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A review on mobile apps in agriculture: Transforming farming practices in India through innovation and technology

¹Dr. Parvez Mallick, ¹Dr. Subhadip Pal, ¹Dr. Agniswar Jha Chakrabarty, ¹Dr. Debolina Sarkar and ²Dr. Riman Saha Chowdhury

¹Assistant Professor, Department of Agricultural Economics and Statistics, SAAS, TNU, Kolkata, West Bengal, India

²Assistant Professor, Department of Horticulture, SAAS, TNU, Kolkata, West Bengal, India

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Corresponding Author: Dr. Agniswar Jha Chakrabarty

Abstract

India is presently more technologically advanced than many other nations. India has also made its tech presence into the primary sector of agriculture. In order to improve service delivery to the agricultural community, the Indian government's e-Government activities have resulted in the adoption of numerous applications in the agriculture sector. It gives farmers the ability to make decisions while using real-time data analysis as support. Apps—also known as mobile applications have become extremely effective tools for empowering decision-making, bridging information gaps, and enhancing output from agriculture in general. This is also related with future technology transfer, farm-related chores, and the many other's app types utilized for agriculture. It is easily accessible for free download from the App Stores. Numerous mobile applications have been developed by government agencies, research institutes, universities, various businesses, and others. Each app has its unique features. In addition to increasing output, technology integration in agriculture is guaranteeing that farmers have access to real-time data, which lowers risks and improves farming methods.

Keywords: Digital agriculture, e-government, mobile, app, technology, artificial intelligence, India digital agriculture, e-government, mobile, app, technology, artificial intelligence, India

Introduction

The application of cutting-edge digital technologies to enhance productivity, encourage sustainable farming methods, and optimize agricultural operations is known as "digital agriculture." It gives farmers access to real-time data and decision-making tools through the use of sensors, big data, satellite imaging, mobile apps, and artificial intelligence. The farming environment has undergone a significant change in recent years due to the integration of contemporary technology such as e-agriculture, mobile applications, artificial intelligence, decision support systems, etc. Numerous mobile applications that address a variety of farming demands have emerged in the Indian agriculture sector. These apps concentrate on offering vital information, including financial services, market prices, pest control options, weather forecasts, and professional guidance.

The most popular information sources are newspapers, TV, radio, other farmers, government agricultural extension organizations, small traders, businesspeople, seed associations, etc., even though they are not necessarily the most up-to-date, trustworthy, or beneficial. Certain information sources, like the intermediary who also serves as a moneylender, can even be prejudiced against farmers. As a result, farmers are unable to make judgments because they lack access to unique, reliable knowledge and information for many of their demands. Access to accurate

and pertinent agricultural information, market connections, weather forecasting, crop management, financial management, and other issues are only a few of the many difficulties faced by farmers worldwide (Rahman, M. S. *et al.*, 2020). Apps, or mobile applications, have become effective instruments that improve overall agricultural output, empower decision-making, and fill in information shortages (Singh, N. K. *et al.*, 2023) ^[65].

According to Kumar *et al.* (2023), smart Android apps are greatly helping farmers with a variety of farming activities and overcoming everyday obstacles. One of the greatest technologies for people in poor countries is the smartphone (Barh & Balakrishnan, 2018) ^[8]. These issues have been addressed by mobile applications, which provide a wide range of features that help farmers with many facets of their jobs (Qiang, C. Z., 2012) ^[57]. Using mobile phones to facilitate effective communication and knowledge sharing, farmers can access crucial information on market trends, weather forecasts, and best practices (Khan *et al.*, 2020) ^[33]. One area where mobile applications may have an impact is Agriculture and Rural Development (ARD), which provides rural inhabitants with access to markets, services, and information.

In order to improve service delivery to the agricultural community, the Indian government's e-governance activities have resulted in the adoption of numerous applications in the agriculture industry. In a similar vein, the National

Agricultural Research & Education System has strengthened research, education, and extension services through the implementation of numerous systems. A more effective, robust, and interconnected agricultural ecosystem is fostered by these applications, which are more than just tools (Bhaskara, S., & Bawa, K. S., 2021) ^[10]. According to research by Ganeshan and Vethirajan (2021), mobile applications help farmers conserve their land for future generations while also increasing their productivity. Mobile education, cloud computing, and integrated IT systems facilitate the dissemination of agricultural knowledge to farmers. Users can obtain the most recent mandi prices, farming advice, and agricultural support using smartphone applications.

