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THE WAY OF THE FUTURE IN AGRICULTURE: SMART FARMING DRIVEN BY MOBILE APPLICATIONS

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ABSTRACT

Agriculture is the world's oldest occupation; Agriculture is also India's major occupation with farmers being the backbone of the country. Due to the beginning of the digital revolution on 1st July 2015 by Prime Minister Narendra Modi, today the smartphone usage has risen to 67.7% in the rural markets. Farmers are constantly embracing the availability of smartphones and the internet. The future of farming around the world as well as in India depends on mobile applications, websites and data.

Services like Agrometeorological advisory services (AAS) by India Meteorological department (IMD) on the official website of IMD or mobile application of IMD called "Mausam" accessed through smartphones have significantly helped farmers. Services on smartphones like Agrometeorological advisory services (AAS) help farmers to keep themselves informed about the weather and make decisions about their agricultural practices based on weather forecasts.

As per study on farmers in Anand District of the state of Gujarat in India, around 80.91% of farmers who adopted services like Agrometeorological advisory services (AAS) reported benefits in terms of crop growth. Farmers also heavily rely on GPS, through GPS farmers can farm precisely on their fields, improve their farm planning, field mapping and operate heavy farm machinery like tractors on their field during foggy weather conditions. Due to growth in the digital era amongst farmers, the Government of India has launched mobile applications like "Kisan Rath", such applications help farmers to identify transport facilities for agricultural produce. Such mobile applications help farmers to transport their farm products from the direct gates of their farms to market, as well as these applications help better pricing of perishable products.

Several other mobile applications like Plantix have been revolutionizing agriculture with the help of Artificial Intelligence (AI), applications like Plantix help farmers to easily identify the problems or diseases their crops are facing with proper solutions. This saves the time of the farmers and minimizes the harm to their crops by providing the information and solutions about the problem on time. Such applications are proving to be revolutionary in the agricultural industry. Plantix has more than 10 million downloads.

Gottfried Pessl, CEO of Pessl Instruments, believes that mobile applications and artificial intelligence will be the future of farming in India. These digital tools will improve farming data, yield management, and decision-making, promoting sustainable practices and healthier crops. They will play a significant role globally

Keywords: Agriculture, Farmers, Digital Revolution, Mobile Applications, and Artificial Intelligence

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1. INTRODUCTION

Agriculture began to develop around 21,000 which is evidence of the earliest small-scale cultivation of edible grasses by the Ohalo people on the shores of the sea of Galilee. In India, agriculture first started in 9000 BC. The earliest evidence

of wheat dates back to 9,500 BC in the middle east, rice and millet farming originated from China around 13,500 years ago.

Agriculture has been the primary occupation of Humans for thousands of years. With agriculture, Humans were able to cultivate crops, because of which small villages, towns and cities started to emerge. Agriculture has helped Humanity to survive and thrive for thousands of years.

There is no doubt that Agriculture, which has been the oldest profession in the history of mankind, is of paramount importance to the economy of India where the farmers are the backbone of it. Starting from July 1, 2015, to the winds of digitalization, the share of smartphone users in rural India has now increased to 67.7 percent as a result of which farmers can get important information through mobile applications. The Agrometeorological Advisory Services (AAS) of the Indian Meteorological Department (IMD) is among the services that have greatly assisted farmers, with more than 80.91 percent of the respondents in studies conducted in the state of Gujarat saying that the use of AAS has help them in the improved growth of crops.

Farming GPS technology is also employed by farmers for the precision farming and the transportation of services via the app 'Kisan Rath.' Moreover, AI powered apps like Plantix use algorithms within the app to inform users where the crops are affected by disease thus improving agricultural efficiency. The ongoing innovations are changing farming in India and improving the activities of the farmers.

In this modern era, due to the digital revolution, everything is becoming technologically advanced and digitized along with agriculture. Mobile applications and Artificial intelligence help farmers and educate farmers about the agricultural process which will make their crops healthier and stronger. Not only in India, but soon mobile applications and artificial intelligence will play a major role in agriculture all around the world.

