

## Role of Digital Technology in Agriculture under Pre and post COVID Pandemic

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### SUMMARY

COVID- 19 lockdown has seriously disrupted Indian farms, as transport was completely halted and farmer faced severe issues in selling their produce, stagnating the harvest further during the peak harvest produce could not reach mandis, thus disrupting supply chain. To overcome this impact of lockdown and pandemic the various organisations and industries have accelerated the digitization of their customer and supply chain interactions and internal operations. Consumers have moved dramatically towards online channels, companies and industries. So there is rapid shift towards interacting with customers through digital channels. Pre- COVID-19 technology, digital India campaign was launched by Prime Minister Narendra Modi government of India on 1 July 2015. The objectives of this scheme is to ensure the government's services are made available to the citizens electronically by improved online infrastructure and by increasing internet connectivity or making country digitally empowered in the field of technology. Post COVID- 19 a Digital Agricultural Mission had been initiated for 2021-2025 by Government, Ministry of Agriculture and Farmers Welfare on 14 September 2021. Modernization of of agriculture sector will continue by adapting new technologies so farmer can increase their income.

### INTRODUCTION

The COVID-19 pandemic in India is a part of worldwide pandemic caused by SARS-CoV- 2. The first cases of COVID- 19 in India were reported on 30 January 2020 in Kerala and lockdown were announced in Kerala on 23 March and in rest of the India on 25 March 2020. This lockdown has seriously disrupted Indian farms, as transport was completely halted and farmer faced severe issues in selling their produce, stagnating the harvest further during the peak harvest produce could not reach mandis, thus disrupting supply chain. To overcome this impact of lockdown and pandemic the various organisations and industries have accelerated the digitization of their customer and supply chain interactions and internal operations. Consumers have moved dramatically towards online channels, companies and industries. So there is rapid shift towards interacting with customers through digital channels.

### What is digital Technology?

Digital technologies are electronic tools, systems, devices and resources that generate stores and process the data. Examples are social media, online games, multimedia, mobile phones etc.

### I Digital technology pre- COVID period

#### Digital India and Agriculture:

Digital India campaign was launched by Prime Minister Narendra Modi government of India on 1 July 2015. The objectives of this scheme is to ensure the government's services are made available to the citizens electronically by improved online infrastructure and by increasing internet connectivity or making country digitally empowered in the field of technology. For agriculture sector digital India campaign developed different portals these are-

#### Farmer Portal:

This portal is regarded to make available relevant information services to farming community through the use of information and communication technology. One-Stop- Shop for meeting all informational needs relating to Agriculture, Animal Husbandry, Sale and storage. Website for Farmer portal is – <http://farmer.gov.in>

#### Fertilizer monitoring system ( FMS):

Fertilizer monitoring system (FMS) software monitors movement of various fertilizers at various stages in their value chain. It provides information on fertilizer companies, rate of concession on each fertilizer, its MRPs and details of dispatch receipts of fertilizers. Website for Fertilizer Monitoring System is – <http://www.urvarak.co.in>

**Kisan Suvidha :**

Kisan Suvidha is an omnibus mobile app developed to help the farmer to get relevant information such as weather, market price, seeds, fertilizers, pesticides, agricultural Machinery, dealers, agricultural advisories, plant protection and Integrated Pest Management ( IPM) Practices, Integrated Nutrients Management ( INM) Practices, Integrated Disease Management ( IDM) Practices and Integrated Water / Weed Management ( IWM) Practices etc. Website for Kisan Suvidha is – <http://www.kisansuvidha.com>

**Mkisan:**

M Kisan SMS portal conceptualized to give quantum leap in coverage of farmers and geographical area in timely, specific, holistic and needs based knowledge dissemination. It provides information through the SMS. Website for MKisan is – <http://mkisan.gov.in>

**Pusa Krishi:**

To take technology to the farm fields, Pusa Krishi application was developed. It help the farmer to find easy solution to problem in their farm filed and get information about weather and take measure to save their crops. Website for Pusa Krishi is- <http://agricoop.nic.in/recentinitiative/mobileapps-pusa-krishi>

