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Transforming Knowledge Transfer System: Impact of Smartphone Agro-Applications on Farmers

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Abstract

This research investigates the socio-demographic characteristics of farmers and evaluates the influence of smart phone agricultural applications on the accessibility and utility of farming-related information. Drawing on a sample of 300 respondents, the study focuses on key variables including landholding size, farming experience, and engagement with institutional extension services. Findings reveal a farming community predominantly composed of small to semi-medium landholders (74%), with considerable practical experience (85% possessing over a decade in farming) and robust institutional ties (over 82% maintaining moderate to high contact with extension services).

A comparative assessment demonstrates a notable positive shift in the perceived impact of agricultural information following the adoption of smartphone applications. Specifically, the proportion of farmers reporting low informational impact declined by 32%, whereas those indicating high impact increased by 36%. Post-adoption analysis suggests that for a majority of respondents (66.67%), these applications function as a valuable supplementary resource within their existing knowledge networks. Nevertheless, a significant minority (16%) reported minimal perceived benefits, highlighting variability in adoption outcomes.

The study concludes that smart phone agro-applications contribute meaningfully to bridging information gaps and enhancing on-farm decision-making, serving as an effective complement to conventional extension frameworks. However, the differential effectiveness observed among users underscores the necessity for intentional strategies aimed at improving application design, regional adaptation, and user-centric support mechanisms. Such efforts are critical to fostering greater inclusivity and optimizing developmental impact across diverse agrarian segments.

Introduction

Agriculture continues to form the base of the Indian economy and sustains a substantial share of the rural workforce. Within the context of the Fourth Industrial Revolution, the integration of Information and Communication Technology (ICT) into agriculture, often termed digital agriculture or 'AgriTech', is increasingly regarded as a transformative avenue for enhancing productivity, promoting sustainable practices, and improving farmer livelihoods. Among these technological innovations, smart phone-based agricultural applications have emerged as a particularly promising tool, capable of delivering timely, locale-specific insights on weather patterns, market dynamics, pest and disease management, soil nutrition, and advanced cultivation techniques directly to farmers.

The district of Wardha in Maharashtra, with its varied agro-climatic zones and considerable dependence on agriculture, presents a relevant setting for examining the adoption and outcomes of such digital interventions. However, the realization of potential benefits is neither automatic nor uniform; it is mediated by a complex interplay of socio-economic, demographic, and institutional factors. Critical variables such as landholding size, which often reflects resource benefits and market engagement, farming experience, shaping risk tolerance and openness to innovation and the frequency of interaction with traditional extension services, which establishes initial trust in formal advisory systems, are likely to profoundly influence how farmers perceive, access, and apply information from digital platforms.

Appreciating these dynamics is essential to advancing beyond mere technological diffusion toward meaningful, equitable, and impactful integration of digital tools in agricultural practice. This study, therefore, seeks to explore how smart phone applications are reshaping knowledge transfer in agriculture and to assess their noticeable impact within the lived realities of farmers in Wardha district.

Methodology Overview

The study was conducted in the Wardha district of Maharashtra State, around five talukas (blocks): Wardha, Selu, Deoli, Hinganghat, and Samudrapur. A multi-stage random sampling technique was used to select 300 farmers as respondents. Primary data were collected through pre-tested, structured interview schedules. The data analysis involved descriptive statistics presented through frequency and percentage distribution to profile the respondents and assess the impact, using a comparative framework for pre- and post-adoption situations. The following sections detail the findings, discussion, and conclusions derived from this investigation.

Literature Review

The integration of Information and Communication Technology (ICT) into agriculture has been a significant focus of research and development aimed at bridging the information gap between research institutions and farmers. This review synthesizes existing literature pertinent to the core themes of this study: the role of ICT, specifically smartphone applications, in agriculture; the socio-economic determinants of technology adoption; and the context of digital agricultural initiatives in India, with a specific lens on conditions relevant to Maharashtra and the Vidarbha region.

