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Enhancing agricultural information dissemination: an empirical analysis of the influence of information and communication technology on agricultural producers in Ekiti State

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Abstract: Nigerian rural farmers have come to rely on indigenous or local knowledge for better agricultural methods throughout the years which include things like using treated seeds, preventing animal and plant diseases, applying fertiliser, using farm equipment, properly storing farm products, using marketing tactics, and engaging in cooperative and agricultural activities. This study aims to identify and assess the types of information and sources that are available to farmers in rural areas, as well as the challenges they face in gaining access to agricultural information. A self-made questionnaire was utilised to collect the data, and the information was then analysed. The results of the study are utilised to create and develop a better ICT solution or platform that would give farmers access to modern agricultural machinery, enhance crop quality and productivity, help them make market judgements, and reduce the presence of middlemen in agricultural trade practices.

Keywords: Chi-square; information and communications technology; agriculture; ICT in agriculture; data analysis; statistics.

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1 Introduction

Information and communication technology (ICT) has been a powerful tool in modernising agricultural practices in developing countries like Nigeria (Senapathy, 2021). ICT encompasses a broad spectrum of technologies and communication tools that facilitate the acquisition, storage, processing, and dissemination of information (Rohila et al., 2017). In the agricultural sector, ICT manifests through diverse channels such as mobile phones, internet platforms, agricultural applications, and other digital tools (Saidu et al., 2017). The integration of these technologies aims to revolutionise traditional farming practices by providing farmers with timely, accurate, and context-specific information (Efobi et al., 2023).

Plotkin (2020) noted that ICT is a basket of technologies that support the storage and dissemination of data and information, including television, radio, telephone, video, voice information systems, fax, and computers. The use of ICT by farmers is necessary for accessing required information and knowledge, and with ICTs, farmers can easily communicate and get information from their counterparts, researchers, and scientists all over the world (Otekunrin et al., 2023). Adewoye and Adebayo (2021) discussed the use of ICTs by rural farmers and mentioned that it can bring new information resources and new open communication channels, which can enhance their productivity and improve sustainable agricultural development. The agricultural sector in Nigeria faces many challenges in obtaining new information about market prices, new agriculture innovations, weather updates, and climate change issues. To ensure food security in Nigeria, farmers' production and productivity need to be increased. The growing global population is expected to rise to 9 billion by 2050, and to feed the expected population,

food production must be increased to 70% (Osabohien et al., 2020). Therefore, the agricultural sector cannot afford to continue with crude methods of farming. Subsistence farmers in Nigeria need information on how to enhance their productivities and be fully fortified with knowledge to overcome problems militating against increased production. The use of ICTs will go a long way in sustaining the development of agriculture (Jumbo et al., 2023). Agriculture remains a vital sector in Ekiti State, contributing significantly to the economy. With the advent of ICT, there has been a paradigm shift in how agricultural information is disseminated.

This study assesses the extent of the use of ICTs for sustainable agricultural development among rural farmers in Ekiti State, Nigeria. This study will provide insights into the current state of ICT use among rural farmers in Ekiti State, Nigeria. The findings will help policymakers and stakeholders to improve the availability and accessibility of ICTs to rural farmers, thus enhancing sustainable agricultural development. This study will also investigate the influence of ICT on the dissemination of agricultural information among agricultural producers in Ekiti by examining the socio-economic characteristics of the rural farmers, examining farmers' exposure to different information and communication technologies and lastly, this study will be able to determine the relationship between socio-economic characters of farmers and use of ICTS as a source of information

1.1 Research hypothesis

- 1 Null hypothesis (H_0): the usage of ICT tools for the dissemination of agricultural information by rural farmers is not influenced by their socio-economic characteristics.

Alternative hypothesis (H_1): the usage of ICT tools for the dissemination of agricultural information by rural farmers is influenced by their socio-economic characteristics.

- 2 Null hypothesis (H_0): farmers do not possess significant exposure to various information and communication technologies.

Alternative hypothesis (H_1): farmers have good exposure to different information and communication technologies.

2 Literature review

2.1 Adoption of ICT in agriculture

The adoption of ICT tools in developing states in Nigeria has witnessed a steady rise. Mobile phones, in particular, have become ubiquitous, serving as essential communication and information dissemination devices (Alabi et al., 2021). Farmers use these devices to access real-time information on weather conditions, crop management techniques, market prices, and government agricultural policies. Additionally, internet connectivity and the proliferation of agricultural apps contribute to a more informed and connected farming community (Suleiman et al., 2021).