**Soil Health Card :**

It aims at promoting Integrated Nutrient Management (INM), through judicious use of chemical fertilizers including secondary and micro nutrients in conjunction with organic manures and bio-fertilizers for improving soil health and its productivity strengthening of soil. Fertilizers testing facilities to provide soil test based recommendation to the farmer. Website for Soil Health Card is- <http://www.soilhealth.dac.gov.in>

**Agrimarket App:**

Agrimarket app is a mobile application developed to keep farmers abreast with crop prices and discharges them to carryout distress sale. Farmer can get information related to prices of crops in market within 50 km. Website for Agrimarket is- <http://mkisan.gov.in/downloadmobileapp>

**Crop Insurance Mobile App:**

It is used to calculate the insurance premium for the notified crops based on area, coverage, amount and loan amount. It is also used to get details of normal sum insured, extended sum insured, premium details and subsidy information of any notified crop in the notified area. Website for Crop Insurance Mobile App is- <http://mkisan.gov.in/downloadmobileapps.aspx>

**E-NAM:**

National Agricultural Market is a pan- India electronic trading portal which networks the existing APMC mandies to create a unified national market for agricultural commodities. It provides a single window service for all APMC related information and services. It includes commodity arrivals and prices, buy and sell trade offers and provision to respond to trade offers and many other services. Website for E-NAM is- <http://www.enam.gov.in/NAM/home/index>

**Direct Benefit Transfer (DBT):**

It is Central Agricultural Portal. Launched in January 2013. DBT agri portal is unified central portal for agricultural schemes across the country. Portal helps the farmer to adopt modern farm machineries through government subsidies.

**Agristock:**

The Ministry of Agriculture and Farmers Welfare has planned creating ‘Agristock’ a collection of technology based interventions in Agriculture. It creates unified platforms for farmers to provide them end to end services across the agriculture food value chain.

**Unified farmer Service Platform (UFSP):**

It is combination of core infrastructure, data applications and tools that enables season less interoperability of various public and private IT system. Like UPI, API(Application Programming Interface).

**Kisan Call Centers:**

A Kisan Call Centre scheme was launched on January 21, 2004. Main aim is to answer the farmer's queries on a telephone call in their own dialect.

**II Digital technology post - COVID period****Digital Agricultural Mission:**

A Digital Agricultural Mission had been initiated for 2021-2025 by Government, Ministry of Agriculture and Farmers Welfare on 14 September 2021. Modernization of of agriculture sector will continue by adapting new technologies so farmer can increase their income. MOUs were signed for pilot project with CISCO, Ninjacart, Jio Platforms limited, ITC limited and NCDEX e-markets limited (NeML). These projects based on new technologies like artificial Intelligence, Block Chain, remote sensing and GIS technology, use of drones and robots etc. The agricultural value chain extends from crop selection to crop management and the market, it involves public and private players in the agricultural input , services and logistics.

**E-Commerce Market Place :**

E-commerce market places are digitally enabled platforms that connect multiple buyers and sellers, allowing buyers to search for products and purchase them online. In India Big Haat which is specifying focuses on agricultural inputs. During COVID-19 pandemic many market places have grown dramatically. These market places can specialized in specific product areas, such as groceries or sell aviritory of products and services, agricultural inputs and finance etc. These market places serving business customers through Business to Business (B2B) approach or focus on consumer Business to Consumer (B2C) approach. Examples of market places – Gem (Government e-market place), Khetifoods, Fruitee- Kenya, Mkumlima, young, BigHaat, Facebook market place.

**Farmer Management Solution:**

It is digitally enabled applications operated by farmers, farmers groups, cooperatives or related agribusiness. Examples- Kheti Buddy, Cropin smart farm pan agro, Satyafims.

**Expanding Mobile Phone Access:**

During the pandemic situation mobile phone emerged as a critical tool in helping agriculture market actors. Smartphones helped actors to access vital information, advisory services, negotiate deals, locate input, and hire labour and mechanization services, aggregate produce and hire transport to market.

**Digital Agriculture:**

It is ICT (Information Communication Technologies) and data ecosystem to support the development and delivering of timely, targeted information and services to make farming profitable and sustainable.