2. OBJECTIVE OF THE STUDY

Objective of this study is to find out and understand how the usage of mobile applications affects the farmers in their agriculture process. The main objective of this study is to highlight and understand the growing trend of smart farming and to prove that mobile applications based smart farming is the future of farming in India as well as around the world. It is also to understand how these mobile applications help farmers in management of their farm and sales of their products. It is essential to understand the future of the farming and ways it's going to function through mobile applications, this study mostly highlights the role of mobile applications in Helping farms in understanding weather conditions which will help their farming process, marketing of their farm products through mobile applications of social media media (Instagram, Facebook) and government launched mobile applications, role of mobile applications in management of farms and cattle's. The findings of this study are expected to contribute to the existing literature on the role of mobile applications in farming. By mentioning their marketing, farm management, etc, capabilities.

The purpose of this research is to investigate and get an understanding of the ways in which the utilization of mobile applications impacts the agricultural process from the perspective of farmers. The primary objective of this study is to bring attention to and get an understanding of the developing trend of smart farming, as well as to demonstrate that smart farming that is based on mobile applications is the future of farming not only in India but also somewhere else in the world. The second objective is to gain an understanding of the ways in which these mobile applications assist farmers in the administration of their farms and the sales of their products.

This study focuses primarily on the role that mobile applications play in helping farms understand weather conditions, which will help their farming process, marketing their farm products through mobile applications of social media media (Instagram, Facebook), and government launched mobile applications, and the role that mobile applications play in the management of farms and cattle's. It is essential to have a comprehensive understanding of the future of farming and the ways in which it will function through mobile applications. It is anticipated that the outcomes of this study will make a contribution to the existing body of literature concerning the function of mobile applications in agricultural settings. Through the mention of their competencies in areas such as marketing, farm management, etc.

3. REVIEW OF LITERATURE

As our technology progresses, it's evident that Mobile application based smart farming is the future of farming in India and all around the world. As per EOS Data analytics, mobile applications in smart farming can suggest profitable

plant-based crop rotation historical data, which is gathered from satellite images and recommendations for growing particular types of crops. Mobile application based smart farming will significantly improve agricultural analytics. With the help of mobile applications, farmers can improve their techniques and agricultural processes every different season, thus increasing their profitability and decreasing their labor costs.

EOS Data analytics also suggests that EOSDA Crop monitoring mobile applications will help farmers to monitor crop performance, generate reports of scouting, and can mark problems of area in one single place. It also helps farms to monitor weather conditions. One of the major advantages of this application is that its function is available in both online and offline modes, thus, making it easier for farmers with poor internet connectivity to use such applications efficiently. Due to this, farmers will have all required information easily available to them with or without proper internet connection.

According to a blog by appinventiv, mobile applications can be very helpful in crop management by educating farms about the soil quality, weather patterns and even pest controls. Along with it, farmers can also manage their livestock by educating themselves on their feeding schedule, heath and breeding tips. One of the most important things a mobile application can help farmers in doing is marketing which can improve their profitability.

Mobile applications can provide farmers information about up-to-date commodity prices and market information. Which can easily help farmers to sell their crops at better prices, thus increasing their profit margin.

Google play store has even launched several mobile applications that are relevant for paddy farming like MARDI MyPerosakPadi, Rice Check and Agrimaths. With the use of these applications, farmers are provided with tools that would assist in the detection of the first signs of the symptoms of diseases and pests and the measures they can take early enough. Applications, rather than the websites, are more preferred by the users of the applications since applications are accessible without the internet and users spend 86% higher time on applications than on websites. Users preferred applications for usage as the applications are easier to install in mobile phones than uninstall when they are not appropriate.

Applications like KishanVishwa are designed for both precision agriculture and traditional farming, integrating with Krishi Vignyan Kendra (KVK) to provide universal access to vital information. It offers real-time control and data visualization for precision agriculture users, while its user-friendly Marathi interface promotes inclusivity. Future enhancements may include an AI chatbot for technical support and a feedback option for user input. Overall, the app empowers farmers with essential tools, fostering informed decision-making and driving agricultural progress

As per Gottfried Pessl, CEO & Founder, Pessl Instruments, "Smart farming isn't a trend. It's a scientifically proven sustainable practice." Gottfried Pessl states that mobile applications, Artificial intelligence and other digital tools will be the future of farming, they will be the foundation to sustainable farming by improvising farming data, yield management and decision making.