Despite the positive strides, challenges associated with the adoption of ICT in agriculture persist. These include limited ICT infrastructure, especially in rural areas, poses a significant obstacle. Insufficient network coverage and unreliable internet connectivity hinder the seamless dissemination of information. Additionally, digital literacy levels vary among farmers, with some facing challenges in navigating and fully utilising ICT tools (Efobi et al., 2023).

Several factors that influence the adoption of ICT in agriculture. These include the farmer's age, education level, income, and access to electricity and internet services. Younger farmers and those with higher levels of education and income are more likely to adopt ICT (Saurabh and Dey, 2021). Additionally, farmers who have access to reliable electricity and internet services are more likely to use ICT in their farming activities. Despite the potential benefits of ICT, its adoption in agriculture is still low in many regions (Solarin et al., 2021). This is due to several challenges, including the high cost of ICT equipment and services, lack of technical skills among farmers, poor network connectivity, and lack of awareness about the benefits of ICT.

2.2 Role and impact of ICT on agricultural efficiency

ICT has emerged as a powerful tool for disseminating agricultural information. It has the potential to reach a wide audience in a short time and at a relatively low cost. This includes information on weather forecasts, market prices, new farming techniques, pest and disease control, and government policies (Sheng and Lu, 2020). The use of ICT can help farmers make informed decisions, improve their farming practices, and increase their productivity and income. The use of ICT in agriculture has been associated with increased agricultural productivity. ICT can provide farmers with timely and accurate information, which can help them make informed decisions about their farming practices. For example, farmers can use ICT to access information on the best times to plant and harvest, how to use fertilisers and pesticides effectively, and how to manage pests and diseases. This can lead to increased crop yields and improved quality of produce (Omulo and Kumeh, 2020).

Precision agriculture involves the use of ICT tools such as GPS, remote sensing, and GIS to monitor and manage agricultural activities. This allows farmers to apply inputs such as fertilisers and pesticides in precise amounts, thereby reducing wastage and environmental pollution. Precision agriculture can lead to increased agricultural efficiency and sustainability (Bhakta et al., 2019).

There are several case studies that demonstrate the impact of ICT on agricultural efficiency. For example, in India, a mobile app called 'AgriApp' provides farmers with real-time information on market prices, weather forecasts, and farming techniques. This has helped farmers increase their productivity and income (Sabirin et al., 2022).

2.3 Agricultural information diffusion in Ekiti State

Ekiti State, situated in Southwestern Nigeria, has a predominantly agrarian economy, with agriculture serving as a vital source of livelihood for a significant portion of the population. The agricultural sector of the state faces challenges such as limited access to information, outdated farming practices, and market inefficiencies (Familusi and

Owoeye, 2014). The introduction and utilisation of ICT in this context have the potential to address these challenges and usher in a new era of agricultural development.

In Ekiti State, the diffusion of agricultural information is primarily through traditional channels such as agricultural extension officers, radio and television programs, and farmer meetings. However, with the increasing penetration of mobile phones and internet services, there is a growing potential for the use of ICT in information diffusion (Toluwase and Awoyemi, 2017). Farmers in Ekiti State face several challenges in accessing agricultural information. These include language barriers, illiteracy, lack of awareness about available information sources, and poor network connectivity. These challenges need to be addressed to enhance the diffusion of agricultural information in the state.

3 Methodology

3.1 Sampling procedure

The target population of the study was within farmers in Ekiti State. The sample frame was drawn from the record provided by the rural farmers in Ekiti State. A sample of two local governments out of the 16 local governments in Ekiti State was randomly selected and interviewed using a questionnaire. Using a random sampling technique.

3.2 Method of data collection

Primary source of data was used for the study. The primary data was obtained through interview with respondent using questionnaires. The questionnaires were distributed among agriculturists in Ekiti State.

