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Tapping into the Indian Agricultural and Allied Mobile Applications: Review of Trends and Features

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ABSTRACT

The rapid pace of technological advancements and the ever-changing landscape of the mobile app industry, it is imperative to gain a comprehensive understanding of the prevailing trends and features that drive user engagement, satisfaction, and adoption rates. Hence research paper presents review aimed at exploring the trends and features of mobile app in the dynamic Indian market. The primary objective of this research paper was to identify and categorize the Indian mobile apps related to agriculture and allied sectors. A thorough literature search was performed on secondary data from reliable sources, such as academic databases, market research studies, and app stores. This study had attempted to provide insights into the agricultural apps by categorising them which may guide strategic decision-making and encourage innovation in the fast-paced Indian mobile app market.

Key Words: Agriculture, Features, Mobile Applications, Scoping.

INTRODUCTION

Unprecedented growth and innovation have been seen in the mobile app business, with India emerging as one of the most active and dynamic markets worldwide has acquired the second position worldwide (Statista, 2023). In its report, the Committee on Doubling Farmers' Income (DFI), (Anonymous, 2022) praised the role of digital technology, which may revolutionize and organize how rural India conducts its agricultural activities. Farmers are becoming more aware as a result of numerous efforts to give them easy access to technology and information, and digital technologies are being used more and more throughout the agricultural value system.

With a user base that is rapidly growing and a wide range of app categories, the Indian mobile app industry offers a fascinating and complicated ecology that calls for an investigation on services farmers receive regarding soil, seed type, pesticides needed for a specific crop at every stage of growth, types of fertilizers, crop illnesses, and crop selling. The study conducted by Ratiya *et al* (2022) addressed that Agro Advisory Services emerged as an effective communication medium for the transfer of technology regarding climate change information and it is obvious to use modern ways of communication besides traditional methods of communication. Besides this, there is a big gap between the availability and delivery of agriculture inputs and agriculture infrastructure that can be bridged by mobile technologies (Neelaveni *et al,* 2023). A smartphone is a device used for making phone calls that also can send and receive email, connect to Wi-Fi and a modem, access the internet, open Office documents, operate simply with a touch screen, and most importantly, run customized software (Patel and Patel, 2016). India's mobile app market has undergone tremendous growth as a result of rising smartphone adoption, better internet access, and the country's constantly growing digital ecosystem. The mobile app market in India has developed into an interesting and dynamic arena for developers, entrepreneurs, and investors, industry stakeholders, and policymakers thanks to the millions of users who interact with numerous applications every day. The present study was conducted to review the

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identification and categorization of the Indian mobile app.

MATERIALS AND METHODS

The methodology involves Systematic Reviews and Meta-Analyses to identify relevant literature and secondary data sources related to mobile applications in the Indian market. The collection of data regarding 30 agriculture mobile apps were selected based upon the hits using keywords like "agricultural mobile apps, plant app, sowing date calculator, farmer app, *etc*. on Google Play Store, online downloading sites, and system stores. The analysis was centered on features, no. of downloads, and new trends in apps. The inclusion and exclusion criteria will consider recent publications up to the knowledge cutoff date, ensuring relevance and validity. This assessment will provide a comprehensive overview of the Indian mobile app environment, illuminating current trends and features through methodical analysis and synthesis.

RESULTS AND DISCUSSION

Android Applications for the Agriculture Sector

A total of 30 mobile applications were identified and categorized based on their primary functionalities. It also enabled researchers and stakeholders to target specific areas of interest within the agricultural sector. Ultimately, the categorization enhanced the accessibility and usability of agricultural apps, promoting their widespread adoption and positive impact on farming practices. The agriculture information apps can be categorized or classified into various categories which is adopted from Costopoulou *et al,* (2016).

A. **Business apps**: They may include accounting software, budgeting tools and sales tracking that facilitate effective financial and operational management for farmers.

B. **Diseases and pests apps**: Apps that focus on identifying, diagnosing, and managing diseases and pests affecting crops and livestock. These provide information about measures to mitigate the impact of pests and diseases on agricultural produce.

C. **Farm management apps:** These apps are made to help farmers run their farms daily. features like farm mapping, task scheduling, crop monitoring, irrigation scheduling, and weather forecasts.

D. **Learning and reference apps:** These apps offer farmers insightful information, knowledge, and references on contemporary agricultural practises.

