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An Experimental Study on the Adoption of Mobile Phones Applications in Agricultural Activities among Young Farmers

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Keywords	Abstract
Mobile Applications, Agriculture, Young Farmers	*The world is increasingly connected through advanced technology, with mobile phones becoming smaller, faster, cheaper, and more efficient. The primary objective of this research was to investigate the usage of mobile applications among young farmers. Researchers introduced agricultural applications to farmers and examined their adoption over time. The research methodology employed a quantitative approach, specifically a survey, to gather the necessary information and achieve the study's objectives. Data collection relied on structured questionnaires to generate numerical data, and statistical analysis was conducted to analyze the findings. The target population for this study consisted of young farmers in the District of Faisalabad, a region known for its significant agricultural activities. A simple random sampling technique was used to select three villages from the surrounding areas, and within these villages, respondents who owned smartphones were chosen using a convenient sampling method, as determined through screener questions. The results showed that all the selected farmers were highly interested in the research. Most farmers agreed that they benefited greatly from using these apps. Moreover, they expressed a willingness to continue using such technologies in the future to enhance their profitability.*

1. INTRODUCTION

The adoption of mobile communication technology has become prevalent worldwide, allowing people to exchange voice, data, and services seamlessly. In the agricultural sector, a significant number of farmers use cell phones and tablets for various purposes, as indicated by Farm Journal Media research. In Pakistan, several communication networks have been established to provide farmers with information and support to improve their farming practices. For instance, in Sialkot, Punjab, data and communication services provide farmers with information about weather forecasts, pesticides, and market prices. Cell phones have empowered farmers to communicate directly with buyers and traders, enabling them to sell their produce at higher prices and avoid wastage. Moreover, cell phones have also provided farmers with alternative options to decide whether to sell their products at higher prices or settle for reasonable prices in the market (Chhachhar et al., 2014).

Numerous researchers have focused on agriculture, and students of agricultural sciences have conducted extensive research and studies about this field. Technology is now used in every sector of

the world, and it has benefited all aspects of life. Enhancing the efficiency of the agricultural supply chain is crucial for increasing productivity and reducing poverty. Creating a more sustainable value chain involves making valuable contributions to the functional segments of the chain and effectively managing information related to these units. One of the ways to improve efficiency in the agricultural supply chain is through the use of mobile phone technology. Various mobile applications are available for agricultural purposes, but are farmers truly benefiting from them? This review aims to determine the practicality of mobile agricultural applications and how they cater to the specific needs of farmers.

1.1. Research Objective

1. To discover the hazards or hesitation in using mobile applications in agricultural practices.
2. To find out the installation of agricultural applications in the mobile phones of selected farmers and get their feedback after a due time.
3. To find the financial benefits or losses by introducing the apps in agricultural practices.
4. To identify the reasons for not using the applications, reluctant farmers

1.2. Hypothesis

H1: There is a relationship between the using of mobile applications in agriculture and the likelihood exposure to potential hazards or hesitation.

H2: Farmers who install and use agricultural applications on their mobile phones will get feedback after a due time.

H3: The introduction and use of agricultural applications among farmers will result in measurable financial benefits for their agricultural practices.

H4: Reluctant farmers who do not use agricultural mobile applications have identifiable reasons that hinder their adoption of these apps.

2. REVIEW OF LITERATURE

Communication technology could be a powerful driver for economic development in agricultural nations. Nevertheless, crops in these nations have lagged far behind those in the developed nations for quite a long time. Public sector programs have attempted to overcome information-related barriers to technological adoption by providing agricultural extension services (Aker, 2011). Mittal and Tripathi (2009) investigated the improvement in agricultural production using cell phones and study revealed numerous instances of the benefits provided by the attributes of portability, modified content delivery, and convenience of mobile phones. Another study Mittal et al. (2010) examined the influence of cell phones on agricultural practices, both economically and socially. As a telephonic gadget, the mobile phone enables access to previously unreachable information sources and it play positive role in both economically and socially. Similarly Nyamba and Mlozi (2012) investigated factors that affect how cell phones are used to share information about farming in the Kilolo Region, Iringa, Tanzania. The study found that inadequate data availability in farming activities led to economic constraints for farmers as market participants. Mtega and Msungu (2013) looked into how data and communication technologies could make agricultural information more accessible and improve farming production in Tanzania. Results showed that radio, cell phones, TV, computers, and the internet can transform a region if utilized effectively.

