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## **FARMERS' KNOWLEDGE AND ATTITUDE TOWARDS AGRICULTURAL MOBILE PHONE APPLICATIONS IN NIGERIA**

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**Abstract:** In order to enhance the dissemination of agricultural information to farmers, numerous Agricultural Mobile Phone Applications (AMPAs) have been developed to bridge the knowledge gap between experts and agricultural practitioners. However, the extent to which farmers are aware of these Applications remains uncertain. The study therefore aimed at examining the knowledge of and attitude towards AMPAs among cassava farmers in South-west, Nigeria. A three-stage sampling procedure was employed to select 410 respondents for the study. Data were analyzed using both descriptive and inferential statistics, including frequency counts, percentages, means, and regression analysis. The findings of the study were that farmers exhibited a high level of knowledge for IITA herbicides calculator (80.4%), Airtel 4-2-1 call App (88.6%), and Akilimo App (75.3%). Farmers had a positive attitude towards the use of the IITA herbicides calculator (75.0%), Airtel 4-2-1 call App (84.5%), and Akilimo App (80.4%). Regression analysis showed that level of education ( $\beta = 0.260$ ,  $p=0.044$ ), and smart phone ( $\beta= 0.278$ ,  $p=0.022$ ) owned were also positively significant to the knowledge level while age ( $\beta= -0.278$ ,  $p=0.021$ ) have negative significance. The study concluded that farmers in the study area had good knowledge and favourable attitude about AMPAs. The study therefore recommended that designing user interfaces that cater to the preferences and usability needs of different age groups is important noting that younger users may navigate complex interfaces, while older users may prefer simpler and more intuitive designs.

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**Key words:** *Agricultural apps, knowledge, attitude, education and ownership of phone*

## INTRODUCTION

To attain a higher productivity increase in cassava production, mobile applications related to agriculture have been developed as a result of the advancement of technology [1,2], to bridge the knowledge and information gap covering a wide range of operations specifically for cassava production and its value chain. The International Institute of Tropical Agriculture (IITA) and several other organizations developed numerous digital solutions to address some of the agronomic issues threatening cassava productivity in Africa to bring about the transformation needed to achieve food security. The selected Apps in this study were Akilimo App, Airtel 4-21 call App and IITA herbicide calculator App. Akilimo app is an advisory tool that provides site-specific recommendations to cassava farmer in order to increase their Cassava-based cropping systems [3]. Airtel 4-2-1 call App is a component of Akilimo that provide a voice-based tutorial on Cassava production, weather, education, rice amongst others by simply dialing 4-2-1 on any mobile phone with an Airtel sim card. IITA herbicides is a mobile application developed to prevent herbicide abuse, such as over-dosing and/or under-dosing herbicides.

Agriculture is location-specific thus, it is imperative that farmers receive specialized guidance on best practices, appropriate usage of inputs, precise weather forecasts, and up-to-date market and price information, hence harnessing the evolution of internet use and related digital technology like smartphones and apps, farmers can get the information they need as well as overcome limitations faced by the traditional agricultural extension service delivery [4]. In addition, each user of agricultural applications has a unique knowledge and comprehension of the app, and how well the app is used can also be influenced by the user's environment, friends, and personal traits like age, gender, and educational background.

In South-west Nigeria, Cassava farming plays a vital role in the agricultural sector, contributing significantly to the region's economy. With the increasing prevalence of mobile phone applications designed for agricultural purposes, there exists a gap in understanding the knowledge of cassava farmers on these technologies. The effectiveness of these applications in enhancing farming practices and increasing agricultural productivity is uncertain due to the limited insights into farmers' knowledge, and usage of the Apps. Studies on mobile applications by farmers is an aspect of technological innovation that has received much attention, but most of these studies tend to focus on usage, diffusion, and adoption without taking into consideration the knowledge and attitude of users using a mobile phone application like agricultural Apps [1,5]. To address these gaps, knowledge and usage of agricultural apps is a major concern, since the users of an application, and their judgment, determines its success or failure.

Therefore, the extent to which farmers know agricultural mobile phone applications among cassava farmers in the study are is not well-documented, leading to a limited understanding of the applications. It is against this background that the study intends to provide answers to the following research questions:

- (i) What is the level of knowledge of cassava farmers on agricultural mobile phone applications in the study area?
- (ii) What is the attitude of cassava farmers in the study area towards the use of agricultural mobile phone applications?
- (iii) Do socio-economic characteristics of cassava farmers have significant relationship with their knowledge on agricultural mobile phone applications in the study area.

## MATERIAL AND METHODS

### Study area

This study was carried out in Southwestern part of Nigeria. South-west Nigeria comprises of six states namely Oyo, Ogun, Osun, Ekiti, Ondo and Lagos states as shown in Figure 3. The six states lie between longitude 2°31' East and 6°00' East and latitude 6°21' and 8°37' North with a total land area of 77,818 km<sup>2</sup>. The coordinates Latitude and Longitude in the three selected states for this study are as follows Oyo (8° 00' 00'' N: 4° 00' 00'' E), Ogun (7° 00' 00'' N: 3° 35' 00'' E), and Ekiti (7°40' 00'' N:5° 15'00'' E).