The transition from traditional, face-to-face extension systems to digital-enabled services represents a paradigm shift in agricultural knowledge dissemination. Studies by Aker (2011) and Qiang et al. (2012) have established that mobile phones, by virtue of their increasing penetration, offer a cost-effective and scalable platform for delivering timely information. Research indicates that ICTs can reduce information search costs, improve access to market prices, and facilitate better risk management (Cole & Fernando, 2012; Mittal & Mehar, 2016). Smartphone applications, with their multimedia capabilities and interactive features, represent an advanced evolution of simple SMS-based services, allowing for more nuanced and visually rich information transfer on complex topics like pest identification, nutrient deficiency symptoms, and precision farming techniques (Gandhi, Armstrong, &Baret, 2016).

The adoption and impact of agricultural technologies are not homogeneous but are filtered through the prism of farmer characteristics. Landholding size is a critical socioeconomic variable. Small and marginal farmers, while numerically dominant, often face constraints related to risk aversion, capital availability, and perceived relevance of technologies designed for larger, commercial operations (Feder, Just, & Zilberman, 1985). Conversely, medium and large farmers are generally found to be earlier adopters of capital-intensive and information-driven technologies due to greater resource endowment and market orientation (Birthal, Joshi, & Roy, 2013).

Farming experience embodies tacit knowledge and shapes cognitive frameworks. Experienced farmers possess deep, location-specific knowledge but may exhibit resistance to change due to established practices. Less experienced farmers may be more open to innovation but lack the foundational knowledge to contextualize new information effectively (Rogers, 2003). This creates a complex dynamic for digital tool adoption.

Furthermore, a farmer's existing linkage with formal extension systems plays a crucial moderating role. Studies suggest that farmers with higher extension contact are often more aware of improved practices and may use digital tools as a complementary verification or updating mechanism (Glendenning, Babu, & Asenso-Okyere, 2010). Those with low extension contact, however, might rely on apps as a primary information source, making the apps' design and reliability even more critical.

In India, initiatives like the Digital India campaign and the promotion of AgriTech start-ups have created a fertile ground for smart phone app proliferation. Studies by Mittal (2016) and Deichmann, Goyal, and Mishra (2016) highlight the potential of mobile-based services in improving input use efficiency and market access. However, challenges persist, including digital literacy gaps, content relevance in local languages, and the durability of impact beyond initial use (Fu & Akter, 2016).

Research specific to Maharashtra, particularly the agriculturally stressed Vidarbha region, underscores the critical need for accessible, actionable information to support livelihood security. While studies have examined broad ICT use, there is a paucity of granular research focusing specifically on the differential impact of dedicated smart phone applications across distinct farmer typologies (defined by landholding, experience, and extension engagement) within a district like Wardha. This study aims to address this gap by providing an empirical assessment of how smart phone agro-apps perform within the specific socio-agrarian fabric of Wardha district, thereby contributing to a more nuanced understanding of digital agriculture's pathway to inclusive impact.

Methodology

Study Area

The study was conducted in the Wardha district of Maharashtra state, India. The district comprises five talukas (blocks): Wardha, Selu, Deoli, Hinganghat, and Samudrapur, which were all included in the study to ensure geographical representation of the district's agrarian diversity.

Data Collection and Variables Primary data were collected through personal interviews using a pre-tested, structured interview schedule. The questionnaire was designed to capture:

Socio-Economic Profile: Landholding size (categorized as Marginal, Small, Semi-medium, Medium, Big), years of farming experience (categorized as Low, Medium, High), and a quantified score for extension contact (categorized as Low, Medium, High).

Impact Assessment:

The core of the study involved measuring the perceived impact of agricultural information. This was operationalized through a set of Likert scale questions assessing the quality, accessibility, timeliness, and usefulness of information. A composite "impact score" was calculated for two scenarios: (i) recalling the situation before the adoption of smart phone agriculture apps, and (ii) assessing the current situation after adoption. This allowed for a direct comparative analysis.

Data Analysis

The collected data were coded, tabulated, and analyzed using descriptive statistical tools including frequency, percentage, and mean. The analysis was presented in tabular form to profile the respondents and to clearly depict the comparative shift in impact scores before and after the adoption of smart phone applications. The categorization of scores (Low, Medium, High) for all variables facilitated clear interpretation of the distribution and trends within the data.