E. **Market data apps:** These apps include real-time market data, pricing details, and agricultural product trend information.

F. **Crop-specific app:** They provide detailed information about individual crops or livestock breeds, including optimal growing conditions, pest management strategies, and harvesting techniques.

G. **Social connecting apps:** Through these platforms, farmers may share information, ideas, and experiences, encouraging cooperation and group problem-solving.

The result showcased the available apps in google play store recently and were categorized into the following categories: Business apps, Diseases and pests apps, Farm management apps, Learning and reference apps, Market data apps, Crop-specific app, and Social connecting apps respectively. Table 1 shows the actual numbers of Android and iOS mobile apps for each category. Due to the fact that the Windows Phone store is relatively recent, it has only 12 mobile applications for the agricultural sector. Mostly all of these were displayed on more than one of the app stores

The data (Table 1) showed that around 26.67 per cent of the farmers uses the learning and reference apps and this might be due to reason that the farmers are trying to adopt new thing and focused on learning to use modern technologies tremendously in agriculture sector. Then, second position is of farm management apps with 20.00 percent due the

Sr. No.	Name of mobile app	Developed by	Services provided	Description	Link
1.	Plantix	PEAT, Germany	in diagnosis and monitoring of plant diseases, nutrient deficiencies and pest attack.	This mobile app helps in the diagnosis and monitoring of plant diseases, nutrient deficiencies, and pest attacks. In this app, the client can send pictures of the affected plant tagged with coordinates which will help in the identification and also, real-time monitoring of pests and diseases. It offers its users tailor-made information regarding best practices, preventive measures and various alternatives to solve their problems.	
2.	Kheti-Badi app		Market price and trends, educating about Organic Farming, social connect app, multi-lingual	Agriculture traders and farmers in India are the major clients of this app. Most of the agricultural products from all over the Indian agriculture markets, market yards and mandi are covered by the app which now lists previous day closing prices to enable the farmers to get prices online. It provides information regarding organic farming practices, so that farmers can take informed decisions on whether they want to transition from chemical-based farming to organic or not. At present the app provides its services in four languages—Hindi, Marathi, English, and Gujarati.	Buy-Sell organic products (kheti-badi.com)
3.	Crop Insurance	DAC&FW On Dec 14, 2018	Information sharing, Insurance Calculator, Crop Loss Intimation, Help Desk	This app talks about insurance schemes. It helps farmers view their policy details and calculate insurance premiums for crops and cut-off dates.	Crop Insurance - Apps on Google Play
4.	APEDA Farmer Connect	Agricultural and Processed Food Products Export Development Authority (APEDA)	to apply online for farm registration and approval by state government and lab sampling by authorized laboratories	This mobile app allows a farmer to apply online for farm registration and approval by state government and lab sampling by authorized laboratories. The farmer can track status of applications. An authorized State Government Officer, farmer or registered laboratory can login to access the information. This app has in-built GPS capabilities to identify the farm location	APEDA - Apps on Google Play

5.	PMKISAN GoI	National Informatics Centre launched in February 2019	Secure payments, proper identity proofs such as per Aadhaar, Dial Helpline Numbers	This app is one of the measures being taken by the Government of India to reach all eligible beneficiaries under PM-KISAN. Public interfaces have been made available for self-registration, checking the payment status, Correction of the name as per Aadhaar as it is being mandatory requirement of the scheme. To broaden the reach further, the PM-KISAN mobile app designed and developed by National Informatics Centre (NIC), Ministry of Electronics and Information Technology, Government of India is being launched.	PMKISAN GoI - Apps on Google Play
6.	Kisan Suvidha	Ministry of Agriculture and Farmers Welfare, Govt. of India	provides information, multi-lingual**, updated weather,** market prices of commodities / crops in the nearest town and marketing of commodities.	Kisan Suvidha is a comprehensive mobile app designed to assist farmers with essential information. It offers valuable details on weather, market prices, dealers, plant protection, IPM practices, seeds, expert advice, Soil Health Card, and the availability of godowns and cold storage. The app caters to farmers in multiple languages, including English, Hindi, Tamil, Gujarati, Odia, and Marathi.	https://apps.mgov.gov.in/ descp.do?appid=1056
7.	Pusa Krishi	Ministry of Agriculture and Farmers Welfare, Govt. of India	provides farmers with information on new crop varieties, efficient farming techniques, machinery, and production technology	This app provides farmers with information about novel crop types created by the Indian Council of Agricultural Research (ICAR), resource-saving farming techniques, agricultural machinery, and production technology. Farmers can communicate with stakeholders in real time thanks to a feedback area.	
8.	Agrofriend		Marketing of top-quality agricultural input	AgroFriend (Farmer's Own Shop) is an Agricultural Platform where in Seeds from top Agricultural Companies, Herbicides, Insecticides, Fungicides, Plant Nutrients, Agricultural Equipment's & Books and other Agriculture related products are made available to farmer's at modest rates at their Doorsteps.	AgroFriend - Apps on Google Play