### Population, sampling procedure and sample size

The population of the study comprised all the cassava farmers trained on agricultural mobile phone app in the selected South-West States in Nigeria. A three-stage sampling procedure was employed to select respondents for the study. The first stage involved the purposive selection of two states in South-West, Nigeria. Oyo and Ogun States were purposively selected for the study because Akilimo, Airtel 4-2-1, and IITA herbicide calculator have been launched and disseminated to some selected cassava farmers on the use of these apps by African Cassava Agronomy Initiative (ACAI) programme of IITA, Justice, Development and Peace Movement (a Non-Governmental Organization) in Oyo State and Ogun State Agricultural Development Programme, among other promoters of agricultural apps. In addition to the aforementioned, cassava cultivation is one of the major crops grown in these areas. The second stage involved the purposive selection of two and three Local Government Areas in Ogun and Oyo State respectively. The third stage involved the proportionate random selection of 20% in each Local Government Areas of 2050-trained farmers, resulting in a sample size of 410 respondents. Data were analyzed using both descriptive and inferential statistics, including frequency counts, percentages, means, and regression analysis. Summary of the sampling procedure is presented in Table 1.

Table 1. Summary of sampling procedure and sample size

Stage 1	Stage 2	Stage 3	
Purposive selection of two States	Purposive selection of LGAs	Proportionate random selection of cassava farmers	20% of trained cassava farmers
Oyo State	Afijo	330	66
	Akinyele	425	85
	Iseyin	505	101
Ogun State	Ijebu ode	375	75
	Odeda	415	83
Total		2050	410

### **Data collection and analysis**

Primary data was collected with interview schedule. Data gathered were analysed and presented using frequency count, percentage, mean score. Stated hypotheses was analysed using Regression statistical tool. Knowledge statements were placed on a 5-point Likert type scale. The scales are very high, high, moderate, low and very low while scores of 5,4,3,2 and 1 were assigned respectively. Respondent knowledge was then categorized as low and high knowledge. Attitudinal statements were placed on a 5-point Likert type scale. This was measured as strongly agree, agree, undecided, disagree and strongly disagree while scores of 5,4,3,2 and 1 were assigned respectively for positively worded statement but reverse was the case for negatively worded statements. A minimum score of 30 and maximum of 150 was expected from each respondent. Respondent attitudes were then categorized as between 30 -90 favorable attitudes and between 91- 150 as unfavorable attitude.

## **RESULTS AND DISCUSSION**

### **Farmers' Knowledge on Agricultural Mobile Phone Application**

Mobile phones have played vital role in enhancing farmers' knowledge about agriculture, and supporting rural development in developing countries [6]. The knowledge of cassava farmers regarding agricultural mobile phone applications can vary depending on factors such as their access to technology, education, exposure to information, and their engagement with agricultural extension services. Also, agricultural mobile apps provide valuable information and knowledge related to farming practices, market prices, weather forecasts, and more. The results on knowledge of farmers on IITA herbicides calculator app in South-West Nigeria as presented in Table 2 showed that farmers agreed to the following knowledge statements such as I can download the app on the play store applicable to my device with a mean score of (5.00), it does not require data after the first download (4.87), also respondents can operate the app offline as much as they want with a mean score of (4.82) respectively.

The findings suggest that farmers are knowledgeable with IITA herbicides calculator app operations. This might be because of the simplicity of downloading the app and clicking on the parameters for calculating herbicides. This is in line with these findings, report that knowledge of farmers on herbicide calculator app helped to reduce underdosing and overdosing the farm with herbicides and prevents environmental pollutions [7]. Hence, respondents have high knowledge (80.4%) on herbicides calculator app in the study areas. Result reveals that farmers exhibited varying degrees of knowledge statements on Akilimo app such as Akilimo app does not have options for detection of cassava disease with a mean score of (4.51) and can determine the land area of their farm through the app with a mean score of (4.28). This implies that cassava farmers can determine their farm area, farm size and are unable to upload picture of diseased plant.

On knowledge categorization of Akilimo App in Table 3, respondents have high knowledge (75.3%) of Akilimo App.

The results reveals that farmers agreed to the following knowledge statements on airtel 4-2-1 call app such as airtel 4-2-1 call app language option is available in English and the three major Nigerian languages with a mean score of (5.00), it is very easy and convenient to use (4.71), and the airtel service does not require airtime or data before I can access the service (5.00).

This implies that due to the portability, ease of dialing calls and available language options on mobile app, farmer of have high knowledge on the app. Furthermore, the reason for the dominance of voice call app was best explained by the similar findings [8] of which also reported that majority (97.1%) of the farmers affirmed that information via voice call app is timely, as 94% affirmed to the reliability of the information received through the app. On knowledge categorization of airtel 4-2-1 call app, respondents have high knowledge (88.6%) of airtel 4-2-1 call app.