3.3 Data analysis

Descriptive statistics such as means, percentages and frequency table were used for data analysis while Chi-square and rank correlation analysis were employed for determining the relationship that exists between selected variables of the study. All this will be done easily with the aid of SPSS. The Statistical Package for the Social Sciences (SPSS) is a software program used for statistical analysis. It is widely used by researchers and statisticians in various fields, including social sciences, business, agriculture, and healthcare, to analyse data and draw conclusions from it. The program allows users to perform a wide range of statistical tests and analyses, including descriptive statistics, correlation analysis, regression analysis, hypothesis testing, and more (Rahman and Mukhtadir, 2021). SPSS is known for its user-friendly interface and the ability to handle large datasets.

The analysis was specifically focused on the socio-economic characteristic of the farmers such as age, gender, education, length of time in farming business and membership of organisation. Also presented was the Chi-square analysis to determine the socio-economic variables and farmers' relationship between rankings of constrain to use of ICTS by the rural farmers and extension agents. Hence, high agricultural productivity should be expected.

The Chi-square test is a statistical test used to determine whether there is a significant difference between the expected and observed frequencies in one or more categories of a contingency table (Gupta and Kapoor, 2020).

The Chi-square can be calculated by the following steps:

- 1 Defining the null hypothesis. The null hypothesis states that there is no significant difference between the expected and observed frequencies.
- 2 Determine the expected frequency for each category. To do this, multiply the total number of observations by the proportion of the sample that you would expect to fall into each category.
- 3 Calculate the Chi-square statistic for each category by subtracting the expected frequency from the observed frequency, squaring the difference, and dividing by the expected frequency.
- 4 Sum up the Chi-square statistics for each category to get the total Chi-square statistic.
- 5 Determine the degrees of freedom (df) for the Chi-square test. This is equal to the number of categories minus one.
- 6 Look up the critical value of Chi-square for your chosen significance level and degrees of freedom.
- 7 Compare the calculated Chi-square statistic to the critical value. If the calculated value is greater than the critical value, reject the null hypothesis and conclude that there is a significant difference between the expected and observed frequencies. If the calculated value is less than or equal to the critical value, fail to reject the null hypothesis and conclude that there is no significant difference between the expected and observed frequencies.

The formula for calculating the Chi-square statistic is:

$$X^2 = \sum (O - E)^2 / E \quad (1)$$

where

X^2 the Chi-square statistic

O the observed frequency in each category

E the expected frequency in each category.

The degrees of freedom (df) for the Chi-square test is equal to the number of categories minus one:

$$df = k - 1 \quad (2)$$

where k is the number of categories.

Once the Chi-square statistic and degrees of freedom have been calculated, then, the value to the critical value in a Chi-square distribution table is compared to determine the level of significance and whether to reject or fail to reject the null hypothesis.

4 Analysis, interpretation and discussion of findings

In this research work, data collected were computed using frequency distribution and simple percentages to meaningfully describe the data gathered for the study. Also, the simple linear regression analysis was used to test the hypotheses earlier set for the study.

4.1 Analysis of the administered questionnaires

The gender distribution in Table 2 indicated that out of the 60 respondents 65% were men while 35% were women. This shows that in the study area, most agricultural activities are undertaken by men.

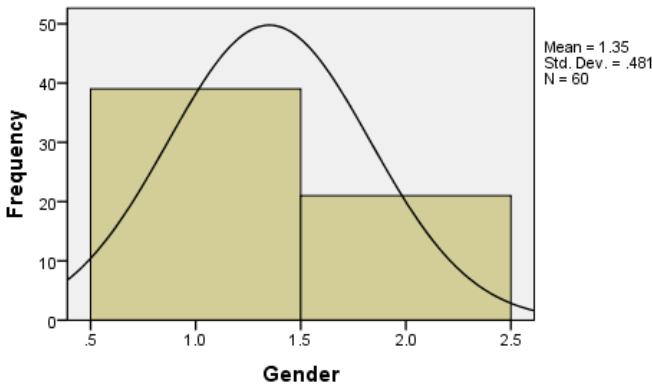
Table 1 Analysis of the administered questionnaires

Questionnaires	Responses	Percentage (%)
Number of filled	60	100
Number of unfilled	0	0
Total	60	100%

Table 2 Gender analysis of respondents

Gender	Frequency	Percent	Valid percent	Cumulative percent
Valid Male	39	65.0	65.0	65.0
Female	21	35.0	35.0	100.0
Total	60	100.0	100.0	

Figure 1 Frequency of gender distribution (see online version for colours)