This article covered the several app types used for agricultural, farm-related jobs, and potential technology transfer. It may be downloaded for free from the App Store or the Google Play Store. Numerous businesses, state and federal governments, research institutes, universities, and other organizations have created an increasing number of mobile applications. Some significant mobile applications in this regard are listed below:

CropIn: Bengaluru, Karnataka-based agritech firm CropIn Technology Solutions Private Limited released the CropIn mobile app in 2010. Agribusinesses in India and other developing countries can obtain real-time actionable information on standing crops and projects across geographies by using CropIn's SaaS-based services, which allow clients to evaluate and interpret data (Rajeev, P. N., & Joy, S., 2020) ^[59]. Over 500,000 farmers in 12 countries are served by the app.

Digital Mandi: In August 2011, the Government of India released the Digital Mandi mobile app as part of a project by Indian Institute of Technology (IIT) Kanpur and Bharat Sanchar Nigam Ltd (BSNL) (Saravanan, R., & Bhattacharjee, S., 2014) ^[63]. The program, which has been downloaded over a million times, is related to farming. The purpose of this application is to empower farmers, merchants, and other agricultural supply chain participants with information regarding crop prices in various mandis throughout the nation.

BaiKhao (rice leaf) app: Using color analysis, the BaiKhao mobile application helps farmers determine the nitrogen content in rice leaves. The crop's nitrogen status is shown by the color of the rice leaf. A leaf color chart (LCC) that displays the color of the rice leaf is typically used by farmers to estimate the quantity of nitrogen fertilizer needed for rice crops (Intaravanne & Sumriddetchkajorn, 2012) ^[26].

Skymet Weather: The most popular apps in agriculture are those that deal with the weather (Karetsos, Costopoulou, & Sideridis, 2014) ^[31]. Skymet provides real-time weather forecasts that include elements such as wind, humidity, rainfall, and temperature. In May 2013, Skymet Weather, which was created by Skymet Weather Services Pvt. Ltd., released its application to the general public. Over 10 lakh people have downloaded this app to date. This helps farmers anticipate inclement weather and adjust their farming practices accordingly.

AgriApp-Smart Farming App: AgriApp is a feature-rich mobile application that provides agribusinesses, crop consultants, and farmers with a variety of intelligent agricultural solutions (Sarma *et al.*, 2024) ^[62]. AgriApp Technologies Pvt Ltd, a Bengaluru, India-based agritech business, formally introduced AgriApp on September 11, 2014. With more than a million downloads as of 2025, the software is widely used by farmers. This app offers crop care, weather information, and professional assistance on managing pests and diseases.

AgriMarket App: In order to improve farmers' access to the market, the Ministry of Agriculture and Farmers Welfare, Government of India, introduced the AgriMarket mobile app in 2015. More than 5,000 people have downloaded the mobile app. According to Kaur *et al.* (2020) ^[32], the app can detect the market price of crops at markets that are within 50 kilometers of the user's location and will automatically determine the user's location using mobile GPS. Farmers can choose where to sell their crops based on the greatest price in nearby mandis thanks to this app's real-time crop market pricing information.

BigHaat Online Smart Agriculture App: BigHaat, an Indian AgriTech platform, created this mobile application in 2015. Over 10 lakh people have downloaded it from the Google Play store. The goal of this agricultural app is to increase agricultural profits. According to Gupta *et al.* (2021), BigHaat is the biggest agricultural platform that offers farmers and Kisan local agricultural solutions utilizing the most recent agricultural technology and methods for Indian farmers. By connecting farmers with several important input suppliers and buyers, this app provides agricultural solutions to farmers at their locations.