9.	BharatAgri	BharatAgri-krushi doctor app	Advisory service, Smart Satellite Mapping, Weather Forecasting, Soil Testing, and Water Testing pest & disease management	BharatAgri is a Smart Kisan & Smart Farming App for Farmers using all-new Agri tech solutions (Kheti Badi) with the help of available technology like Smart Satellite Mapping, Weather Forecasting, Soil Testing, and Water Testing to increase farmers overall farm income. So if you also want to become a "Smart Farmer" then download and use the BharatAgri App (खेती ऐप/Krishi app) and get the best farmer support. weather forecast, pest & disease management, proper & timely guidance from crop experts for better crop growth.	
10.	Mkisan		Advisory services to farmers by experts and government officials	The main objective is to empower farmers and various stakeholders by granting them access to valuable advisories and information shared by experts and government officials across different levels through the Mkisan portal. Users can readily access these insights without the need for portal registration. This app offer seamless access and enhanced convenience to the clients.	http://mkisan.gov.in/testimonials.aspx.
11.	Krishi Video Advice mobile app	MANAGE with NIC, Hyderabad	-Expert advice on images of infected crop or animal as sent by farmer on the app -Live video conference with the KCC expert on farm issues	It has been designed to bridge the information gap between farmer and the expert. The mobile app works on all smartphones or tabs having android operating system. Any farmer/extension officer can use the mobile app to capture three images of the crop live from the farmer's field itself and upload the same. Thereafter, Kisan Call center (KCC) expert will provide advice based on the crop images.	
12.	Shetkari Masik android app	Department of Agriculture, Maharashtra	Information sharing	The Android app for Shetkari magazine has a very simple interface and requires mobile internet or Wi-Fi connectivity to register and download the issues. Once downloaded, the magazine can be read without internet connectivity.	farmer.gov.in/mobileappsdownload.aspx

13.	AgriMarket app (Marketing category)	Ministry of Agriculture and Farmers Welfare, Govt. of India	Market price of crops at markets within 50km radius	The main focus of this app is to give real time and quick information to the farmers regarding the market price of crops at marketplaces situated within 50 kms from their location, which is currently available in English as well as Hindi languages. App uses mobile GPS to determine the user's location and provide relevant information.	farmer.gov.in/mobile appsdownload.aspx
14.	Digital Mandi India (Marketing category)	Appkiddo	Market price of agricultural commodity	This App helps in checking the latest Mandi prices of agricultural commodities reported from different states and districts/mandis in India One can get commodity wise categorization or state wise categorization	Digital Mandi India Mod apk download - Digital Mandi India MOD apk free for Android. (happymod.com)
15.	e-NAM Mobile App (Marketing category)	SFAC, Ministry of Agriculture & Farmers Welfare, Govt. of India	-Farmers and others can view state wise list of e-NAM mandis, mandi wise arrivals and minimum and maximum price prevailing there.	The National Agriculture Market (NAM) is an electronic trading platform for all of India that the Indian government has pushed. It connects the mandis already in place to form a single national market for agricultural products. The mobile app's goal is to make it easier for merchants to conduct remote bidding and for farmers and other stakeholders to obtain arrivals and price-related information on their smartphones. Traders can bid for the lot available, do fresh bid or change last bid price, can see maxikultimum and minimum bid price in open auction and can view winner list, bid history and share feedback	eNam | Mobile App
16.	IFFCO Kisan-Agriculture App	IFFCO Kisan	Weather -market price -agricultural advisory -expert consultation -agri-library -market place	IFFCO Kisan-Agri app is a modern farmer toolkit which offers customized advisory services with more visual content for the farmers. This app comes with crop advisory services containing modern farming practices curated on basis of agro-climatic region, climate-smart agriculture practices, nutrition management, use of precision technology, and mechanization. It gives access to various modules like agricultural advisory, weather, market prices and more. It supports eleven languages including English.	IFFCO Kisan-Agriculture App - Apps on Google Play