4.1.1 Analysis of the demographic characteristics of the respondents

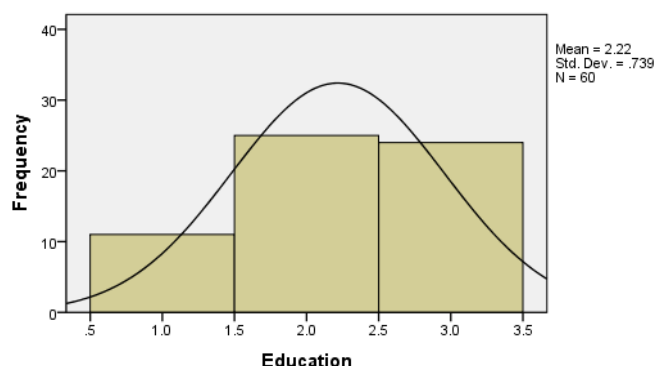
The educational levels of the farmers generally indicate high exposure to western education by the respondent it can also be said that the farmers will have more interest in obtaining agricultural information which will improve their farming practice because of their exposure to education. Educated farmers are likely to have better comprehension and utilisation of the information disseminated via ICT tools. They might be more comfortable using digital devices and navigating through different applications or

websites. This could lead to improved farming practices, as they can access a wide range of information, including weather forecasts, market trends, new farming techniques, pest and disease control methods, and government policies. Moreover, educated farmers might also be more open to change and innovation, making them more likely to adopt new technologies in their farming practices. This could potentially lead to increased productivity and income.

Table 3 Respondent level of education

<i>Gender</i>		<i>Frequency</i>	<i>Percent</i>	<i>Valid percent</i>	<i>Cumulative percent</i>
Valid	Primary	11	18.3	18.3	18.3
	Secondary	25	41.7	41.7	60.0
	Tertiary	24	40.0	40.0	100.0
	Total	60	100.0	100.0	

Figure 2 Frequency of education distribution (see online version for colours)

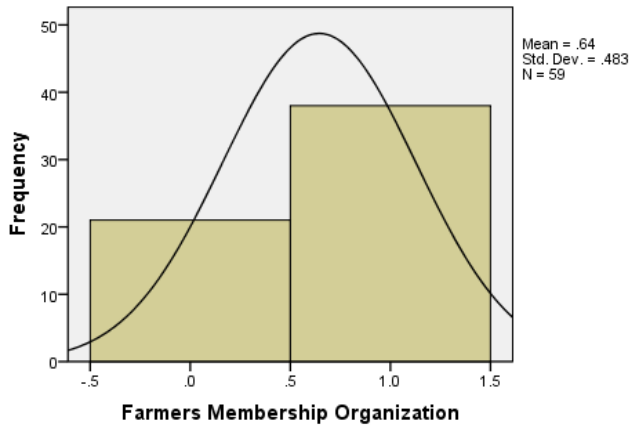


However, it is important to note that while education can facilitate the use of ICT, other factors such as access to ICT tools, internet connectivity, and training on the use of ICT for agricultural purposes also play crucial roles. Therefore, holistic approaches that consider all these factors are needed to effectively promote the use of ICT among farmers.

Table 4 Membership of a union

<i>Membership of a union</i>		<i>Frequency</i>	<i>Percent</i>	<i>Valid percent</i>	<i>Cumulative percent</i>
Valid	No	21	35.0	35.6	35.6
	Yes	38	63.3	64.4	100.0
	Total	59	98.3	100.0	
Missing	System	1	1.7		
Total		60	100.0		

Figure 3 Frequency of farmers in membership organizations (see online version for colours)



Frequency distribution of membership to organisation shows that to 64.4% of the respondents belongs to cooperative society, social development association, 25% young farmers club, better life programmes, 23.3% does not belong to any membership organisation we can say that majority of activities such as cooperative societies and social development association, hence, they should have better chance of improving their practice through thrift and community development

Table 5 Length of farming experience

		<i>Frequency</i>	<i>Percent</i>	<i>Valid percent</i>	<i>Cumulative percent</i>
Valid	1–5	22	36.7	36.7	36.7
	6–10	20	33.3	33.3	70.0
	11–15	8	13.3	13.3	83.3
	Above 15	10	16.7	16.7	100.0
	Total	60	100.0	100.0	