Bhuvan Hailstorm: In order to provide real-time hailstorm monitoring and forecasting in India, the Department of Agriculture & Farmers Welfare and Indian Space Research Organization (ISRO) created the Bhuvan Hailstorm mobile application in 2015. In order to help farmers and residents in impacted areas prepare and lessen damage, the app tracks and detects hailstorm episodes using data from satellites, weather stations, and other sources. This application uses the following parameters to record crop loss from hailstorms. 1. A field photo with latitude and longitude. 2. Crop Name 3. Sowing Date 4. The anticipated harvest date 5. The irrigation source (Nag *et al.*, 2017) ^[49].

IFFCO Kisan Agriculture App: The availability of customized agricultural data allows IFFCO Kisan to acquire knowledge based on needs in order to make well-informed judgments (Sharma *et al.*, 2020) ^[64]. The Indian Farmers Fertilizer Cooperative Limited (IFFCO) Ltd. initially introduced the IFFCO Kisan Agriculture App in September 2015. To improve production and profitability, this app offers market prices, tailored crop advisories, real-time weather information, and best agricultural practices. On mobile devices, the IFFCO Kisan Agriculture App has been downloaded more than 900,000 times.

Pashu Poshan: The Pashu Poshan app offers extensive materials and tools for animal husbandry in order to assist

livestock farmers. The National Dairy Development Board (NDDB), led by Shri Radha Mohan Singh, the Union Minister for Agriculture at the time, created the Pashu Poshan app in New Delhi in 2015 (Jadoun *et al.*, 2023) ^[28]. To improve cattle productivity and welfare, the app provides features including health management, vaccine reminders, nutrition tracking, and professional assistance.

AgriBazaar: In 2016, Star Agribazaar Technology Pvt Ltd. released the Agribazaar mobile app. Over 10,000 people have downloaded the AgriBazaar app from the Google Play Store. Agribazaar provides services such as crop calendars, market rates, input stores, and a crop doctor service to assist farmers in managing their crops properly and boosting their productivity (Qayum, A., & Dubey, A. K., 2023) ^[58].

Agrostar Kisan Agridoctor App: Farmers can greatly increase their production and income using AgroStar's best agriculture application, which combines agronomy advice from Agri physicians professionals with agricultural knowledge and Agri products (Khan, S., & Parihar, P., 2022) ^[34]. On August 16, 2016, this mobile application was made available. Over 5 million people have downloaded the AgroStar Kisan Agridoctor App from the Google Play Store. The app offers thorough information on fertilizers, seeds, and pesticides, as well as individualized crop advice, real-time weather updates, and strategies for managing pests and diseases. Through the app, farmers may also speak with agronomy specialists directly for customized guidance.

Crop Insurance: This mobile application was introduced by the Indian government's Department of Agriculture & Farmers Welfare in 2016. This mobile app has more than 10 lakh users. A digital tool called the Crop Insurance Mobile Application was created to make agricultural insurance programs like the Pradhan Mantri Fasal Bima Yojana (PMFBY) easier to access. Farmers can use their cellphones to check policy details, compute premium rates, and register for crop insurance.

eNAM: By connecting domestic marketplaces across states, the electronic National Agriculture Market (eNAM) offers a pan-Indian marketplace that allows farmers to sell their produce anywhere in the nation by getting over state restrictions (Desmukh *et al.*, 2018). Prime Minister Narendra Modi introduced the eNAM (National Agriculture Market) mobile application on April 14, 2016. Through a single digital platform, the eNAM mobile application aims to unify agricultural markets nationwide. This mobile application has been downloaded by over one lakh users. Transparent and effective commerce is made possible by the app's seamless connections between farmers, traders, and buyers. It enables farmers to obtain competitive pricing for their produce by offering essential features including online bidding, trade history access, and real-time price discovery.

Kishan Suvidha: Indian Prime Minister Narendra Modi introduced the Kisan Suvidha app for farmers during the "Krishi Unnati Mela" on March 19, 2016. The ground-breaking Kishan Suvidha mobile app was created to give Indian farmers access to vital agricultural data. This software, which was created by the Ministry of Agriculture

and Farmers Welfare, helps farmers make educated decisions by offering real-time weather reports, market pricing, and professional advice. It also has advantages like disease and pest control. Additionally, farmers can use the app to report problems and receive expert solutions. Over 10 lakh people have downloaded the Kisan Suvidha mobile app.