Organizations like Ericsson’s perspective towards the future of smart farming have supported expansion of 5G networks which will help mobile applications in agriculture, with real time mobile based agriculture data like increased yield activities and agricultural management. In the United States, Ericsson has already started providing 4G and 5G as part of ARA (Agriculture and Rural communities) living lab in Iowa. This research initiative focuses on giving access to mobile applications to farmers which will help them in their agriculture and convergence of wireless 5G technologies along with other things. Today, Ericsson's and its partners have already connected six rural communities practicing agriculture based on a 1550 square kilometer 5G coverage area.

During this digital age, when rural agricultural areas get more investment, the mobile applications based on smart agricultural practices can prove to be revolutionary. As per the review of literature, it's been clear that mobile based smart farming is possible only if there is proper support and investment by the others.

4. RESEARCH GAP/LIMITATIONS

Lack of Internet: There are still remote parts of India where farms can't access internet connection. If they do have an internet connection, it's extremely weak. Lack of Internet access can also occur due to geographical reasons. In India, there are many remote mountainous regions, where it's close to impossible to set up a network tower due to harsh terrains.

Lack of affordable devices: Over 80% of farmers in India live below poverty line India, many farmers who are not in poverty line still cannot afford expensive smartphones in India. About only 30 million out of 120 million farmers currently have smartphones. Even though, smartphones are getting extremely popular in India due to the rapid digitalization, many farmers in India still cannot afford to purchase a smartphone

Lack of knowledge on smartphones: Many farmers in India don't know how to use a smartphone, they don't have any knowledge about smartphones. Due to this many farmers in India hesitate to buy smartphones.

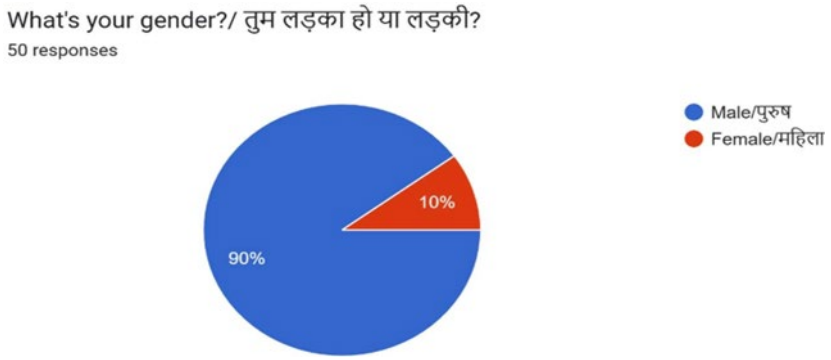
Lack of education of the mobile applications: Many farmers in India are not aware of the mobile applications which can greatly help them in their agriculture process. Many farmers in India should be educated about the usage of both mobile phones and the mobile applications which will greatly help them in their agriculture process. By educating farmers about certain mobile applications, it can also increase their farm products sales, which can be extremely profitable to them.

5. RESEARCH METHODOLOGY

Descriptive survey is used to learn the data and sampling method is used to collect the data of over 50 farmers. Overall, the Quantitative method is used to analyse and collect the data.

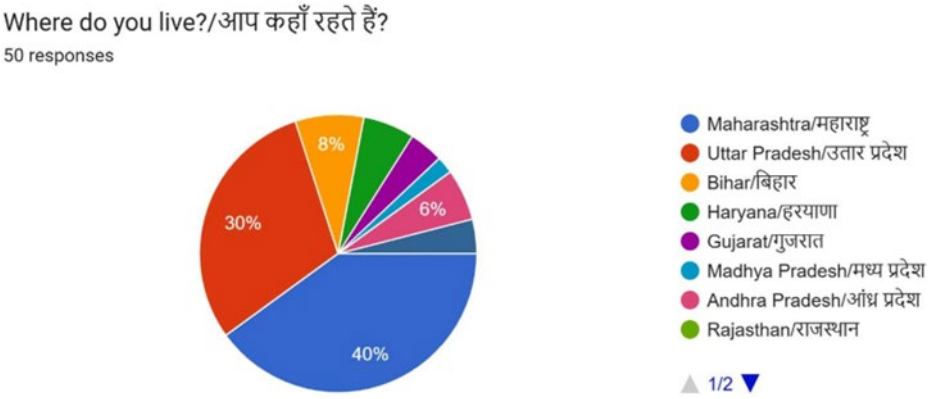
6. DATA ANALYSIS/ INTERPRETATION

Chart 1



Interpretation: Over all the survey received 50 responses, in which 90% of the responses were from males and another 10% were from females. Thus, highlighting that farming is male dominated field.