17.	Kisan konnect		-Deliver fresh and hygienic fruits and vegetables from farms to consumers' doorstep within a day at fair prices.	Kisankonnect aims to contribute by bringing sustainable practices of best-in-class supply chain model for delivering the freshest produce from the farm to consumers' home within a day. Kisankonnect is a pioneering integrated farming network equipped with the necessary infrastructure, technology, and supply-chain expertise to deliver farm-to-table freshness of fruits and vegetables.	
18.	Krish-e	Mahindra & Mahindra group.	**crop calendar, 8 local languages,** Crop production management, Pest and disease management, Fertilizer calculator and crop nutrition.	Moreover, the app provides gri Advisory Service is available for free for crops such as Sugarcane, Paddy (धान की खेती), Cotton (कपास की खेती), or for sabji ki kheti/ vegetable farming like Potato (आलू की खेती), and Soybean growing in a number of states.	Krish-e : Kheti Ke Liye App - Apps on Google Play
19.	Agriapp-smart farming app	AgriApp	Free Crop Advisory Access, Multilingual Support, Secure Payments, 24/7 Customer Support, crop production, and protection activities.	Agri app is a farmers' app that helps farmers stay updated on the best farming and agricultural practices. Also, as one of India's leading mobile apps for agriculture.	AgriApp : Smart Farming App - Apps on Google Play
20.	Krishify agricultural kisan appp	Gurugram-based agritech	Poultry farming, social app, crop production info, Dairy farming, Horticulture, Fish Farming, market price, marketing, weather.	Krishify is a social app for farmers. As a one-stop solution, it is a leading app for the Indian farmers (Kisan) community.	Krishify Agriculture Kisan App - Apps on Google Play
21.	MyAgriGuru	Mahindra Group.	connects farmers, information sharing	MyAgriGuru is a digital platform for farmers –aimed at creating an integrated network in the agriculture community in India. The platform connects farmers and agri-experts across the country and enables the exchange of thoughts, ideas and information – creating a true, trustworthy eco-system.	

22.	**Pusa Krishi**	Union Agriculture Minister in 2016	Information of New crop varieties introduced by ICAR, knowledge sharing, Marketing.	the app aims to revolutionise agricultural practices for more returns on their yields. Moreover, it gives farmers access to the latest technologies that are developed by Indian Agriculture Research Institute (IRAI). Also, this is one of the best farming mobile apps as it provides information on:	farmer.gov.in/ mobileappsdownload. aspx
23.	Agrio plant health App	Saillog ltd.	crop advisors, and agronomists in **crop management, plant disease identification, plant diagnosis, and yield improvement.**	Agrio is a precision plant protection solution that helps growers and crop advisors to forecast, identify, and treat plant diseases, pests, and nutrient deficiencies. The digital plant doctor contains the knowledge of numerous agriculture experts from all over the world and continuously improves.	Agrio - Plant health app - Apps on Google Play
24.	Vivasayam in Tamil - விவசாயம்	AgriSakthi	Language specific, information sharing,	App has been developed to promote organic farming, to inform the latest technologies about agriculture in real time and to preserve traditional agriculture.	Vivasayam - நித்ரா விவசாயம் - Apps on Google Play
25.	(crop specific) riceXpert	ICAR-National Rice Research Institute (NRRI), Cuttack	News, E-advisory services, weather information, bilingual, disease and pest management.	It is a bilingual (English and Odia) Android platform with a view to reach the latest rice technologies to the rice farmers in real time basis. It provides real time diagnosis of insect pests, diseases, nematodes, weeds, nutrient deficiencies and toxicities to farmers.	riceXpert - Apps on Google Play
26.	Mana Verusanaga App	ANGRAU, Andhra Pradesh, India	Information sharing, social app	Provides detailed information to the farmers and extension personnel on all aspects of groundnut cultivation. The content includes varieties, seeds, nutrient management, pest and diseases, farm mechanization, value addition and contact details with photographs	ANGRAU Mana Verusanaga on Windows PC Download Free - 1.5 - com.kishan.agri (appsonwindows. com)
27.	Mobile App on Castor	ICAR-IIOR, Hyderabad	information on castor production	This mobile app provides information on castor production technologies, recommended hybrid varieties, intercropping, major insects, pests and diseases and its remedies to castor farmers.	Castor Connect - Apps on Google Play