Landholders in underdeveloped countries need to use cell phones to improve their businesses and engage in agriculture. With this critical new approach, they can directly communicate with market workers and offer their products at reasonable prices. Their cell phones also provide weather information so they can use pesticides and compost on their farms, depending on external factors (Razaque & Hassan, 2013). This information is provided by the meteorological department. This device offers new guidance and a direct approach for landholders to share recent advancements.

A study was conducted in Punjab to explore potential technologies associated with using the internet and mobile phones among farmers to deliver agriculture-related information to them. Findings indicated that agricultural information, like mobile systems, should rely on mass communication technology (Jain et al., 2014). Jaji et al. (2017) studied cell phones as an extension tool among female rural professionals in Lagos State, Nigeria. Results showed that female farming professionals in Lagos State cut across various age groups, with patterns of farming activities changing as young people and those of younger age now actively participate. Kaske et al. (2017) examined cell phone usage for accessing agricultural information in southern Ethiopia. The results revealed that the majority (90.6%) of family heads made phone calls for agricultural purposes. More than three-quarters (85.9%) of family heads received calls related to farming. Short message service (SMS) was poorly utilized. It is inferred that cell phones play a significant role as an educational medium. Otene et al. (2017) evaluated cell phone use among farmers in Nasarawa State, Nigeria's local government area. The study revealed that the majority of the respondents (60.1%) had a medium level of cell phone usage. In Nigeria's agricultural settlement Ogbeide and Eli (2017) examined mobile phone usage. This study used 328 smallholder farmer respondents to investigate the objectives of how farmers use cell phone technology. The results demonstrate that cell phone usage for farm and other social purposes has increased among farmers. Folitse et al. (2018) determined the determinants of cell phone utilization among small-scale poultry farmers in Ghana. The study showed high usage of cell phones among poultry farmers.

Khou and Suresh (2018), highlighted that traditionally, agricultural information exchange has been dominated by conventional media like newspapers, TV, and magazines. The study was aims to understand how farmers use information in social media to create and market their products. He further suggested that digital marketing for agriculture is crucial for agricultural countries like India. Toseef and Khan (2018) explored using an intelligent and mobile application for diagnosing crop diseases in Pakistan, using a fuzzy inference system. An intelligent approach for predicting crop diseases is proposed, capable of operating over Android smartphones, using a fuzzy reasoning system as the main decision engine at the backend.

2.1. Theoretical Frame Work

The diffusion of innovation theory posits that the adoption of a new idea, behavior, or product ("innovation") within a social system is not uniform but rather a process where some individuals are more receptive to embracing the innovation than others. Researchers have found that early adopters of an innovation exhibit different characteristics compared to those who adopt it later. When introducing a new idea to a specific group, it is essential to understand what aspects of that group have influenced the spread of the idea, either positively or negatively.

The diffusion of innovation theory serves as a conceptual framework to understand the adoption of mobile phone applications in agricultural practices among young farmers. According to this

theoretical framework, assimilating new concepts, behaviors, or products within a social context is not a homogeneous process; instead, it involves variations among individuals in their willingness to accept innovation.

In the context of this study, the theoretical perspective helps to elucidate the factors that contribute to varying levels of receptiveness among young farmers towards the use of mobile applications in agriculture. The theory proposes that individuals who are quick to adopt innovations possess specific attributes that increase their likelihood of embracing novel technologies. By identifying these characteristics, researchers can gain valuable insights into the factors that either promote or hinder the adoption and dissemination of mobile applications among young farmers.

The diffusion of innovation theory emphasizes the significance of understanding the specific group or target audience when introducing a new concept. In this case, it is crucial to recognize the characteristics and qualities of young farmers that influence their inclination or reluctance towards adopting mobile applications in agriculture. This knowledge can inform the development of strategies to effectively promote and facilitate the adoption of these applications.

This study aims to use the diffusion of innovation theory to identify early adopters within the demographic of young farmers. Additionally, the study seeks to gain insight into the characteristics of these early adopters and explore the various factors that impact their adoption of mobile applications. By integrating this theoretical framework, the study establishes a strong foundation for examining the factors that facilitate or hinder the adoption of these applications, thus informing initiatives to promote and optimize their use among young farmers. Overall, the diffusion of innovation theory enhances our understanding of the factors influencing young farmers' adoption or rejection of mobile applications in agriculture, providing valuable insights to improve their implementation and integration in the agricultural sector.