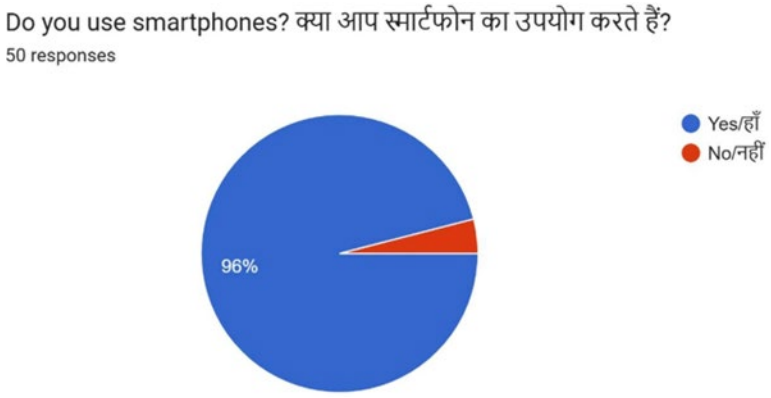
Chart 2



Interpretation: Survey respondents were selected from 10 states of India—Maharashtra, Uttar Pradesh, Bihar, Haryana, Gujarat, Madhya Pradesh, Andhra Pradesh, Rajasthan, West Bengal and Punjab. In which 40% of the responses were from Maharashtra—making it a majority, 30% of the responses were from Uttar Pradesh—making it second major response, 8% of the responses were from Bihar—making it third major response, 6% of the responses were from Andhra

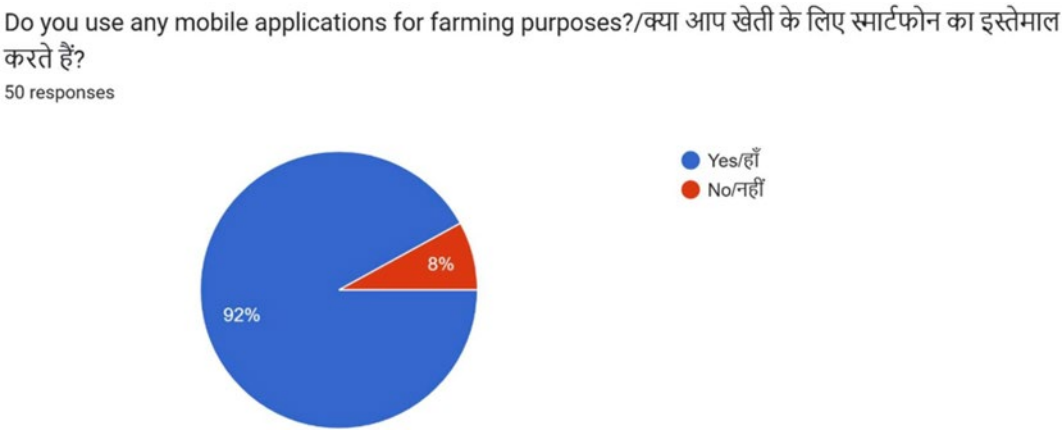
Pradesh, 6% of the responses were from Haryana, 4% of the responses were from Gujarat and Punjab, 2% of the responses were from Madhya Pradesh, 0% from West Bengal respectively. It is important to note that these 10 states are considered as major farming states of India.

Chart 3



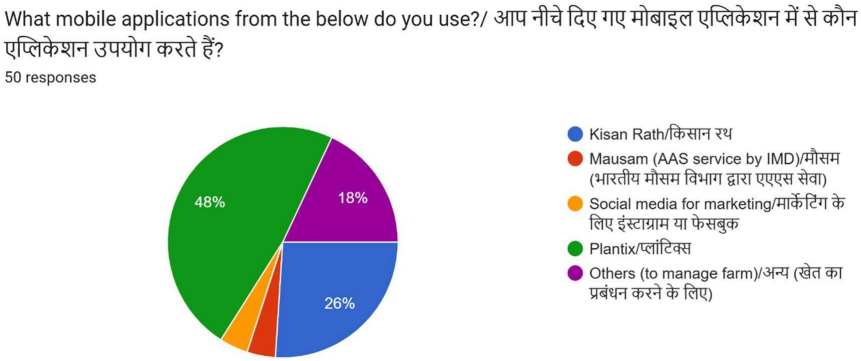
Interpretation: When asked about whether farmers use smartphones or not, 96% of them replied with yes and just 4% with no. This stunning response by farmers proves that the majority of the farmers are slowly becoming technologically aware.