KVK Mobile App: At a function at the Indian Agricultural Statistics Research Institute (IASRI) in New Delhi on December 21, 2016, Shri Radha Mohan Singh, the Union Minister of Agriculture and Farmers Welfare at the time, formally unveiled the KVK (Krishi Vigyan Kendra) Mobile App. created by ICAR-IASRI's Division of Computer Applications in association with the Indian Council of Agricultural Research's (ICAR) Extension Division. An inventive tool created to close the knowledge gap between farmers and agricultural specialists is the KVK Mobile App. It offers real-time access to a variety of information, such as market pricing, agricultural advice, weather updates, and training schedules provided by Krishi Vigyan Kendras around India. Through the app, farmers may obtain useful answers to field-specific problems, take part in virtual training programs, and receive individualized advice. Users can ask the experts any questions they have about farms and receive a response. According to Pal *et al.* (2019) ^[50], this mobile application provides its users with current information that may be sent straight to the recipients. Currently, more than 1,000 people have downloaded the KVK Mobile App from the Google Play Store.

Pusa Krishi: At the Krishi Unnati Mela in New Delhi on March 21, 2016, Union Agriculture and Farmer's Welfare Minister Radha Mohan Singh unveiled the "Pusa Krishi" smartphone app. Over 40.7K people have downloaded the Pusa Krishi mobile app. This app offers comprehensive details on cutting-edge crop varieties, environmentally friendly farming methods, and resource-efficient technology created by IARI. Additionally, this app offers details on a number of crop varieties created by ICAR (Mahapatra, S. K., & Pradhan, J., 2021) ^[44].

riceXpert: NRRI Cuttack created the multilingual (English and Odia) riceXpert smartphone application in 2016 with the goal of providing farmers with real-time rice growing solutions. Other elements of the app include news, rice varieties, agricultural tools, professional advice via an e-advisory services module, meteorological data, a personalized pest solution and fertilizer calculator, and more (Mohapatra *et al.*, 2018) ^[48].

Soil Health Card: In India, the Soil Health Card (SHC) program was launched in 2015 with the goal of providing farmers with a thorough assessment of the health of their soil, promoting sustainable farming methods, raising crop yields and farmers' earnings, and reducing environmental damage (Reddy *et al.*, 2023) ^[61]. The Indian government released the Soil Health Card (SHC) smartphone application on December 5, 2017, in honor of World Soil Day. More than 50,000 people have downloaded this app from the Google Play Store. The Indian Ministry of Agriculture created this smartphone application. It gives farmers access

to their soil health cards, which contain vital details about the composition of the soil, nutrient levels, and suggestions for enhancing fertility.

Sufal Bangla App: The West Bengal government's creative "Sufal Bangla" program aims to effectively sell horticultural products in the state (Basu *et al.*, 2019) ^[9]. The Sufal Bangla App is a smartphone app designed to give users direct access to premium, fresh goods while guaranteeing fair rates for West Bengali farmers. Users can check the availability of fruits, vegetables, and other necessities, find the closest Sufal Bangla stores, and see real-time price updates. On September 20, 2017, the West Bengal government's Department of Agricultural Marketing released the Sufal Bangla mobile app. This mobile app has been downloaded by over 10,000 farmers and customers.

Crop Cutting Experiment: In order to estimate crop production based on the sampling of small subplots within farmed fields, the Crop Cutting Experiment (CCE) technique was developed in India (Ahmad *et al.*, 2021) ^[6]. The National Informatics Centre (NIC) created the Crop Cutting Experiment (CCE) App, a customized mobile application designed to make crop yield estimation studies easier. 2018 saw the initial release of this app. Over 10,000 people have downloaded it from the Google Play Store. It gives field workers and agricultural officers the means to document, evaluate, and report data gathered from randomly chosen plots. In order to ensure accuracy and openness in the yield assessment process, the app facilitates rapid data entry, including GPS tagging, photographic documentation, and real-time data submission.