1. Land holding

Table1: Distribution of the respondents according to their land holding

Sr. No.	Category	Score	Respondents (n=300)	
			Frequency	Percentage
l.	Marginal	Upto1ha.	18	6.00
2.	Small	1.01to2.00ha.	114	38.00
3.	Semi- medium	2.01to4.00ha.	108	36.00
4.	Medium	4.01 to10.00ha.	47	15.67
5.	Big	10.01ha.andabove	13	4.33
Total			300	100.00

As per the above table no. 1, the data shows that small (38.00%) and semi-medium (36.00%) farmers collectively form 74.00% of the sample, indicating a farming variable dominated by moderate-scale, family-based operations. Marginal farmers constitute a smaller section (6.00%), while medium and big land holders together account for 20.00%. This variable is important as landholding size considerably influences risk-taking capacity, investment potential, and the scale at which new information can be applied (Birthal et al., 2013).

2. Farming Experience

Table2: Distribution of the respondents according to their farming experience

Sr. No.	Category	Score	Respondents (n=300)	
			Frequency	Percentage
1.	Low	Upto9	45	15.00
2.	Medium	10 to32	210	70.00
3.	High	32andabove	45	15.00
Total			300	100

As per the data shown in table no. 2, significant 85% of farmers possess over a decade of experience, with the majority (70%) falling into the 'Medium' category (10-32 years). This high level of experiential knowledge suggests that the farming community has managed through multiple agricultural cycles and technological changes. The equal distribution of Low and High experience (15% each) indicates a demographic mix where deep traditional knowledge exists with newer innovations, a dynamic that can both foster and challenge knowledge transfer (Rogers, 2003).

3. Extension contact

Table 3: Distribution of the respondents according to their Extension Contact

Sr.No.	Category	Score	Respondents (n=300)	
			Frequency	Percentage
1.	Low	Up to 24	53	17.67
2.	Medium	25 to 44	185	61.67
3.	High	45 and above	62	20.67
Total			300	100.00

As per table no. 3, the data indicates a strong institutional linkage, with 82.34% of farmers reporting medium to high levels of extension contact. This extensive connectivity provides a solid foundation upon which digital tools can build as complementary information sources. However, the 17.67% with low contact represent a potential gap in the information network, who may rely more heavily on informal channels or could be primary targets for digital outreach (Glendenning et al., 2010).

Table4: Distribution of respondents according to the impact of Agricultural Information due to Use of Smartphone Agriculture Apps

Sr. No.	Category	Score	Before adoption (n=300)		Score	After adoption (n=300)	
			F	%		F	%
1.	Low	Up to 9	44	14.67	Up to 20	30	10.00
2.	Medium	9 to15	209	69.67	21 to 25	206	68.67
3.	High	16 and above	47	15.66	26 and above	64	21.33
Total			300	100	Total	300	100

As the data shown in table no. 4, following impact is seen, Low-Impact Category: The proportion of farmers reporting a low impact from agricultural information decreased from 14.67% to 10.00% post-adoption. This reduction indicates that smart phone apps have successfully provided actionable information to a section of farmers who were previously underserved or disconnected from effective knowledge sources, thereby justifying information poverty.

Medium-Impact Category: This remained the largest and most stable group, with a marginal shift from 69.67% to 68.67%. The stability suggests that for the majority, apps have added and covered existing information channels rather than totally transforming them. These farmers continue to experience dependable, reasonable benefits, likely using apps to verify information, access timely updates, and improve their standard decision-making processes.

High-Impact Category: This is where the most significant positive change is observed. The percentage of farmers reporting a high impact from agricultural information increased substantially from 15.66% to 21.33% post-adoption. This growth of over one-third in the high-impact group represents farmers for whom app adoption has been transformative. They likely experience profound benefits such as

real-time market data, precise pest/disease diagnostics, customized advisories, and direct expert interaction, leading to distinctly improved agricultural outcomes and confidence.