3. RESEARCH METHOD

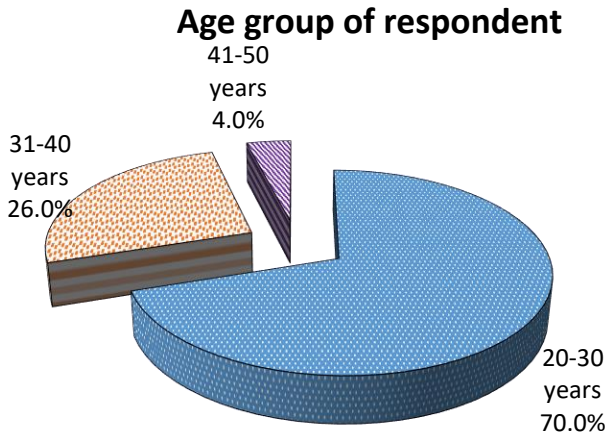
This study employed a quantitative approach, specifically a survey. Data collection relied on well-structured questionnaires to generate numerical data, and statistical analysis was conducted to analyze the findings. The target population for this study consisted of young farmers in the District of Faisalabad, a region known for its significant agricultural activities. A simple random sampling technique was used to select three villages from the surrounding areas, and within these villages, respondents who owned smartphones were chosen using a convenient sampling method, as determined through screener questions. The questionnaire included closed-ended questions was administered in two stages. Initially, the questionnaire assessed the participants' existing knowledge and status regarding information technology before introducing mobile applications. Subsequently, after the participants had utilized the selected applications for a considerable period, their opinions and feedback were obtained. The collected data was then analyzed using descriptive statistics and correlation analysis. By adopting a quantitative survey approach, this research provided a structured and systematic means of gathering data from a representative sample. It enabled the generation of statistical evidence to support the study's objectives and facilitated a comprehensive analysis of the adoption of mobile phone applications among young farmers in agricultural activities.

4. RESULTS

The collected data was analyzed and divided into two parts, descriptive statistics and correlation analysis. The descriptive data is presented in graphs while correlation analysis in tables along with interpretation.

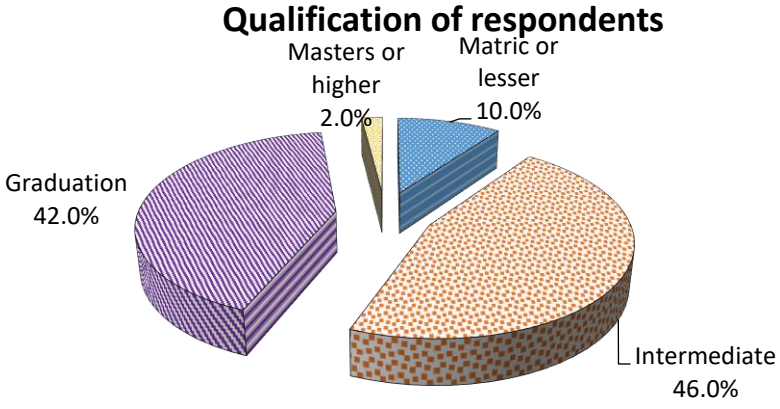
4.1. Descriptive statistics

Graph 1: Distribution of respondents concerning Age.



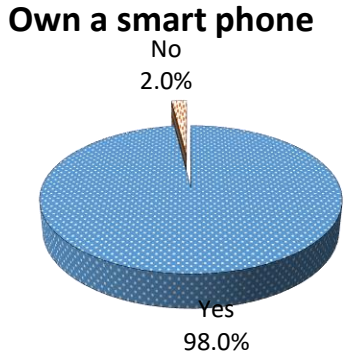
Graph No. 1 shows that 70% of farmers aged 20-30 years were involved in using agricultural mobile applications in agriculture. Whereas 26% and 4% of 31-40 years and 41-50 years, respectively, were found in the usage of mobile applications in n Agric field.

