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DEEP LEARNING BASED CLOUD INTEGRATED FARMING DURING COVID-19 FOR THE SAFETY OF AGRICULTURAL WORKERS

Outbreak of corona virus in India and the consequent lockdown, unfortunately, also coincided with the country's peak harvesting time of a variety of crops of the season. Across India, a massive agricultur-

al crisis is due to COVID-19 shutdown. As per COVID-19 safety guidelines agricultural workers movement to the farms has been restricted, therefore essence of robust digital infrastructure in agriculture is the need of hour for the safety of agricultural workers. A digital ecosystem in which a farmer and agricultural worker can monitor and grow crops with increasing yield, cost effectively, and sustainably. Technology adoption in agriculture sector is one of the major challenging problems in current time of pandemic. During this pandemic, Indian farmers and agricultural workers faced many problems in agriculture domain such as lack of irrigation infrastructure, market infrastructure and transport infrastructure etc. In this study we have proposed a one of the possible solutions for improvement is by using deep learning based cloud environment that helps in gathering information from farm workers such location-based information, crop health information and environmental constraints. In this paper we proposed a cloud based agriculture framework to monitor and analyse crop health by using deep learning remotely. This framework promotes a fast development of agricultural modernization, realize smart agriculture and effectively solve the problems concerning agriculture.

The on-going health crisis around COVID19 has affected all walks of life. Protecting lives of people suffering from the disease as well as frontline health responders have been the priority of nations. Governments have swung into actions since the Corona virus attack created an unprecedented situation. India declared a three-week nation-wide lockdown till mid-April in the initial phase, which was subsequently extended for achieving satisfactory containment of the virus spread. During these challenging times, how does Indian Agriculture respond to the crisis and how do government measures affect 140 million farm households across the country and thereafter impact the economy of a very important country in the developing world. We assess the immediate challenges that COVID19 has posed to the farm sector and suggest mitigation measures to ensure a sustainable food system in the post-crisis period.

Because of country wide lockdown and disconnected logistics leads lacks of agricultural inputs, shortage of labours, interrupted trade. This caused delay in agriculture production, food insecurity that ultimately leads social instability.

The Government of India (GoI) and many state governments have designed several measures to address the problems that agricultural workers are facing. The GoI has announced the several measures like PM Kisan Yojana, Agri Infrastructure Fund, Pradhan Mantri Matsya Sampada Yojana(PMMSY) etc. to support farmers and agricultural workers.

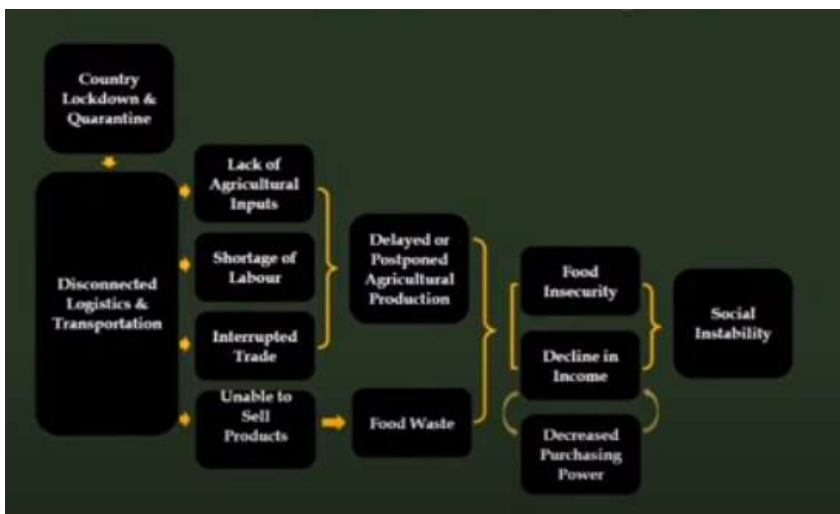


Figure: Effects of COVID-19 on agriculture.

In spite of all these measures taken by state and central government in view of COVID-19 are not enough to fulfil the need of our farmers and agriculture labours. Therefore our agriculture scientists and researchers have to think how science and technology can be used as tool to empower Indian Agriculture and to develop India. With growing population and ever growing demand for food, the scientist and researchers across the globe are busy to find innovative ways to meet this ever surging demand.