FARMS - Farm Machinery Solutions App: A user-friendly mobile application called FARMS, or Farm Machinery Solutions, was created to improve farmers' access to and affordability of contemporary agricultural equipment. The National Informatics Center (NIC) created this application in September 2019. The software lessens the burden of ownership expenses by allowing farmers to rent farm equipment, such as tractors, harvesters, and plowing machines, at nominal prices. Over 5 lakh individuals have downloaded this mobile app so far.

Krishak Bandhu Mobile App: The "Krishak Bandhu" Scheme was introduced in January 2019 by the West Bengal government's Department of Agriculture. The new program was presented by the Honorable Chief Minister of West Bengal (Krishak Bandhu, 2021) ^[39, 38]. The Krishak Bandhu Program was created by the West Bengal government to support preproduction farmers and to protect farm families' income in the case of a farmer's death (Patra, S., 2023) ^[53]. This mobile application has been downloaded by more than one lakh users thus far. By giving farmers in West Bengal easy access to the advantages of the Krishak Bandhu plan, the Krishak Bandhu Mobile Application is a game-changing digital platform. Farmers can use this app as a one-stop shop to sign up for the program, monitor their financial aid, and get their unique farmer ID cards.

Meghdoot: The Indian Meteorological Department (IMD) and ICAR worked together to develop the Meghdoot mobile

application in 2019 with the goal of providing farmers with vital information via a straightforward and user-friendly smartphone application. Following installation, the app shows data, including specific meteorological characteristics like temperature and precipitation. (Kumar and others, 2022) ^[42] More than one lakh people have downloaded this mobile application. It offers services in more than 700 regions and supports twelve languages as of 2025.

e-Choupal: e-Choupal helps farmers become more focused on the market by giving them access to all current market information. Although they are leveraged in e-commerce, intermediaries are not involved in the transfer of market information to farmers (Bowonder *et al.*, 2002) ^[13]. ITC Limited's e-Choupal mobile application is a cutting-edge project designed to give farmers access to essential agricultural data and services. In 2020, this mobile device was created. Over 10,000 users have downloaded the smartphone app thus far.

PMKISHAN Mobile App: The Indian government launched the "Pradhan Mantri Kisan Samman Nidhi (PM-Kisan)" project to provide financial assistance to farmers. A minimum income assistance of Rs. 6,000 will be given annually to all qualifying farmers under this policy (Kumar, D., & Phougat, S., 2021) ^[41]. On February 24, 2020, the Indian government released the PM Kisan mobile app. The Ministry of Electronics and Information Technology's National Informatics Centre (NIC) created the application. The Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) scheme's benefits can be easily accessed by farmers thanks to this user-friendly smartphone application. Over one crore individuals have downloaded this mobile application. Farmers can use this app to register for the program, verify their eligibility, and monitor the progress of any financial aid they receive.

IVRI-Technologies & Services App: The Indian Veterinary Research Institute (IVRI) and Indian Agricultural Statistics Research Institute (IASRI) created the IVRI-Technologies & Services App as a digital platform to connect veterinary research with end users, such as farmers, veterinarians, and industry stakeholders. The Google Play Store offers the app, which was initially released on December 25, 2021. On the Google Play Store, the IVRI-Technologies & Services App has received more than 1,000 downloads. A multitude of information on IVRI's cutting-edge technologies, veterinary services, and livestock solutions may be accessed through the app. The app's main goal is to advertise and display information on significant technologies, including their characteristics, utility, IPR status, and inventors, in order to facilitate their commercialization (Tiwari *et al.*, 2024) ^[69].

KISAAN 2.0: An revolutionary platform called KISAAN 2.0 (Krishi Integrated Solution for Agri Apps Navigation) aims to advance smartphone-based farming and e-agriculture in India. On July 16, 2021, it was initially made available. The program combines more than 300 agricultural apps created by ICAR-IASRI into a single, intuitive Android aggregator app. Indian farmers can access agricultural knowledge about crops, horticulture, livestock,

fisheries, natural resource management, agricultural engineering, agricultural education, and agricultural extension using the KISAAN 2.0 app, which offers a single interface in several Indian languages (Burman *et al.*, 2023) ^[14].

