of the freshwater taken from aquifers, streams, and lakes is currently utilised for crop irrigation [11,12], but that proportion would need to climb to maintain the anticipated increase in food production.

The study demonstrates the use of appropriate soil moisture sensors, which makes it easier to track and record changes in soil moisture. The temperature is monitored and examined using an Arduino Mega microcontroller equipped with a light-dependent resistor sensor, a moisture sensor, and a temperature sensor. The soil for a specific amount of time provides information about the soil's moisture level. The data obtained from the Sensors will be gathered and processed by the Arduino Mega. The water supply will be adjusted when the soil reaches a certain threshold moisture level. This is crucial since the plant has to receive water at a specific time for a healthy yield. By eliminating old methods, this project is heavily utilised by farmers and nursery specialists.[13]

Livestock management

Several foresight studies have modeled the impacts of different livestock production systems and human diets on global food supply and the environment, combining different livestock management systems, different human consumption patterns, different policy choices and investments and different world orders, from equitable to stratified societies. The sustainable organic livestock model was specifically designed to explore the technical feasibility of an ideal livestock sector that matches food demand and supply without adversely impacting the environment. The implications of such a model require acting at both ends of the production and consumption chain, with decreased food-competing-feed for ruminants, decreased animal numbers, especially grain-eating pig and poultry, and decreased consumption of animal-sourced proteins to a level that matches healthy diet recommendations. This chapter sheds light on the need to consider protein output/input efficiency, combine attributional and consequential life cycle analysis and complement efficiency with consistency and sufficiency strategies.[14]

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Tank level monitoring

Storage tanks, totes, and containers can be found in a range of settings, including above- and below-ground installations, indoor installations, and outdoor installations. The productivity and profitability of these tanks can be increased by owners and asset managers by properly monitoring and maintaining level conditions inside the tanks. For more information on the advantages of a wireless tank level monitoring technology, continue reading.

There are numerous cutting-edge technologies available for water monitoring. The study thinks that one of the factors contributing to the water deficit is the labour- and time-intensive nature of old approaches. Water shortages come from insufficient early notification of relevant stakeholders about the present water level. Earlier research has examined a range of approaches for efficiently monitoring water levels. The importance of water monitoring systems will be discussed in this chapter, focusing on three Remote Sensor Networks that have been created to monitor water.[15]

Smart greenhouse solution

Crop growers can spend less time managing, watching over, and maintaining a greenhouse by using a smart greenhouse. Modern automated smart greenhouses allow crop growers to leave their greenhouses while still being able to adjust the environment with the push of a button.

In nations like Qatar with scarce resources and a difficult climate, greenhouse farming is crucial to boosting local food output. To get beyond these obstacles and attain high levels of food security, smart greenhouse development is even more crucial. While providing a suitable environment for high-yield production and safeguarding crops from unfavourable weather conditions is the primary goal of greenhouses, smart greenhouses provide precise regulation and control of the microclimate variables by utilising the most recent control techniques, cutting-edge metering and communication infrastructures, and smart management systems, thus providing the ideal environment for crop development. However, greenhouses are going through a significant shift as a result of the growth of information technology.[16]

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Utilising soilless crops, which boost production and make better use of water and fertilisers, is one of the advancements used in protected crops with significant growth potential. Most open soilless farming systems, where drainage is discharged into the environment, were used in the beginning. Due to the high water usage and environmental pollution caused by the application of 31% nitrates and 48% potassium during the crop cycle, aquifers are contaminated, and eutrophication-related environmental issues may also result. However, recent European programmes, including the Green Deal have focused on improving the sustainability of agricultural practises. The use of greenhouses to produce more than 60% of the region's food in the Mediterranean[17,18]

Data analytics

Precision farming and data analytics are on the rise, and Xuan Pham and Martin Stack expound on the effects on agriculture at two distinct but connected levels in their article "How Data Analytics is Transforming Agriculture".

The authors focused their discussion on the upstream connections that link input suppliers, ag input retailers, and farmers despite taking into account the entire value chain—the sequence of businesses and transactions from ag input manufacturers, ag retailers, farmers, processors, the food industry, food retailers, and food consumers. This is because this is where the majority of significant innovations are taking place. We may better grasp what lies ahead and how to best position ourselves in a dynamic agriculture value chain environment by thinking back on the previously discussed questions.

The Problem with Agriculture

Farmers and agricultural executives must undergo a digital transformation to increase the efficiency of food production. They must embrace AI, IoT, big data, and analytical tools to provide insights that support data-driven decisions. The strength of SAS analytics is applicable to the whole agricultural sector, and we can assist you in solving issues like farm production optimisation and supply chain optimisation for businesses that manufacture consumer goods.

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Agriculture is one of the key economic activities in India. The agriculture sector in India accounts for between 60 and 70 percent of all jobs. It has the second-most arable land behind the United States. This is brought on by the rich soil fertility and extensive network of irrigation water sources. The wide range of climatic conditions at various locations ensures that vegetation is abundant and productive. Despite the fact that resources are present, they do not always yield the same results.It is due to a lack of technology and its improper application, a lack of education and awareness among agrarians, and the usage of some antiquated techniques. The majority of crops suffer from pests, insects, and illnesses, which reduce yields.Insect or pest attacks cause damage to numerous crops. Pesticides and insecticides are not always proven to be effective because certain birds and animals may be poisoned by them. Additionally, it harms food chains and the natural animal food web. Crop disease has a very low throughput impact. The authors of Oerke describe the 20% to 40% yield reduction in agricultural productivity that is brought on by insects, pests, viruses, animals, and weeds. Additionally, they have a variety of aspects, some of which will have immediate effects and others which will have long-term effects on the world's food security. In India's semi-arid climate, crop output losses from pests and diseases are particularly significant. The impact of weather on agricultural production is enormous. In general, weather-based frangible agriculture systems produce greater crops. According to surveys, if the population increases to 10 billion people, we will undoubtedly reach food catastrophe by the year 2050. It means that unless we develop and expand smart agricultural technologies, our ability to produce food will go bankrupt. Therefore, it is essential to provide a cost-effective technology for Indian farmers in order to properly manage the country's scarce resources. The method ought to assist farmers in increasing food production and quality while promptly preventing crop illnesses.

Using IoT, develop smart agricultural

The phrase "smart agriculture" refers to a broad category of agricultural and food production methods supported by big data, advanced analytics, and the Internet of Things. IoT mainly refers to the addition of analytics, automation, and sensor technology to contemporary agricultural processes. Among smart agriculture's most popular IoT applications are:

1] Sensor-based devices for keeping an eye on crops, fields, livestock, barns, and pretty much any other significant aspect that affects production.
2] Drones, autonomous robots, and smart agricultural actuators.
3] Connected agricultural environments like hydroponics or smart greenhouses.
4] Systems for managing, displaying, and analysing data.
5] Modelling and planning that is predictive.

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