Proposed System — Deep Learning Based Cloud Integrated Farming

In this study a survey on deep learning and cloud computing role in agriculture is performed and we proposed a deep learning based cloud environment to help farmers and agricultural workers. The proposed system Deep Learning Based Cloud Integrated Farming system is completely automated wireless system in which plants are attached with sensors that continuously sense the environmental variables like Dryness of soil, Temperature, Pressure, Soil fertility, pH Concentration of soil etc. and upload these data to respective IoT cloud Provider. The Major benefit of this system is that farmer can remotely monitor these environmental variables with the user interface provided by cloud provider. He can on/off water tap if soil is too dry. Farmer can

increase or decrease Temperature, pH, Pressure etc. Values depending on the soil need and environmental conditions. Sensor uses deep learning algorithm to calculate amount of water or fertilizer to release which is captured and twisted to the farmer.

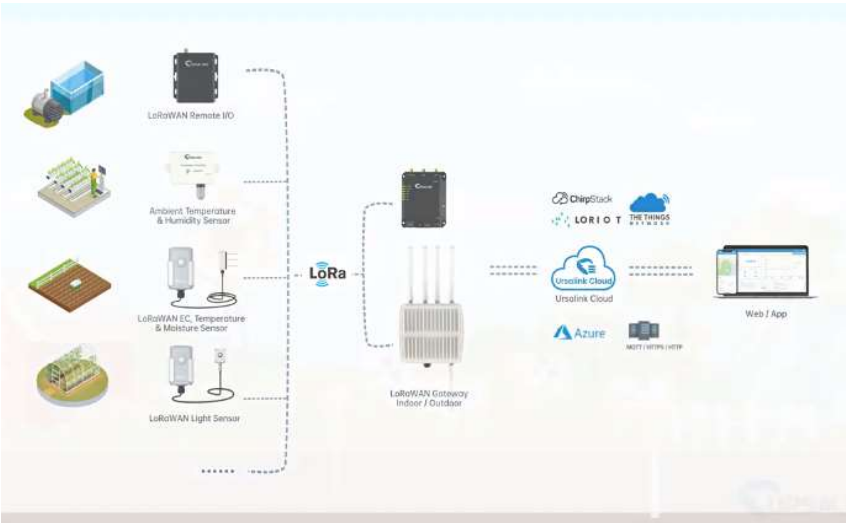


Figure: Deep learning based cloud agriculture

This system provides various services to the farmer and agricultural worker over internet.

Crop related information: It captures information related to all the crops grown in recent past in different regions. This will help the local farmers of different parts of the nation in crop related decision making.

Weather information: It stores the region specific weather information and also the weather forecast for a specific duration. It will benefit the farmers in decision making related to selection of crops.

Soil Information: Soil information also plays a vital role in crop related decision making. So, this section provides information on nature of soil of different parts of the country. It can also provide the trend of soil in past and will help in forecasting the future trend of soil.

Growth progress monitoring: It monitors and captures data on crop growth in different regions on a regular interval. This will be specifically useful in comparing the crop growth region wise and also comparing it with past data will bring a clearer picture.

Farmers Data: It captures the region wise farmer related data, to monitor and study the involvement of local farmers in Indian agricultural sector.

Expert Consultation: It provides solutions to common problems that farmers frequently experience. It can also have a provision to post unattended problems seeking for solutions from the experts. It will also have a bundle of frequently asked questions (FAQs) and their answers to make the response reach the farmers faster.

Conclusion: In this study we have proposed a deep learning based cloud environment to help farmers and agricultural workers. This framework can help and guide reforms to make the Agri food system and livelihoods more resilient. Key among the needed changes are agricultural market reforms and digital solutions to connect farmers and agricultural workers to markets, creation of safety nets and provision of reasonable working conditions, and decentralized food systems, especially for vulnerable communities. As enormous amounts of crucial agricultural data is stored in the clouds, it becomes easier to process the data and take timely actions to address problems before they turn detrimental to productivity.

An effective implementation of our model will encourage other sectors also, which will lead to optimal benefit of shifting towards cloud. This will bridge the gap between technology, information and farmers. This will have positive and tremendous impact on to face troublent time like pandemic and lead the nation towards technological development especially in agriculture domain.

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