



# Revolutionizing India: Unraveling the Impact of Digital Infrastructure and Agricultural Advancements

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## Abstract

Information and communication technology (ICT) advancements have made way for the adoption of digitization in all facets of government services provided by the union and state governments. To make significant changes the way ICTs are used in agriculture, the agricultural industry is also taking the lead. The Govt. of India started a Mission of Mode Project an Agriculture to build ICT-enabled services farmers through a various assist farmer has day-to-day operations. Krishi-Digital Mission also emphasizes the employment of modern Krishi-Digital Mission integrates cutting-edge the "Internet of Things (IoT)", robotics, Kisan drones, artificial intelligence (AI), machine learning (ML), and blockchain technologies. Remote sensing, etc. The agricultural services will be improved farming operations and increase income. To improve the agricultural extension system, this study covers several digital agricultural services.

**Keywords:** Agriculture development, digital agriculture mission, Kissan drone, Machine learning

## 1. Introduction

A large portion of India's workforce-54.6%-is employed in agriculture and associated industry, which is essential to the country's economy. The Indian government has made various steps to build a national digital agriculture ecosystem to push the country's agricultural sector toward greater production and efficiency. The improvement of farmers' wellbeing and income is the main objective. Notably, the agriculture industry employs 49% of the workforce and contributes roughly 15.9% of the nation's \$2.7 trillion economy (2018–19). The Indian agriculture industry is embracing cutting-edge practices like smart farming, which has the potential to change the industry in the years to come. In order to monitor agricultural land, temperature, and soil moisture, smart farming uses technologies like sensors and automatic irrigation systems. This allows farmers to monitor their crops from a distance.

In its continuous pursuit of better farmer knowledge, education, and productivity, Ministry of Agriculture and Farmer's Welfare. The guidelines for the program were revised on June 2, 2020, to incorporate the recommendations of the Doubling Farmers Income (DFI) Committee. According to the updated regulations, state funding will only be given to initiatives involving cutting-edge IT, including projects involving AI & ML, Blockchain, IoT, robotics, etc., as well as the customization and integration of current web and mobile applications into the upcoming platform created using IT.

## 2. Review of Literature

The modern era of agriculture, Farmers are leveraging digital hardware or tools, and software, and helping for farming-related activities. It includes using essential digital tools directly or indirectly to increase productivity and

broaden market knowledge (Abdulai *et al.*, 2023) <sup>[1]</sup>. Drone use in agriculture has expanded in smallholder markets like China and Thailand to boost production and limit operator exposure (Narain, 2020) <sup>[7]</sup>. Farmers may boost their yield by the study how to take care of the crop and identifying out the accurate quantity of water or fertilizer to use by using AI for techniques like precision farming (Kumar, V, R *et al.* 2014) <sup>[12]</sup>. For effective implementation of the crop insurance scheme, digital infrastructure such as weather stations, drones, and Low Earth Orbit (LEOs) are required (Gulati *et al.*, 2018) <sup>[4]</sup>. Innovative and data-seeking attitude also proved significant when switching from the machine direction to the Farmer (Barnes. A.P *et al.*, 2019) <sup>[3]</sup>. At the national level, 30.3% of people in the 15–24 age range have basic digital abilities and agricultural techniques; technologies may help raise output, also help lower production and logistical costs, reduce food waste, and boost productivity (Barnes, A. P 2019) <sup>[3]</sup>. To promote digital agriculture's development by increasing access to mobile phones and the Internet for rural farmers (Olaniyi. *et al.*, 2018) <sup>[8]</sup>. The National Agriculture Policy and the National e-Governance Plan both emphasize the use of information and communication technologies for growth agriculture growth and generate value at the grassroots level (Yadav, 2010) <sup>[13]</sup>.

### 3. Materials and Method

We focus on secondary data sources from state and union government annual reports, such as the sub-department of Agriculture and Farmers group, reports from the Indian Economic Survey, the Indiastat database, and reports from the Doubling of Farmers Income Commission, to meet the study's objectives. Due to the government's extensive usage of digital agriculture infrastructures, this study employed simple analytical techniques. We attempt to describe how farmers take part in and efficiently use these resources.

### 4. Result and Discussion

#### 4.1 Government of India Initiative Digital Agriculture facilities

In the National e-Governance Plans agriculture (NeGP-A) initiative was started by the Indian governments with the goals of develop national agricultural service portal using information and communication technology (ICT). The main objective is to give farmers and other system stakeholders rapid access to information on agriculture. The Digital Agriculture Mission was launched by the Indian government in 2021, with an emphasis on initiatives that make use of cutting-edge technologies including artificial intelligence, blockchain, remote sensing, GIS, drones, and robots. The mission's use of this cutting-edge technology is intended to modernize and enhance the agriculture industry.

**Table 1:** Show the Details on the major National level Applications and portal the under Digital agriculture bellow.

SL. No	Name of the App's	Purpose	Benefits to the farmers/officers
1	Kisan Suvidha	This App improved to assist farmers in providing data about agriculture information to them.	The app provides farmers with a wealth of useful information, such as market prices, agricultural advisories, commodity prices in nearby regions, as well as the highest prices available within the state and throughout India. Additionally, the app offers five-day predictions as well as real-time weather updates for the current day. This user-friendly software had an astounding number of 1,369,263 downloads as of December 2020.
2	Pusa Krishi	This application facilitates the establishment of a robust bond between the research community and the external world.	This software actively encourages agribusiness enterprises for a wide spectrum of people, from corporate entities to individual farmers, by supporting technology development and easing commercialization.
3	Kissan Masik	It is the most popular monthly magazine,	The user-friendly "Shetkari Magazine" Android app requires