Krish-e: Krish-e, an agricultural app that offers farmers expert guidance, was released by Mahindra & Mahindra on June 15, 2021, and it has had over a million downloads on the Google Play store. It offers information on how to prepare land, plant crops in various ways, apply fertilizer, and plan crops for increased yields. Weed control techniques, soil-specific irrigation techniques, crop disease detection and treatment, and seed planting and treatment are all included in the software (Tiwari *et al.*, 2024) ^[69].

IFFCO Kisan Uday App: In order to encourage the use of drone technology for spraying nano fertilizers, the IFFCO created the farmer-focused Kisan Uday App in 2023. Over 10,000 users have downloaded this mobile application from the Google Play store. Farmers can use it to register their farm details, schedule drone-based spraying services for IFFCO's nano goods, and get detailed product information.

Jai Kisan Farmer: Jai Kisan, a rural fintech firm created in 2017, released the Jai Kisan Farmer mobile application. In April 2024, the app was formally released. It offers financial solutions specifically designed to meet the needs of rural populations, especially farmers. In both online and offline rural commerce settings, the platform provides prompt and easily accessible credit solutions (Chakraborty, S., & Veeresh, D. A., 2024) ^[15]. This program has been downloaded by more than 10,000 users so far.

The Impact of Mobile Apps on Indian Farmers

In order to determine the extent to which farmers use mobile phones for agricultural and associated tasks, as well as the reasons for their use, Panda *et al.* (2019) ^[51] conducted a study. The results showed that farmers who use mobile phones for information gathering had better marketing results because they have access to more accurate price information. Kusumaningsih (2023) ^[43] looked at mobile phone usage and found a positive correlation with a volume of 1.84. They also suggested that farmers benefit from using mobile phones in rice farming, and it can be inferred that mobile phone users have access to better communication channels and information resources that improve their agricultural practices. According to Patra (2023) ^[53], utilizing cellphones makes it simpler to quickly and directly learn new techniques for boosting crop productivity and yield. Additionally, farmers won't need to rely on agencies to buy lower-quality seeds at higher prices. According to Ahmad *et al.* (2024) ^[5], rice farmers in Bangladesh's Dinajpur area utilize mobile phones to conveniently access current agricultural information, new technology, online training resources, market updates, and disease identification. According to the study, Boro rice production increases by 1.6 to 4.5% when cell phones are used. The introduction and adoption of mobile apps in Indian agriculture have led to several positive outcomes as follows:

1. Increased Productivity: Mobile apps have made it

possible for farmers to optimize their farming techniques by giving them fast and precise information. Crop health and yields have increased as a result of improved weather forecasts, pest control strategies, and professional guidance.

2. Reduced Costs: Farming expenses have decreased thanks to the effective use of resources including water, fertilizer, and pesticides. Precision agriculture-focused apps let farmers apply inputs more precisely, cutting down on waste and needless costs.

3. Better Market Access: Farmers now have direct access to market pricing and buyers thanks to mobile apps, guaranteeing that they are paid more for their produce. This has increased farmers' bargaining strength and lessened middlemen's exploitation.

4. Financial Inclusion: Mobile apps have improved financial inclusion for farmers, especially those in rural areas, by making financing and government programs more accessible. This has improved their general financial situation and enabled them to invest in cutting-edge farming machinery.

5. Sustainability: Additionally, by lowering the overuse of fertilizers and pesticides, mobile technology has contributed to the promotion of sustainable agricultural practices.

Conclusion

Indian farmers' operations are being revolutionized by mobile applications, which provide them with the means to increase market access, boost productivity, and efficiently manage resources. In addition to improving farmers' financial prospects, the incorporation of cutting-edge technologies into agriculture is opening the door for a more efficient and sustainable agricultural ecosystem. Mobile applications will be vital in determining the direction of Indian agriculture and ensuring that farmers are better prepared to face the challenges of the twenty-first century as a result of ongoing technological improvements and increased emphasis on digital inclusion.

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