Figure 4 Frequency of the years of experience of the farmers (see online version for colours)

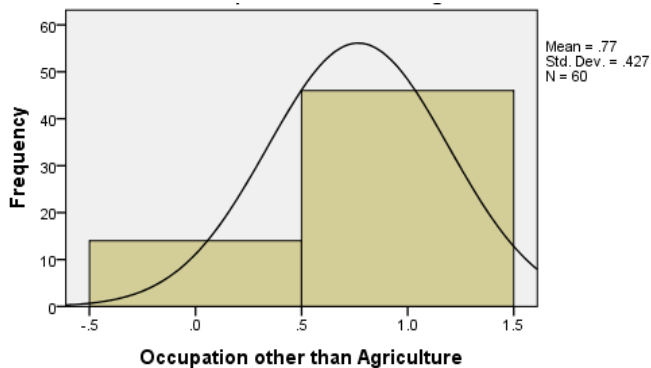


There is high level of years spent in farming business. This means majority of the farmers have acquired farming experience due to high duration of time spent in the farming. All this stage, it is expected that the respondents has less difficulties due to familiarly with different process and problems accounted in farming activities. A significant number of respondents have substantial experience in farming. Specifically, 36.7% have 1–5 years of experience, 33.3% have 6–10 years, 13.3% have 11–15 years, and 16.7% have more than 15 years of experience. This high level of experience in farming among the respondents could indeed suggest a certain level of familiarity and proficiency with different processes and challenges encountered in farming activities. Experienced farmers are likely to have developed strategies and solutions to handle common problems in their farming practices. However, it's important to note that while experience is valuable, the introduction of ICT tools for the dissemination of agricultural information could present a new set of challenges and opportunities. For instance, experienced farmers may face challenges in adopting new technologies due to lack of familiarity or resistance to change. On the other hand, their extensive experience could also make them more adept at integrating the new information obtained from ICT tools into their existing knowledge and practices.

Table 6 Respondent primary occupation apart from farming

		Frequency	Percent	Valid percent	Cumulative percent
Valid	No	14	23.3	23.3	23.3
	Yes	46	76.7	76.7	100.0
	Total	60	100.0	100.0	

Figure 5 Frequency of farmers involved in other occupation aside farming (see online version for colours)



The data provided offers a comprehensive overview of the demographic characteristics of the respondents, their farming experience, and their primary occupations. These factors are crucial as they can significantly influence the adoption and utilisation of ICT tools for the dissemination of agricultural information.

- *Demographic characteristics*: the gender distribution of the respondents, with 65% male and 35% female, could potentially influence the use of ICT tools. Previous

research has indicated that gender can play a role in the adoption of new technologies, with various socio-cultural and economic factors at play.

- *Farming experience*: the data shows a high level of farming experience among the respondents. This could suggest a certain level of familiarity and proficiency with different processes and challenges encountered in farming activities. However, the introduction of ICT tools could present a new set of challenges and opportunities. Experienced farmers may face challenges in adopting new technologies due to lack of familiarity or resistance to change. On the other hand, their extensive experience could also make them more adept at integrating the new information obtained from ICT tools into their existing knowledge and practices.
- *Primary occupations*: the data reveals that a significant majority of the respondents (76.7%) have a primary occupation apart from farming. This could influence their attitudes and behaviours towards the use of ICT tools for the dissemination of agricultural information. Farmers who have another primary occupation might face unique challenges in using ICT tools due to their work commitments. On the other hand, their exposure to other occupations might provide them with additional skills and perspectives that could be beneficial in their farming practices.
- *Educational qualification*: majority of the respondents have secondary education. This implies that they can read and write and will be able to use ICT tools for the dissemination of agricultural information. Educated farmers are likely to have better comprehension and utilisation of the information disseminated via ICT tools. They might be more comfortable using digital devices and navigating through different applications or websites.