Graph 2: Distribution of respondents concerning Qualification



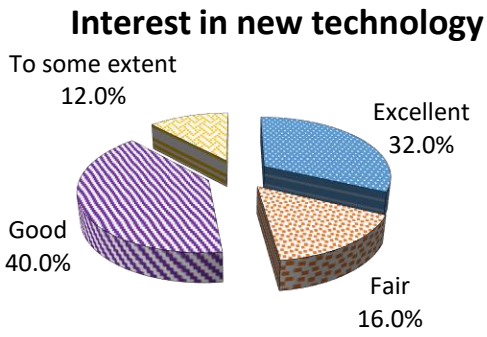
Graph No. 2 described that 46% and 42% of intermediated and graduated farmers, respectively, were interested in using mobile agriculture applications. The remaining 10% and 2% of matric and Masters showed less interest in mobile phone usage in agriculture.

Graph 3: Distribution of respondents with respect to Own a smart phone.



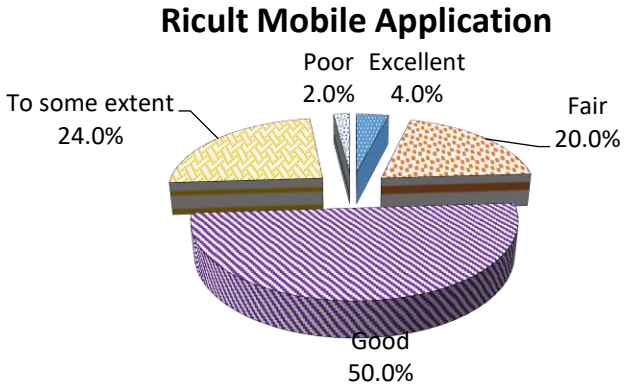
Graph No. 3 shows that 98% of respondents were owners of mobile phones. At the same time, only 2% of them were not mobile phone consumers.

Graph 4: Distribution of respondents with respect to Interest in new technology.



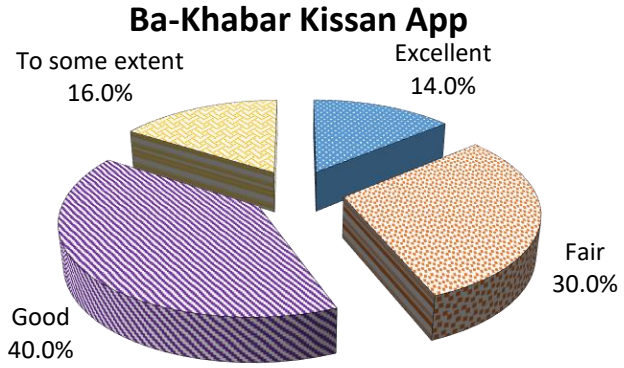
Graph No. 4 reveals that only 32% of responding farmers showed excellent interest towards technology usage. Whereas 40%, 16% and 12% of them had good, fair and up to some extent interest in technology usage, respectively.

Graph 5: Distribution of respondents with respect to Ricult Mobile App.



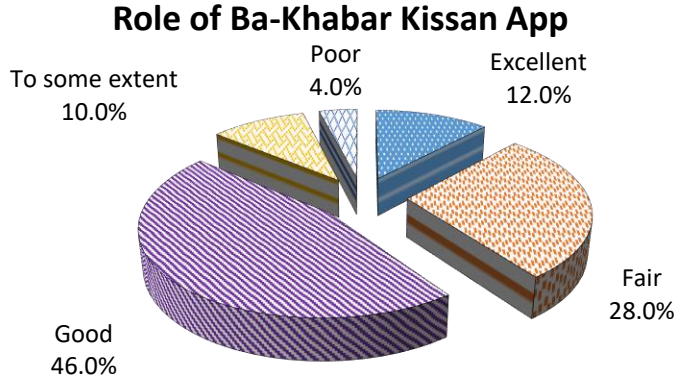
Graph No. 5 indicate that only 4% of the respondents found the Ricult Agriculture application an excellent mobile application. In comparison, 50% and 20% found it good and fair, respectively, in agriculture.

Graph 6: Distribution of respondents with respect to Ba-Khabar Kissan App.