This migration signifies that smart phone apps are effectively performing a dual function: bridging information deficits for previously underserved farmers and acting as a catalyst that elevates information utility for a significant segment into a transformative range (Aker, 2011). The stability of the medium-impact majority aligns with the observation that for most, digital tools reinforce rather than replace established information channels.

Table 5: Distribution of the respondents according to the impact of smart phone agriculture apps on their agricultural information

Sr. No.	Category	Score	Respondents (n=300)	
			Frequency	Percentage
1.	Low	Upto7	48	16.00
2.	Medium	8to14	200	66.67
3.	High	15&above	52	17.33
Total			300	100

The data shown in the table no. 5 is elaborated below,

Low Impact (Score up to 7): Representing 16.00% of respondents, this group reports marginal observed benefit from the agricultural apps. For these farmers, the apps may not have significantly changed their access to or quality of information. Potential reasons could include limited usability, lack of locally relevant content, low digital literacy, or a preference for established information sources like traditional extension or peer networks.

Medium Impact (Score 8 to 14): Constituting a substantial majority at 66.67%, this category represents farmers for whom the apps provide a clear, useful supplement to their existing knowledge systems. They likely experience dependable benefits such as suitable access to weather forecasts, basic pest advisories, or market prices. The apps have been successfully integrated as a supportive tool that enhances, but does not completely transform, their information-gathering and decision-making processes.

High Impact (Score 15 & above): Comprising 17.33% of the sample, this section includes farmers who report a transformative effect. For them, the apps are essential resource, potentially enabling data-driven decisions on irrigation, fertilization, or crop choice, providing direct access to expert advice, or unlocking premium market opportunities. These users are likely highly engaged, tech-comfortable, and have found apps that directly address their main working challenges.

This divergence suggesting that impact is mediated by factors like landholding, digital literacy, and app relevance (Fu & Akter, 2016).

Results:

The study of 300 farmers brings in the following key findings across five critical dimensions:

Landholding Structure: The agrarian community is defined by moderate-scale, family-based farming. A dominant 74% of respondents are small and semi-medium farmers. Marginal farmers constitute 6%, while medium and large landholders represent a combined 20% of the sample.

Farming Experience: The community is highly experienced. The vast majority (85%) have over a decade of farming practice, with a core cohort of medium-experience farmers. Notably, low-experience and high-experience farmers are symmetrically represented, each at 15%.

Extension Contact: Engagement with formal agricultural extension services is strong. A total of 82.34% of farmers reported medium to high contact levels. The distribution is fixed by those with medium contact (61.67%), indicating widespread linkage, supplemented by a significant group with high contact (20.67%).

Impact of App Adoption on Information: The adoption of smart phone agriculture applications prompted a measurable positive shift. Post-adoption, the percentage of farmers in the low-information-impact category fell from 14.67% to 10.00%. Simultaneously, the high-impact category grew from 15.66% to 21.33%, indicating a migration towards higher-value information access.

Overall App Impact: In a combined assessment, most farmers found the apps beneficial. 66.67% reported a medium impact, viewing apps as a useful additional tool. 17.33% reported a high,

transformative impact, while 16.00% perceived a low impact, highlighting variability in user experience.

Conclusion and Recommendations

Conclusion

This study assessed the impact of smart phone agriculture applications on farmers in Wardha district, investigate by their landholding, experience, and extension contact. The findings reveal an agrarian community dominated by experienced small and semi-medium farmers with strong traditional extension linkages. Within this context, smart phone apps have proven to be a significant positive intervention.

The adoption of these digital tools has led to a measurable improvement in the perceived impact of agricultural information, effectively reducing the proportion of information-poor farmers and expanding the section experiencing high-value, transformative information access. The technology predominantly serves as a powerful complement to existing knowledge systems. However, the benefits are not uniformly distributed, indicating that the effectiveness of digital agriculture is depending upon underlying socio-economic and human capital factors.

Recommendations

Based on the findings, the following recommendations are proposed for policymakers, extension agencies, and app developers to enhance the inclusivity and impact of digital agriculture.