Table 7 Other statistical data collated

		<i>Internet can be a useful source of agricultural information</i>	<i>Television broadcast programs provides sufficient agricultural information to rural farmers</i>	<i>Mobile phones have a positive impact on rural farmers</i>	<i>ICT plays a very crucial role in agricultural production of rural farmers</i>	<i>Electronic Book on agriculture may be useful information to rural farmers</i>
N	Valid	59	59	59	59	59
	Missing	1	1	1	1	1
Mean		1.32	1.97	1.49	1.92	2.44
Median		1.00	2.00	1.00	2.00	2.00
Mode		1	2	1	1	1
Std. deviation		0.600	0.946	0.796	1.179	1.568
Skewness		2.219	0.954	2.258	1.346	0.725
Std. error of skewness		0.311	0.311	0.311	0.311	0.311
Minimum		1	1	1	1	1

4.2 Farmer's exposure to the use of different information communication technologies

Table 8 shows that a significant majority of the respondents find the internet useful for obtaining agricultural information, with 71.7% agreeing and 23.3% strongly agreeing. This finding is significant as it underscores the potential of the internet as a tool for the dissemination of agricultural information among farmers in Ekiti State. The internet can provide farmers with access to a wide range of information, including weather forecasts, market trends, new farming techniques, pest and disease control methods, and government policies. This can help them make informed decisions, improve their farming practices, and increase their productivity and income. However, it's also important to note that while many of the respondents find the internet useful, there are still some who disagree. This suggests that there might be barriers to the use of the internet among some farmers. These could include factors such as lack of internet access, high cost of internet services, lack of digital literacy skills, or lack of relevant content in local languages. The table shows that almost all the respondent knows the value of internet as a useful source of agricultural information, it means the respondent have been visiting the internet to get various agricultural information.

Table 8 Internet as a useful source of agricultural information

		<i>Frequency</i>	<i>Percent</i>	<i>Valid percent</i>	<i>Cumulative percent</i>
Valid	Agree	43	71.7	72.9	72.9
	Strongly agree	14	23.3	23.7	96.6
	Disagree	1	1.7	1.7	98.3
	Strongly disagree	1	1.7	1.7	100.0
	Total	59	98.3	100.0	
Missing	System	1	1.7		
Total		60	100.0		

Figure 6 The usefulness of the internet as a source of agricultural information (see online version for colours)

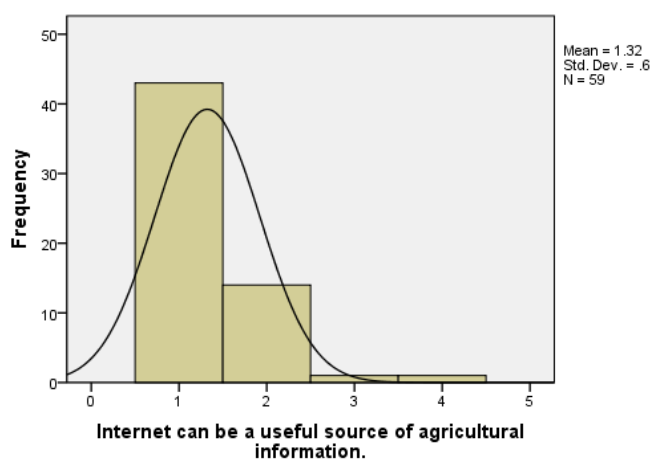


Table 9 Impact of mobile phones on rural farmers

		<i>Frequency</i>	<i>Percent</i>	<i>Valid percent</i>	<i>Cumulative percent</i>
Valid	Agree	37	61.7	62.7	62.7
	Strongly agree	18	30.0	30.5	93.2
	Disagree	2	3.3	3.4	96.6
	Strongly disagree	1	1.7	1.7	98.3
	Undecided	1	1.7	1.7	100.0
	Total	59	98.3	100.0	
Missing	System	1	1.7		
Total		60	100.0		

Figure 7 The rate of positive impact of mobile phones for rural farmers (see online version for colours)