**Agricultural Biotechnology:**

The range of tools includes fractional breeding technology that alter living organism, part of organism to make or modify product, improve plants or animals or develop microorganisms for specific agricultural use.

**Precision Agriculture:**

It is an approach where inputs are utilized in precise amounts to get increased average yields, compared to traditional cultivation technology. Precision agriculture is based on ICTs like Digital and wireless technology for data measurement, weather monitoring, robotics, drone technology etc.

**Artificial Intelligence in Agriculture :**

Artificial Intelligence systems are helping to improve the overall harvest quality and accuracy. Artificial Intelligence technology helps in detecting diseases in plants, pests and poor nutrition of farm. Artificial Intelligence sensors can detect and target weeds and then decide which herbicide to apply within the region.

#### **Applications of Artificial Intelligence in Agriculture:**

- Crop and soil monitoring
- Insect and plant disease detection.
- Livestock health monitoring
- Intelligent spraying
- Automatic weeding
- Aerial survey and imaging
- Produce grading and sorting

#### **Robotics:**

Robotics are being introduced to the dairy, poultry and beef farming industries. Applications include autonomous feeding and milking, egg collection and sorting, autonomous cleaning. These technologies are helping early detection and treatment of animal health issues.

#### **Satellite Imagery:**

In cropping, less waste and higher yields are being generated by equipment programmed for variable seeding rates and depths based on soil property and moisture data, derived from satellite imagery. Digital infra-red light and heat sensors combined with geographic information system technology in drones are used measure paddock crop health to inform decisions about irrigation, pest management, fertilizer applications and harvesting.

#### **Sensors and electronic identification**

Integrated digital animal health biometric sensors and electronic identification devices enable farmers to rapidly respond to cases of animal stress or disease, helping to increase livestock production and improve livestock health.

### **III Applications of Digital Agriculture:**

**AgroPad:** AI-powered technology helping farmers check soil and water health. AgroPad, developed by IBM, is a paper device about the size of a business card. The microfluidics chip inside the card performs on the spot a chemical analysis of the sample, providing results in less than 10 seconds. A drop of water or soil sample is placed on the AgroPad and the set of circles on the back of the card provide colorimetric test results; the color of each circle represents the amount of a particular chemical in the sample. Using a smartphone, the farmer can then take a single snapshot of the AgroPad by using a dedicated mobile application and immediately receive a chemical test result for a water or soil sample.

**Plantix and crop disease identification over WhatsApp:** Developed by PEAT, a German startup, Plantix is a mobile application, which is a massive database of pictures of plant disease that can be used for comparison. This helps in identification and subsequent diagnosis and treatment. PEAT aims to support farmers across the world to enhance their agricultural output through timely and informed disease treatment. The facility is now also available over WhatsApp where just an image of the infected leaf is required to be sent to the Plantix WhatsApp number and the diagnosis is messaged back to the sender via WhatsApp in real time and many farmers in India are using this service.

**Pay per use based farm tech and mechanization:** Trringo and EM3 Agriservices are the pioneers of farm equipment rental service. They can be called the ubers of the Agriculture sector and have successfully replicated the uberisation of renting farm machinery and tractors in India. Using their services, through a mobile application or a phone call, farmers can rent their required farm machinery on a pay per use basis thus saving them time and ensuring reasonable costs while reducing uncertainty around availability. EM3 calls its app Samadhan and categorises it as Farming as a Service (FaaS) that creates a platform that enables technology to reach the farmer

and the farm in an efficient and affordable manner through a network of farm centers. These centres are managed through IT enabled systems and manned by agri-professionals and equipped to handle a comprehensive suite of basic and precision farm operations throughout the entire crop production cycle.

**Use of drones to fight locusts in India:** Locusts have been attacking and destroying large swathes of India's crops on a regular basis since the winter months of 2019 and the attack is continuing. The Agriculture Ministries both at the federal level and the state levels have been using drones for anti-locust spraying. They are proving to be effective solution in an otherwise challenging scenario where India stares at large amounts of crop loss in the states of Rajasthan, Gujarat, Madhya Pradesh and Uttar Pradesh.