Chart 4



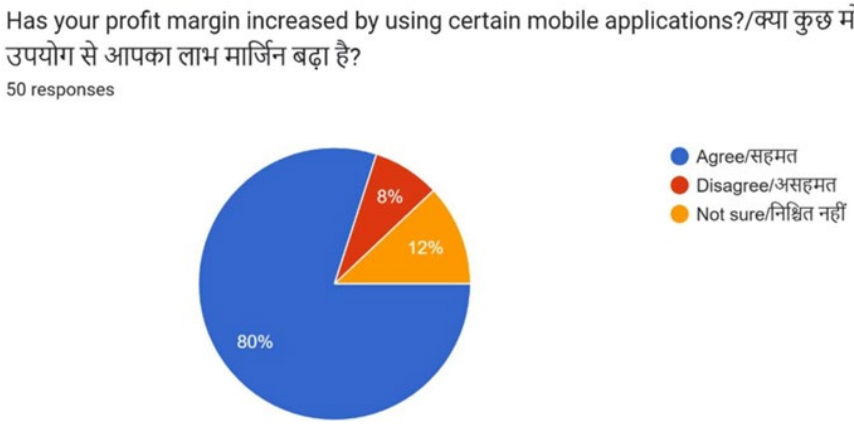
Interpretation: when asked about if farmers use any mobile applications for farming purposes, stunning 92% of them responded with yes and just 8% of them responded with no. This again makes it evident that farmers are slowly learning new and more digital ways in their farming process.

Chart 5



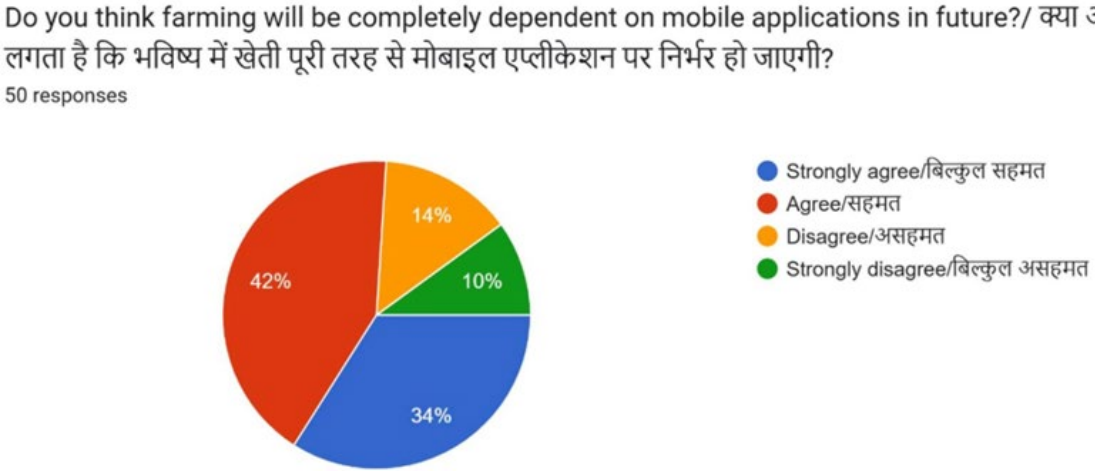
Interpretation: Farmers were given the choice of four applications with one other option. Those four applications are Kisan Rath—mobile application launched by the Government of India to help farmers to identify transport facilities for agricultural produce, Mausam— application by Indian Meteorological department (IMD) where farmers can use it to inform themselves about weather conditions suitable for farming, Social media (Instagram, Facebook) for marketing purposes, Plantix—application which helps farmers to easily identify the problems being faced by their crops with the help of Artificial intelligence (AI). Around 48% of farmers responded that they used Plantix, 26% of farmers responded that they used Kisan Rath, 18% responded that they use other mobile applications to manage their farms, while only 4% of farmers responded that they use social media and Mausam applications. With this data, it highlights that majority of farmers are using Plantix to identify the problems being faced by their crops and Kisan Rath, which help farmers to identify transport facilities for agricultural produce. Such mobile applications help farmers to transport their farm products from the direct gates of their farms to market, as well as these applications help better pricing of perishable products.