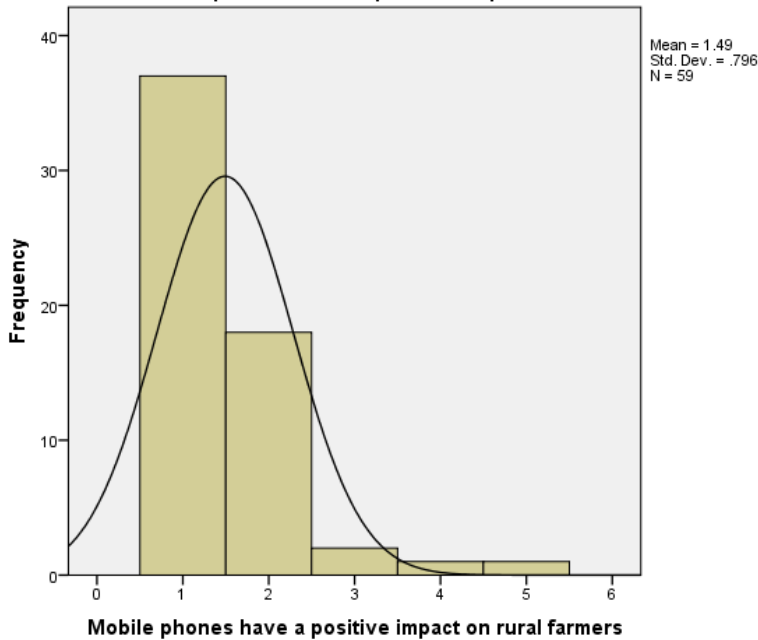


Table 9 shows that a significant majority of the respondents find mobile phones useful for obtaining agricultural information, with 61.7% agreeing and 30% strongly agreeing. Only a small percentage of respondents disagree (3.3%) or strongly disagree (1.7%), and 1.7% are undecided.

This finding is significant as it underscores the potential of mobile phones as a tool for the dissemination of agricultural information among farmers in Ekiti State. Mobile phones, being portable and relatively affordable, can provide farmers with access to a wide range of information, including weather forecasts, market trends, new farming techniques, pest and disease control methods, and government policies. This can help

them make informed decisions, improve their farming practices, and increase their productivity and income.

However, it's also important to note that while the majority of the respondents find mobile phones useful, there are still some who disagree or are undecided. This suggests that there might be barriers to the use of mobile phones among some farmers. These could include factors such as lack of network coverage, high cost of mobile data, lack of digital literacy skills, or lack of relevant content in local languages.

Table 10 Television broadcast programs provides sufficient agricultural information to rural farmers

		<i>Frequency</i>	<i>Percent</i>	<i>Valid percent</i>	<i>Cumulative percent</i>
Valid	Agree	21	35.0	35.6	35.6
	Strongly agree	24	40.0	40.7	76.3
	Disagree	10	16.7	16.9	93.2
	Strongly disagree	3	5.0	5.1	98.3
	Undecided	1	1.7	1.7	100.0
	Total	59	98.3	100.0	
Missing	System	1	1.7		
Total		60	100.0		

Figure 8 The rate of sufficient information provided by television programs for rural farmers (see online version for colours)

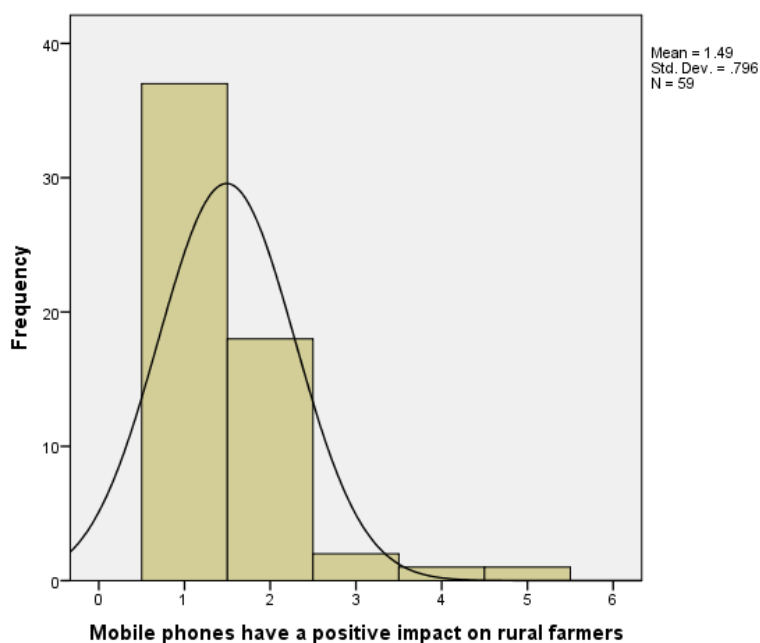


Table 10 shows that a significant majority of the respondents find television broadcast programs useful for obtaining agricultural information, with 35.6% agreeing and 40.7% strongly agreeing. Only a small percentage of respondents disagree (16.9%) or strongly disagree (5.1%), and 1.7% are undecided.