	Android App	provides the information about agriculture activities.	mobile internet or Wi-Fi access for the registration and issue download Procedures. Users can read the magazine without a connection after downloading the issues, allowing for smooth offline access.
4	Bhuvan Hailstrom App	It has been improved for capturing and evaluating the crop loss that happens for hailstorms and natural disasters.	A mobile device or tablet with the App loaded on it can be used by agriculture officers to enter the fields and gather important parameters. The names of the crops being grown, the dates of planting and harvesting, taking photos of the fields, noting their latitude and longitude, and identifying irrigation systems are a few of these. The data collected by the app is simply integrated and plotted on the Bhuvan website. Due to the app's many capabilities, it is easy to analyze the data obtained, facilitating efficient decision-making and agricultural planning.
5	Agrimarket	This is useful to farmers to get the market price within 50 km distance from device location.	Users of the Agri. market App may easily access features that provide them access to agricultural market pricing. When someone uses their mobile GPS, the software detects their location and immediately retrieves the crop prices from markets within a 50-kilometer radius of where they are. There is also the ability to manually choose any market and any crop to get the necessary price information for those who would rather not utilize GPS. All customers benefit from the flexibility and simplicity provided by this dual strategy, which enables them to get market prices in the manner that best suits their needs.
6	MNCFC (Mahalanobis National Crop Forecast Centre)	The Android-based program shows to be quite useful for gathering field data, especially for crop evaluation using satellite data. The FASAL project, started by the Ministry of Agriculture, is responsible for this application. The software improves agricultural monitoring and decision-making processes by facilitating precise and thorough crop assessments using satellite data.	The application is a flexible tool for gathering crucial field data, including 640x480-pixel Field Photographs, GPS coordinates, and important details like crop kind, condition, sowing date, soil type, etc. It is a great tool for crowdsourcing since farmers can actively engage by submitting photos taken using their mobile devices that show the present state of crops, crop kinds, and soil conditions.
7	Karnataka Bhoomi	This App helps farmers to know their agriculture land details, and easy to know land-related service status and disputes.	A groundbreaking project in Karnataka called "Bhoomi" aims to provide online delivery and effectiveness administration of land records. The land is what the word "Bhoomi" means in the regional tongue. Karnataka farmers can quickly access and monitor the status of their land-related applications with this application. This digital platform has significantly simplified the process of collecting land records, enhancing transparency and accessibility for farmers. Farmers can use Bhoomi to keep track of the status of their applications and make educated decisions about their land holdings and transactions.
8	MKissan	Throughout the agricultural cycle, weather-related information is essential in helping farmers make wise decisions. Farmers may	Farmers are now better able to make educated judgments about the sale of their produce thanks to the adoption of basic mobile telephony. Farmers may strategically decide when and how

	make good plans” thanks to information on several meteorological criteria like the possibility of rain, and temperature, humidity, and other climatic elements.	much to charge for their crops by using mobile services to receive up-to-date, reliable information on market prices and trends. This important information aids in reducing the distress sales brought on by changes in the market's supply, ensuring farmers receive fair prices for their produce.
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**Table 2:** Numbers of operative (KCCS), OC loans, and term loans in India from 2016-2017 to 2021-2022. (Numbers in Lakh & Amount in Crore)

Year	Number of operative KCCs	Outstanding Crop Loan	Outstanding Term Loan
2016-2017	23.37	3,851.89	498.13
2017-2018	23.52	3,906.02	407.20
2018-2019	236.30	4,13,670.40	41,409.00
2019-2020	241.50	4,23,587.80	46,555.80
2020-2021	306.96	4,13,903.00	36,161.00
2021-2022	268.71	4,33,413.00	29,309.00
Total	1,100.36	16,92,332.11	1,54,340.13

**Sources:** Indiastat.com & Reserve Bank of India

In order to minimize the cost to the farmer, the planned "Kisan Drones" initiative in the MoAFW, Government of India, may be used to assess crop and health, fields area affected by weed, harms, and pests, and the precise quantity of chemicals required to battle these infestations. Drones may be shoot pods, and their seeds, essential nutrients into the soil using drone-planting systems. Along with lowering the cost, drones will improve crop management's consistency and effectiveness. Additionally, it lessens exposure to risky working situations for people. Drones may be used to assess crop stress, track plant development, forecast yields, and distribute tools like fertilizer and pesticides since they are well equipped with capabilities like multispectral picture camera.

In the Ministry of Agriculture and the Farmers Welfare published guidelines to lower cost of drone technology for industry participants in order to encourage its adoption in Indian agriculture. The "Sub-Mission on Agricultural Mechanisation" was amended to allow grants for the purchase of agricultural drones by the Farm Machinery Evaluate and Testing organization, ICAR institutes, Krishi Vigyan Kendras, and State Agriculture Universities in order to conduct extensive demonstrations of this technology on farmers' fields, up to 100%.

For the purpose of demonstrating the agriculture drone in the farmers' area, Farmer Producers Organizations (FPOs) are entitled to obtain grants totaling up to 75% of the cost of the drone. implementing agencies would receive a contingency budget of Rs. 6000 per acre if they decide to rent drones from hiring groups, hi-tech hubs, drone creation, and start-ups instead of buying them for demonstrations. The contingent cost to implementing organizations for drone demonstrations will fixed at Rs. 3000 per acre.

## 5. Conclusion

The rise of communication technologies has created the implementation of digital service across many industries, including agriculture. The Govt. has begun adopting ICT application under NeGP-A. This technology will benefit farmers in terms of lower cultivation costs and increased income generation in addition to assisting them in accessing digital agricultural services to streamline farming practices. Departmental representatives, scientists, and businesspeople can offer digital and high-tech agriculture services. Entrepreneurs may promote input applications using drones by charging farmers a small fee, saving farmers a significant amount of money.

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