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AI and IOT in Smart Farming

Agriculture is backbone to our country. Farmers have to take innumerable decisions at each phase of cultivating the crop. Even though there is vast advancement in the information technology, acceptable and adoptable tools are still not available to farmers to support their decision making at each and every stage of crop growth period. The recent advancement in the field of software technologies especially Artificial Intelligence (AI), IOT and mobile based applications have opened up new challenges as well as opportunities to fulfill the needs of farmers for up-to-date and precise information. Hence, an intelligent mobile based application is needed to reach farmers easily and generate quick decisions for real time problems facing at the field level. Coupling AI, IOT and mobile based applications there is a need to develop adoptable tools to farmers to help them in real time decision making.

INTRODUCTION

Agriculture performs important role for the improvement of country's economy. In India approximately 1/3 of the nation's capital comes from farming and it additionally offers big enough employment possibilities to the people. By 21st century there will be big challenge in food production and is predicted that by 2050 the world population will be in the range 9.4 and 10.1 billion people (UNO, 2019). To feed the developing global population, Food and Agriculture Organization (FAO) estimates 50% more food by 2050 will needs to produce. Further each crop field has distinct characteristics may be measured one at a time, like irrigation requirement, soil type, pest resistance, etc., In maximum of situations, site-specific analyses are required for best possible yield production. Farmers should take innumerable decisions at every phase of cultivating the crop. Even though there may be great development in the information technology appropriate and adoptable tools are nevertheless now no longer to be had to farmers to assist their choice making at each and every stage of crop growth period. To rout the challenges occurring in agriculture

emerging technologies are required (FAO, 2020) to give solutions. Hence modern technology is needed in the agriculture sector for increasing the yield.

National efforts required to be addressed in agriculture sectors to meet food needs to build a sustainable future in India. Farming communities must adapt agriculture to climate change. In this circumstance Artificial Intelligence (AI) and mobile based applications and sensor technologies have opened up new challenges and opportunities to fulfil the needs of framers for up-to-date precise and timely information to boost decision making

To prevail over the challenges in food production a novel farm management thought called smart farming can be applied on a diverse degrees and scales of agricultural operations (Walter, 2017; Wolfert, 2017). There are many types of sensors can be used to collect the data (e.g., moisture, humidity, light, moisture) in smart farming for data analysis to get different solutions in smart farming (Pivoto, 2018). IOT are the devices which are interconnected gadgets (Madakam, 2015). The database created with smart faming helps in boosting productiveness and allowing essential activities to be carried out at the exact time (Leonard, 2016). IOT helps an easier adaption of smart farming (Ibarra-Esquer, 2017). By creating public policies and providing incentive programs agricultural producers are promoting the practice of IOT in precision farming (Bndes Estudo, 2018).

MAJOR APPLICATIONS USING IOT AND AI

Both AI and IOT facilitates in collecting data from sensors, processed that data and facilitates in understanding the essential elements which in the long run facilitates in crop production (Raju,2019). Water management, soil management, crops health management, weed management, crop diseases, temperature, and rainfall prediction, are a number of the elements which might be counted with inside the agricultural process. By using IOT technology with AI in agriculture practices, everything of conventional farming techniques may be basically changed. IOT and AI are very use full in soil management, crop diseases, rainfall prediction, crops health management etc. (Raghava, 2020). In smart agriculture, integration of IOT and Wi-Fi sensors can increase agriculture to tiers. IOT can assist to enhance the answers of many conventional farming issues, like land suitability, irrigation, drought response, yield

optimization, and pest control. The following section provides major applications of AI and IOT and in Agriculture (Muhammad Ayaz, 2019).

A. MONITORING CLIMATE CONDITIONS

To plan feature activities efficiently in agriculture, monitor weather conditions continuously. On weather stations most, important weather parameters are like wind direction, temperature, humidity, and air pressure, etc. are monitored and send to the cloud server. Collected data will be analysed to map the climate conditions and to present new insights to get required actions. To monitor weather changes, by using IOT technology a wireless sensor network have been deployed (Talavera et al., 2017).

B. CROP PEST AND DISEASE MANAGEMENT

Real-time monitoring of pest and disease forecasting, modelling will be done using IOT (Kim, 2018; Venkatesan, 2018). Usually, the dependability of crop sickness tracking and pest control relies upon 3 aspects: sensing, evaluating, and treatment. During the crop season, raw images of crops are acquired using field sensors and Remote Sensing (RS) technology and can be used for disease and pest recognition approaches. The images obtained through RS covers massive regions and, consequently, give better performance with lesser cost. Field sensors collecting data are successful to help greater features in the collection of data of plant health, and pest situations environment sampling, during the entire crop cycle. IOT base Precision farming consists of multiple tracking and controlling applications like climate conditions monitoring, irrigation, soil pattern monitoring, pest, and crop monitoring, and decide the most efficient time to plant and harvest and tracking/tracing.

C. IRRIGATION

The irrigation approaches is projected to be modified through implementing the IOT technologies. A large boom in crop performance is anticipated with the usage of IOT including crop water stress index (CWSI)-based irrigation management (USDA, 2018). Air temperature is needed for calculation of CWSI at different periods. All the field sensors are connected together and transmit the data to central database to analyse the farm data with IOT software. The satellite data, weather data, can be used as input to CWSI models for calculation of irrigation for respective site (Jacob LaRue, 2012).

D. FERTILIZER MANAGEMENT

Fertilization enables a precise estimate of the desired dose of nutrients under smart agriculture. Soil nutrient level measurements required at site-specific for fertilization, based on diverse factors like utilization rate, weather condition fertility type, crop type and soil type, soil absorption capability. Fertilizing processes with IOT helps in estimation of vitamins required with better accuracy and minimum labour requirement (Lavanya, 2019).

E. SOIL SAMPLING

Complete soil tests are optimistic on an annual basis, if possible in spring. However, mostly based on climate consents and soil situations and, they could be executed in winter or fall (Dinkins, 2013). To obtain soil nutrient status of an area soil sampling is required to take various decisions at different stages. With mapping of nutrient status of soil, we can find out nutrient deficiencies at specific areas. With the help of soil mapping we can sow different crop varieties. In soil mapping we will monitor topography, fertilizer application, soil type, irrigation level, etc. The sensors could help farmers to track the water holding capacity, absorption rate together with texture and also soil quality (Dinkins, 2013).

CONCLUSION

In this article, an evaluation of IOT in agriculture is discussed. The literature shows that a lot of work going in the development of IOT in agricultural applications. However, there are some troubles to be addressed to make it less expensive for small and medium-scale farmers. To increase the adoption rate IOT in agriculture favourable policies have to be implemented. By using the IOT can encourage modernization of agriculture system which improves the agriculture production.

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