This finding is significant as it underscores the potential of television broadcast programs as a tool for the dissemination of agricultural information among farmers in Ekiti State. Television broadcast programs can provide farmers with access to a wide range of information, including weather forecasts, market trends, new farming techniques, pest and disease control methods, and government policies. This can help them make informed decisions, improve their farming practices, and increase their productivity and income.

However, it is also important to note that while the majority of the respondents find television broadcast programs useful, there are still some who disagree or are undecided. This suggests that there might be barriers to the use of television broadcast programs among some farmers. These could include factors such as lack of access to television, high cost of electricity, or lack of relevant programs in local languages. We can see here that television program provides farmers with sufficient agricultural information they need.

4.3 Discussion of findings

To determine whether there is a relationship between variable and the target value which is the use of ICT in information dissemination, there is a need to compare the calculated Chi-square statistic (χ^2_{cal}) to the tabulated Chi-square value (χ^2_{tab}) at a given significance level (often denoted as α). If χ^2_{cal} is less than χ^2_{tab} , it suggests that there is not enough evidence to reject the null hypothesis, indicating that there is no significant relationship between the variables. On the other hand, if χ^2_{cal} is greater than χ^2_{tab} , it suggests that there is a significant relationship between the variables, and the null hypothesis may be rejected. To determine how the socio-economic characteristics of the farmers which are the educational level, membership or union participation and years of experience influence their usage of ICT tools for information dissemination, a Chi-square test is conducted.

The result regarding the relationship between educational level of farmer and access to ICT shows no significant relationship, as the tabulated chi square was less than the calculated. Thus, the educational level of farmers in Table 3 has nothing to do with the use of ICT information dissemination. The calculated Chi-square (χ^2_{cal}) = 9.15 and tabulated (χ^2_{tab}) = 16.919. This is an interesting finding, as one might expect that higher levels of education would facilitate the use of ICT. It would be worth exploring this further, perhaps by looking at other factors that might influence ICT use, such as digital literacy skills or access to ICT infrastructure.

The Chi-square test (χ^2_{cal} = 15.93, χ^2_{tab} = 11.070) regarding the relationship between the membership participation of farmers and their usage of ICT tools indicates a significant relationship between membership participation of farmers and the use of ICTs. This suggests that farmers who participate in memberships are more likely to use ICTs. This could be because membership in groups or organisations provides farmers with more opportunities to access and learn about ICTs.

The Chi-square test (χ^2_{cal} = 42.06, χ^2_{tab} = 16.919) indicates a significant relationship between the years of experience of the farmers and their use of ICTs tools for information

dissemination, thus the null hypothesis is discarded. This suggests that the years of experience of the farmers plays a major role in their usage of ICT tools regarding information dissemination. This is not a surprise as farmers who have risen through the rank will understand better about the importance of ICT to their work.

5 Conclusions

This study offers a comprehensive understanding of the pivotal role that ICTs, such as the Internet, radio, television, and mobile phones, play in disseminating crucial agricultural information to farmers. The findings underscore the potential of these technologies to bring about positive changes in farmers' lives and activities. The data reveals that a significant majority of farmers find these ICT tools useful, indicating their potential to improve farming practices and increase productivity and income. However, the study also highlights the existence of barriers to the use of these tools, such as lack of access, high costs, and lack of digital literacy skills, underscoring the need for targeted interventions to address these challenges. Furthermore, the study illuminates the influence of socio-economic characteristics, such as age, education level, and primary occupation, on the use of ICT tools. These insights could inform the development of strategies and interventions tailored to the needs and circumstances of different demographic groups. These findings show that there is a compelling case for investing additional resources and efforts into enhancing the reach and effectiveness of ICT-based extension methods. This could involve developing tailored content, providing digital literacy training, improving ICT infrastructure, and fostering partnerships with broadcasters and tech companies. Such a multi-dimensional approach could create a more inclusive and effective information ecosystem that adequately suits the local situation and conditions of farmers, ultimately contributing to the sustainable development of the agricultural sector. The study concludes on a note of optimism, envisioning a future where ICT tools are seamlessly integrated into the fabric of agricultural practices, empowering farmers with the information they need to thrive in a rapidly changing world. Further research is needed to explore these issues better and to develop effective strategies for promoting the use of ICT among farmers.

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