28.	Cane Adviser	ICAR-SBI, Coimbatore, Tamil Nadu	Social app for cane growers and sellers , marketing	Cane Adviser is a mobile app for cane growers and millers. It gives details from planting to harvest with text and graphics for tropical and sub-tropical India. The features of the app include static as well as dynamic platforms	ICAR-SUGARCANE BREEDING INSTITUTE – Sugarcane Breeding Institute
29.	Rythu	Nestham Foundation	Bilingual, organic faming production, marketing	Rythunestham is a mobile app which helps farmers in organic farming. The mobile app is available in both English and Telugu	https://rythunestham.in/
30.	RML Farmer	RML AgTech	weather forecast, market price, crop advisory, location-specific, preferred language, track of pest and disease attack.	Farmer can access information about 450 crop varieties, 1300 mandis, and 3500 weather locations across.	Download RML Farmer - Krishi Mitr 5.1.0 apk free - ApkHere.com (apkbe.com)

Table 1. Cateogrisation of mobile apps (N=30)

Sr.No.	Cateogrisation of mobile apps	Frequency	Percentage
1	Business apps	2	6.67
2	Diseases and pests apps	2	6.67
3	Farm management apps	6	20.00
4	Learning and reference apps	8	26.67
5	Market data apps	4	13.33
6	Crop-specific app	4	13.33
7	Social connecting apps	4	13.33
	Total	30	100.00

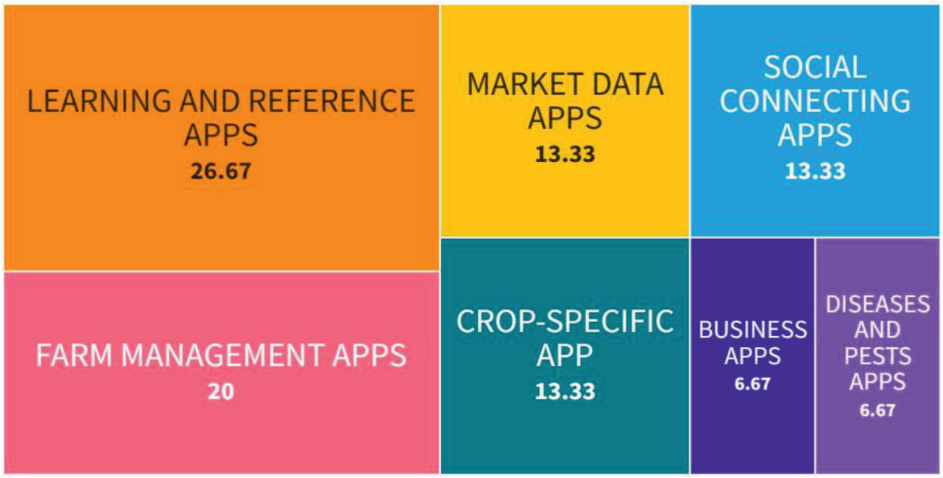

Figure 1: Tree map of Mobile app percent in each category

reason because they are frequently used by farmer for checking features like weather, crop and other details, calculators etc. Followed by these app category ie. market data apps, crop-specific app, social connecting apps with 13.33 percent because exchange and information sharing is a great way for sharing and communicating in community for easy and fast adoption of particular technology. It is also an indicator of how far information is likely to spread within any given farming community, giving an estimate of the potential 'reach' for the service in broad terms, although this would need further and more detailed investigation. Lastly, Business apps, Diseases and pests apps occupies with 6.67 percent.

CONCLUSION

This research endeavour aims to add to the body of knowledge by exploring the diverse Indian mobile app market. It does so by providing insightful knowledge that may guide strategic decision-making and encourage innovation in the fast-paced Indian mobile app market. Additionally, it shed light on the key features that play a crucial role in influencing user usage rates. Research concludes that around 26.67 per cent of the farmers uses the learning and reference apps followed by farm management apps with 20.00 percent, market data apps, crop-specific app, social connecting apps with 13.33 percent, lastly business apps, diseases and pests apps have 6.67 percent. Understanding these trends and features can aid researchers and marketers in formulating effective strategies to better understand user preferences and requirements. Investigating why certain app categories are more popular than others will provide valuable insights for future app development, leading to more effective solutions that cater to farmers' needs.

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