Chart 6



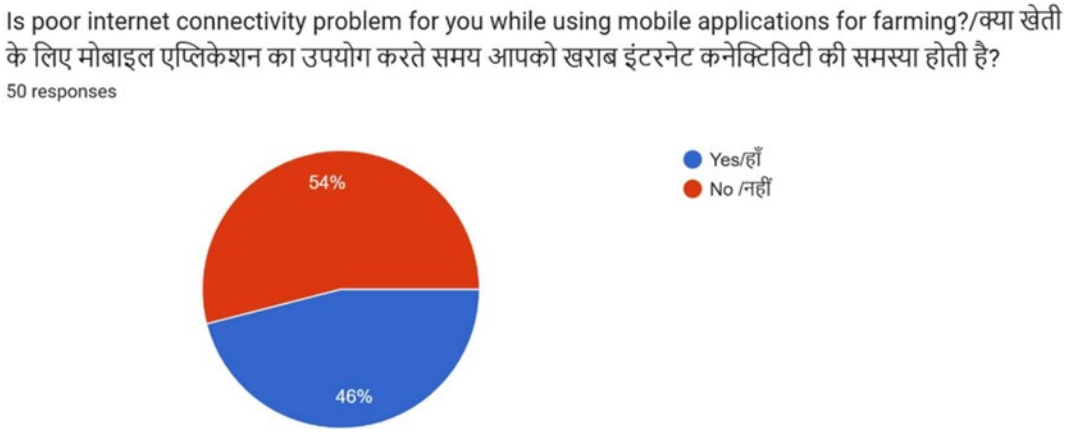
Interpretation: when asked about their profit margins, astounding 80% of farmers agreed that their profit margin has been increased by using mobile applications to help them farm easily, while only 8% disagreed and 12% were unsure. This response by farmers highlights that development in farming technology is heavily beneficial for farmers.

Chart 7



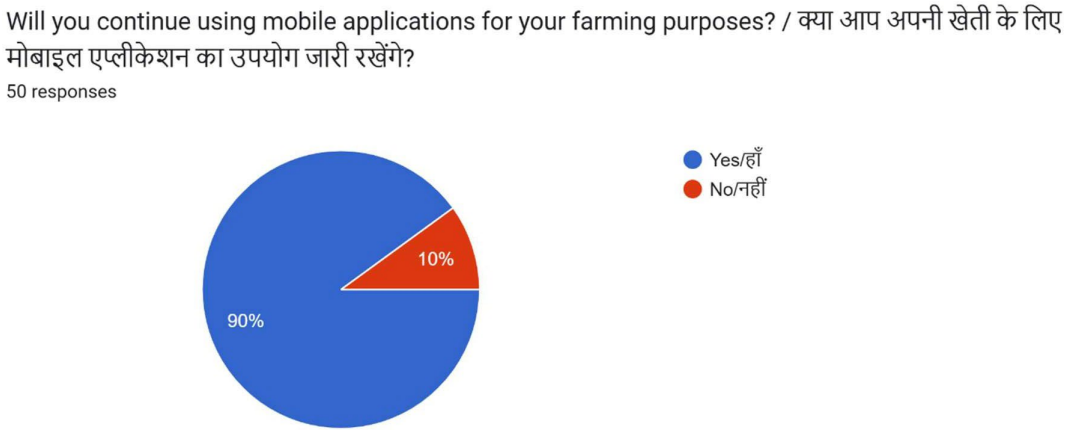
Interpretation: around 76% (both agree and strongly agree data are merged) of farmers think that in future farming will be completely dependent on mobile applications, while 24% of the farmers disagreed