**Use of drones for rural property mapping in India:** The Government of India recently launched the 'Swamitva18 scheme' under which Drones will draw a digital map of every property falling within the geographical limits of a village and demarcate the boundaries of every revenue area. Property card for every property in the village will be prepared by states using accurate measurements delivered by such drone-mapping. These cards will be given to property owners and will be recognised by the land revenue records department which will enable the property holders to access formal finance from bank by using their property as collateral. It can have positive implications for agriculture because asset light rural citizens as well as non-land owning farmers would stand a chance to access formal and cheaper financing by using their property as collateral.

**Grain Bank Model of 'Ergos':** Ergos has one of the most unique models in the Agri-tech landscape. They have a "Grain Bank model" that is providing doorstep access to end-to-end post-harvest supply chain solutions to small and marginal farmers, i.e. enabling farmers to convert their grains into tradable digital assets, avail credit against those assets through partner NBFCs and Banks, and get better prices for their produce. The Ergos model offers farmers the flexibility to store/ withdraw a single bag of grains. Farmers get immediate liquidity and better income, as they don't have to sell all their produce at once at the prevailing market rates during harvest season. Through an efficient use of technology and direct farmer engagement, they provide the following services to farmers at the farmgate presently in the state of Bihar. Storage – Ergos has a network of scientifically managed micro-warehouses at the farm gate, where farmers can store even a single bag of grains. Credit availability – Post harvest, farmers need liquidity. With Ergos they have an option to take credit against the value of stored grains from partner lending institutions. Market linkage – Farmers can sell even a single bag of grains stored with Ergos, for immediate liquidity. Ergos aggregates the demand from buyers and supply from farmers and offers farmers market linkage to sell their stored grains at a fair price.

**Quality Assessment using technology:** AgNext produced a technology platform Qualix, to assess trade quality and safety parameters for multiple commodities (grains, pulses, tea, spices, herbs, milk and honey etc.) in a minute. It is a platform for introducing rapid quality estimations in agriculture and food value chain through technologies like AI based spectral and AI based image analytics using a mix of hardware, software and data analytics. Thus their solution, they claim, helps in identifying chemical and physical composition of grains such as wheat, rice, pulses, maize and oilseeds in less than a minute with the help of a small pocket sized device. Using the same Bluetooth enabled, battery operated hand held device, which works in coherence with a mobile application, the chemical composition of milk and honey can be identified to detect the presence of adulterants. The same device also checks fat%, protein, lactose and SNF content in a milk sample.

**Digital tools for agriculture farm monitoring and risk management:** Yuktix Technologies is an Agritech startup based out of Bangalore that focuses on creating digital tools for agriculture farm monitoring and risk management. The solution helps growers make decisions and implement best practices that increase yield and cut losses. The tools are powered by their hardware and software solution that they call Green Sense IoT devices and Green Sense dashboard. Yuktix Green Sense is an off grid remote monitoring and analytics solution for agriculture. Green Sense nodes with dashboard provide an effective tool for monitoring and DPI (Disease, pest, and irrigation) management. Their solar powered weather stations provide real time weather conditions anytime from anywhere. For instance, in Odisha they deployed a network of Yuktix micro-weather station to collect data from different locations, use existing indigenous knowledge, combine it with research to provide a digital tool

that helped them distribute crop specific advisory to a group of tribal farmers to use climate smart agriculture practices.

## CONCLUSIONS

Government of India Launched Digital India Campaign in pre- COVID period, this scheme is to ensure the government's services are made available to the citizens electronically by improved online infrastructure and by increasing internet connectivity or making country digitally empowered in the field of technology. Lockdown disrupted Indian farms, as transport was completely halted and farmer faced severe issues in selling their produce, stagnating the harvest further during the peak harvest produce could not reach mandis, thus disrupting supply chain. To overcome this impact of lockdown and pandemic the various organisations and industries have accelerated the digitization of their customer and supply chain interactions and internal operations. After COVID period there is boost in digitalization, because of there is increase in number of mobile users. There is establishment of new applications which is helpful for easy marketing and provision of services digitally to the clients.

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