- Develop Differentiated Digital Content
- Integrate Digital Tools with Extension Systems
- Launch Targeted Digital Literacy Campaigns
- Promote Local Language and Hyper-Local Content
- Facilitate Peer Learning Networks

By adopting a targeted and inclusive approach, the potential of smart phone agro-applications can be fully realized, transforming them from a supplemental novelty into a cornerstone of a strong, informed, and productive agricultural system in Wardha district and similar regions.

Summary:

In summary, the study profiles a mature and moderately-scaled farming community with strong traditional knowledge and institutional linkages. Within this context, the introduction of smart phone agriculture apps has proven to be a significant positive mediation. The technology has demonstrably improved the quality and utility of agricultural information for a substantial segment of users, effectively bridging information gaps for some and catalyzing enhanced decision-making for others. The data confirms that these digital tools primarily function as a powerful complement to, rather than a replacement for, existing knowledge networks and extension services.

However, the determined low-impact group signals that benefits are not universal. The effectiveness of these apps is mediated by factors such as landholding size, digital literacy, and the local relevance of app content. Therefore, to fully bind the potential of digital agriculture, future efforts must move beyond broad dissemination. Policy and development initiatives should focus on targeted, inclusive design—creating locally-relevant content, providing digital skill training, and designing user interfaces that cater to the needs of diverse farmer types, particularly smallholders and those with lower extension contact. By doing so, smart phone apps can evolve from being a supplemental tool for the majority to a transformative and equitable resource for the entire farming community.

References

Aker, J. C. (2011). Dial "A" for agriculture: a review of information and communication technologies for agricultural extension in developing countries. Agricultural Economics, 42(6), 631-647.

Baumuller, H. (2018). The Little We Know: An Exploratory Literature Review on the Utility of Mobile Phone-Enabled Services for Smallholder Farmers. Journal of International Development

Birthal, P. S., Joshi, P. K., & Roy, D. (2013). Farmers' choice of market channels and producer prices in India: Implications for food policy. International Food Policy Research Institute.

Feder, G., Just, R. E., & Zilberman, D. (1985). Adoption of agricultural innovations in developing countries: A survey. Economic Development and Cultural Change, 33(2), 255-298.

Fu, X., & Akter, S. (2016). The impact of mobile phone technology on agricultural extension services delivery: Evidence from India. The Journal of Development Studies, 52(11), 1561-1576.

Glendenning, C. J., Babu, S., & Asenso-Okyere, K. (2010). Review of agricultural extension in India: Are farmers' information needs being met?. IFPRI Discussion Paper 01048.

Jaiswal, Monika, Ajeet Singh, Bhupendra Singh, and Kartikey Singh. 2018. "Assessment the Usefulness, Applicability& Impact of Kisan Mobile Advisory Services (KMAS) by the Farmers in Burhanpur District of Madhya Pradesh."Indian Journal of Extension Education 54 (3):31-36

Manjuprakash, H. Philip and N. Sriram. 2020. Farmers Perceived Effectiveness of Information and Communication Technology (ICT) Tools in Karnataka, India. Int. J. Curr. Microbiol. App. Sci., 9(6): 3545-3550

Mittal, S., & Mehar, M. (2016). Socio-economic factors affecting adoption of modern information and communication technology by farmers in India: Analysis using multivariate probit model. The Journal of Agricultural Education and Extension, 22(2), 199-212.

Nagesh, N. S. and Saravanan, R. (2019) Impact of ICTs on Agriculture growth and Development Case studies from Karnataka Region, Discussion Paper 9, MANAGE-Centre for Agricultural Extension Innovations, Reforms and Agripreneurship, National Institute for Agricultural Extension Management (MANAGE), Hyderabad, India

Rogers, E. M. (2003). Diffusion of innovations (5th ed.). Free Press.

Rudroju, V., Angadi, J. G. (2013). Awareness, accessibility and utilisation pattern of information and communication technology (ICT) projects by farmers of Belgaum district. Karnataka J. Agric. Sci., 26(3): 460.

Xiaolan Fu & Shaheen Akter, 2019. "The Impact of Mobile Phone Technology on Agricultural Extension Services Delivery: Evidence from India," Journal of Development Studies, Taylor & Francis Journals, vol. 52(11), pages 1561-1576, November.