Chart 8



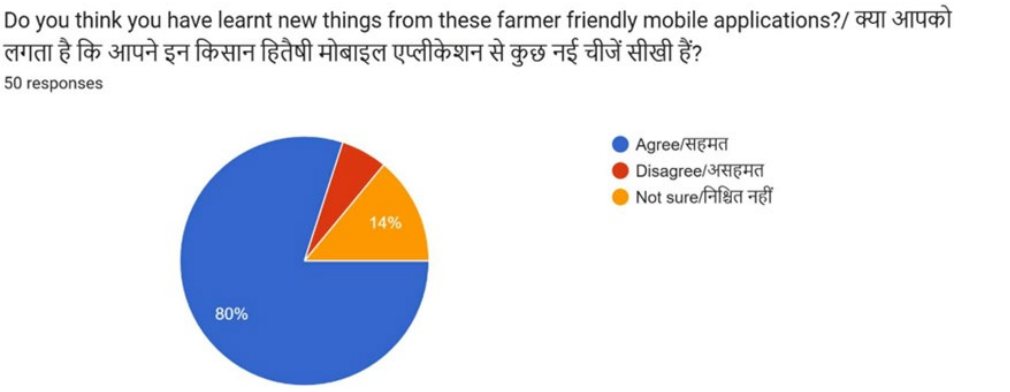
Interpretation: Around 54% of farmers said that poor internet connectivity is not a problem for them, whereas around 46% of farmers said that poor internet connectivity is indeed a problem for them. Even though, majority of them said poor internet connectivity was not a problem for them, it is important to note that 46% is still a huge percentage. It highlights that even today, many farmers in rural areas of India are facing poor internet connectivity.

Chart 9



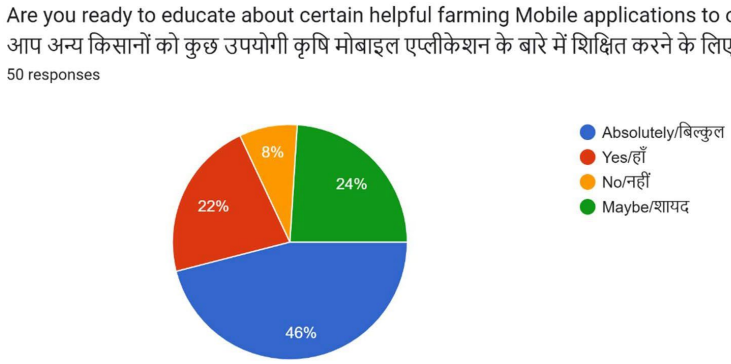
Interpretation: 90% of farmers responded that they will continue using mobile applications for their farming purposes, while only 10% of them responded with no. This highlights the mobile applications for farming are proving to be extremely helpful.

Chart 10



Interpretation: 80% of farmers agreed that they have learnt new things from farmer friendly mobile applications, whereas only 3% of farmers disagreed and 14% were unsure. This indicates that along with being helpful, mobile applications for farmers are being educational too.

Chart 11



Interpretation: around 68% of farmers agreed that they are willing to educate other farmers about the mobile applications made for farmers, while only 8% denied and 24% were unsure.

7. CONCLUSION

According to the data and research that has been collected, it is evident that the majority of farmers in India are embracing simpler methods of farming with the use of mobile applications that have been designed to assist them in working with agriculture. Despite the fact that the majority of farmers in India have access to cellphones, even in the most remote rural areas of the country, it is evident from studies that the majority of farmers in India continue to struggle with inadequate internet connectivity.

As a result of this, numerous mobile applications, such as Plantix, have begun to function in both online and offline modes, which is ultimately providing the farmers with the relief that they so desperately require. With the help of mobile applications, farmers are now able to educate themselves on a variety of farming techniques, crop management, crop disease control, and innovative marketing tactics to promote their products. As a result of this, farmers are gaining a stronger sense of assurance in their methods, which may prompt them to educate other farmers about the utilization of mobile applications, which will bring them to more effective and less difficult farming methods.

In general, despite the fact that there are a few issues, such as inadequate internet connectivity, numerous mobile applications are beginning to upgrade to both online and offline modes, which is proving to be of great assistance to farmers. It is becoming increasingly apparent that mobile application-based smart farming may be the future of farming in India as well as the entire world, as an increasing number of farmers are adopting and appreciating this method of farming.

CONFLICT OF INTERESTS

None.

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