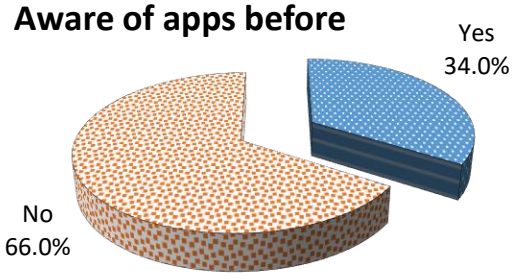
Graph No. 6 shows that 14% of the farmers used the Ba-Khabar Kissan app excellently in agriculture activities. In comparison, 40% and 30% of them found it reasonable and fair.

Graph 7: Distribution of respondents with respect to Role of Ba-Khabar Kissan App.



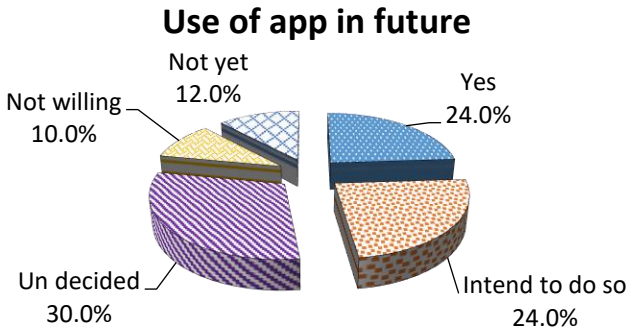
Graph No. 7 reveals that 12% of the farmers found the excellent role of the Ba-Khabar Kissan App in agriculture activities. In comparison, 46% and 28% found this app reasonable and fair.

Graph 8: Distribution of respondents with respect to Aware of apps before.



Graph No. 8 indicate that 34% of the respondents were aware of the apps before. The remaining 66% needed to be made aware of the used apps.

Graph 9: Distribution of respondents with respect to Use of app in future.



Graph No. 9 shows that 24% of the respondents decided to use these apps in future, whereas 30% of them were undecided, and 12% of them never used these apps.

4.2. Correlation Analysis

Table 1: Correlation between age and interest in new technology

		Q1.1 Age	Q2.1 Interest in new technology
Q1.1 Age	Pearson Correlation	1	0.400**
	Sig. (2-tailed)		0.004
	N	50	50
Q2.1 Interest in new technology	Pearson Correlation	0.400**	1
	Sig. (2-tailed)	0.004	
	N	50	50

The value of the relationship between age and interest in new technology usage is 0.400, which determines their moderate positive relationship. It demonstrates that one variable affects the other moderately.

Table 2: Correlation between Ricult mobile application and role of Ba-Khabar Kissan application.

		Ricult Mobile App	Role of Ba-Khabar Kissan App
Ricult Mobile App	Pearson Correlation	1	0.510**
	Sig. (2-tailed)		0.000
	N	50	50
Role of Ba-Khabar Kissan App	Pearson Correlation	0.510**	1
	Sig. (2-tailed)	0.000	
	N	50	50

** = Highly significant (P<0.01)

The maximum value of the relationship between the Ricult Mobile app and the role of the Ba-Khabar Kissan app is 0, which determines the moderate relationship between them. It demonstrates that one variable affects the other moderately.

Table 3: Correlation between Ricult mobile application and tried new crop.

		Ricult Mobile App	Tried new Crop
Ricult Mobile App	Pearson Correlation	1	0.618**
	Sig. (2-tailed)		0.000
	N	50	50
Tried new Crop	Pearson Correlation	0.618**	1
	Sig. (2-tailed)	0.000	
	N	50	50

The maximum value of the relationship between Ricult Mobile app usage and its utilization on new crops is 0.618, which determines their noticeable positive relationship. It demonstrates that one variable affects the other moderately.

Table 4: Correlation between Ricult mobile application and discussed issues with experts.

		Ricult Mobile App	Discussed Issues with Experts
Ricult Mobile App	Pearson Correlation	1	0.561**
	Sig. (2-tailed)		0.000
	N	50	50
Discussed Issues with Experts	Pearson Correlation	0.561**	1
	Sig. (2-tailed)	0.000	
	N	50	50

** = Highly significant (P<0.01)

The value of the relationship between the role of the Ricult mobile app and its usage the in the discussion of issues with experts is 0.56, which determines the moderate positive relationship between them. It demonstrates that one variable affects the other moderately.

Table 5: Correlation between phone application benefits in crops and tried new crops.

		Phone App Benefits in Crops	Tried new Crop
Phone App Benefits in Crops	Pearson Correlation	1	0.648**
	Sig. (2-tailed)		0.000
	N	50	50
Tried new Crop	Pearson Correlation	0.648**	1
	Sig. (2-tailed)	0.000	
	N	50	50

** = Highly significant (P<0.01)

The value of the relationship between phone apps' benefits in crops and their usage in new crops is 0.64, which determines the moderate positive relationship between them. It demonstrates that one variable affects the other quite reasonably.

5. CONCLUSION

Overall, findings of the study revealed numerous advantages for small-scale farmers resulting from the use of mobile phones and the unique features offered by agricultural applications, such as convenience, customized content delivery, and ease of use. As mobile application providers continue to expand their services in rural communities where agriculture is prevalent, there is a noticeable increase in smartphone adoption and usage to cover various aspects of farming activities. The results revealed that 100% of the selected farmers displayed greater interest in the study. Younger farmers demonstrated more significant interest in the use of mobile applications. Farmers who recently completed intermediate and graduate studies showed more responsiveness to mobile applications. Only 4% of them owned more than 24 acres of land. Among the young farmers, 98% had smartphones during field visits, but only 32% showed interest in new technology. Only 2% of young farmers regularly utilized smartphones in agriculture. Only 12% of the respondents found phone applications more valuable in crops. Similarly, only 4% of the respondents considered the Ricult agriculture application an excellent mobile app, while 20% and 40% of respondents found the Ricult app highly useful and helpful in agriculture, respectively.

Regarding satellite image utilization, 18% of the farmers found it extremely valuable in farming. Additionally, 20% of the app users found them beneficial in determining the rates of various products. Only 10% of the farmers found the applications helpful for communication with experts. A mere 4% of the participants found the application to be extremely helpful in improving their financial yield status. As for the Ba-Khabar Kissan application, 14% of the farmers used it excellently in agricultural activities, and 12% found it to perform an outstanding role. Additionally, 16% of the respondents found the app to be incredibly supportive of animal welfare. The applications were found to be effective only 6% of the time in determining grain market rates for farmers and just 12% in providing information about plant diseases. However, 22% of the farmers expressed enthusiasm in trying the applications for new crops, and they were found to be effective up to 64% in determining nutrient deficiencies. Only 34% of the respondents were aware of the applications beforehand, and 24% of them expressed their intent to use these applications in the future.

The correlation between age and interest in technology usage was 0.400, indicating a mild, positive relationship. This means that one variable mildly influences the other. The highest correlation value between the Ricult Mobile application and the Ba-Khabar Kissan application was 0.510, determining a slight relationship between them, with one variable slightly impacting the other. The maximum correlation value between Ricult Mobile app usage and its application in new crops was 0.618, indicating a slight positive relationship. The correlation value between the role of the Ricult mobile app and its usage in discussing issues with experts was 0.56, determining a slight positive relationship. Lastly, the correlation value between the benefits of phone apps in crops and their usage in new crops was 0.64, indicating a slight positive relationship between them. Mobile technology has become the most common method of communication worldwide, with 59% of landholders using cell phones and 44% using tablets, as indicated by Ranch Diary Media research.

5.1. Policy Implications

The implication of this research lies in its potential to contribute valuable insights and knowledge to the existing body of literature in the field. This study holds particular importance as

it focuses on the use of mobile phone applications by young farmers in agricultural practices.

This research presents a significant opportunity to revolutionize the field of agriculture through an examination of mobile application usage. Mobile phones offer a robust tool for young farmers to conveniently access up-to-date information, expert guidance, and market updates. The utilization of mobile applications has the potential to address knowledge disparities, empower agricultural practitioners, and enhance their ability to make informed decisions. The outcomes of this research provide valuable guidance for policymakers, extension services, and technology developers in formulating customized strategies to address the needs of young farmers. The initiative advocates for the implementation of sustainable practices, resource optimization, and rural development. Furthermore, it acts as a magnet for attracting and retaining young individuals passionate about farming, rejuvenating the agricultural workforce and local communities.

This study also establishes a foundation for a future era in which the integration of mobile technology in agriculture leads to a paradigm shift in farming methodologies, resulting in enhanced efficiency, productivity, and the establishment of a robust and environmentally sustainable food production system. It can further investigate the impact of mobile applications on sustainable agricultural practices, as well as explore user experience, data security, and integration with emerging technologies.

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