Table 2: Distribution of the respondents on knowledge of agricultural mobile phone application

Knowledge on Agricultural Mobile Phone Application	Mean score
<b>IITA Herbicide calculator App</b>	
I can calibrate accurately the required herbicides to be use on the farm	4.70
I can operate the app offline as much as I want	4.82
Calculating the volume of water to use is difficult	4.57
It requires a lot of data that is why I do not use it	4.36
It does not require data after the first download	4.87
Herbicide calculator apps is easy and convenient to use	3.00
It does not require update	4.20
I can update app when the need arises	4.35
The app is error free	4.02
The parameters for calculating herbicides are difficult	4.21
I can download the app on the play store applicable to my device.	5.00
Description on how to use the app is available when you click on it.	4.27
I can reset the parameters for calculation on the app	4.85
<b>AKILIMO App</b>	
I can determine the land area of my farm through Akilimo apps	4.28
It provides the option of choosing my farm location	3.64
When I click on the unit price options, it does not connect and it say invalid unit price	4.28
It does not provide information on weed management practices	3.64
The fertilizer blending on the app does not load while using the app	3.31
The schedule planting date and harvesting dates options does not provide the expected yield.	3.31
It is too complex for me to understand	3.22
It does not have options for detection of cassava disease	4.51
The inter-cropping pattern is not flexible to use on the app	3.98
Recommendations is not available on the app	3.36
Is the apps user friendly	3.73
I do not use the app often because it consumes data when in use.	2.85
Do you get recommendations while using Akilimo App	3.65
Are Update available on the app	3.07
Unable to complete a task on the app	3.69
Error pop up while using the app	4.03
It takes times to learn and understand it	1.63

Contin. Table 2.

Airtel 4-2-1 Interactive Voice Recording (IVR) service App	
4-2-1 call app language option is available in English and the three major Nigerian languages	5.00
It is very easy and convenient to use	4.71
I can listen to drama programs related to cassava farming	3.80
It provides information on News, current affairs, education and governance	4.04
I understand fertilizer recommendation for cassava and maize intercropping	4.48
I can monitor weather conditions with 4-2-1	3.95
Health News such as family planning, Lassa fever, covid-19, yellow fever are timely and informative	4.72
Tailored fertilizer recommendations is available according to ecological zones and state applicable to the users	4.62
It provides voice base tutorial on cassava and other arable crops	4.50
It provides good agronomic practices on six steps to weed management	4.33
The airtel service does not require airtime or data before I can access the service	5.00
It provides best planting practice	4.60
I can operate it easily on both basic and smart phone	4.93
I can update my profile on 4-2-1	4.20

Source: Field survey, 2023

Table 3. Distribution of the respondents by the categorization of their knowledge level on IITA Herbicide Calculator, Akilimo and Airtel 4-2-1 call App.

Apps	Category	Frequency	Percentage (%)
IITA Herbicide Calculator	High	119	80.4
	Low	29	19.6
	Total	148	100
Akilimo	High	292	75.0
	Low	96	25.0
	Total	388	100
Airtel 4-2-1 call App	High	195	88.6
	Low	25	11.4
	Total	220	100

Source: Field survey, 2023.

### Farmers' Attitude towards Agricultural Mobile Phone Applications

Some cassava farmers may have a positive and enthusiastic attitude towards using agricultural mobile phone apps. They may recognize the potential benefits of these apps in terms of accessing valuable information, improving farming practices, connecting with markets, and enhancing productivity and profitability. These farmers are likely to actively seek out and embrace the use of such apps in their cassava farming operations. Other cassava farmers may have a neutral or open-minded attitude towards agricultural mobile phone apps. They may be willing to explore and learn about these apps, but their level of enthusiasm may depend on their understanding of the apps' benefits and their experiences with using agricultural apps.

From the result in Table 4, respondents embraced the use of IITA Herbicide calculator apps, I use the app because it enables me to calculate right and prevent environmental pollution with a mean score of (4.47) respectively.

This implies that the farmers were generally in support of mobile phone technologies.

This suggests that most of the farmers were convinced of the efficacy of the mobile phone technologies at enhancing their farming activities through effective information disseminating potential of mobile apps [9].

It also implies that the farmers in the study area are ready to take part extensively in the deployment of apps, particularly agricultural mobile phone apps. Furthermore, favorable attitude of farmers towards mobile phone was also established by a study in Niger state of Nigeria where they also revealed that 7 out of the 10 parameters used in assessing the perception of the farmers on relevance of mobile phone technologies got mean score above 3 [10]. Also, the findings revealed that the farmers across the study area predominantly express a favourable disposition towards mobile phone apps. Table 10 also revealed that respondents with a mean score of 3.57 disagreed that Akilimo App has no impact on cassava productivity. 50% of respondents disagreed that they do not use the app because of several interface with a mean score of 3.37. Majority of the farmers with a mean score of 82.2% acknowledged that the use of 4-2-1 Interactive Voice Recording (IVR) service on airtel network to access information is available in three major Nigerian languages. Also, 99.5% of the respondents with a mean score of 4.80 disagreed to the statement that the 4-2-1 call app is not effective.

The overall attitude toward mobile apps in the study area was favorable with 75.0% for herbicides calculator which implies that the purpose and benefits of developing the app has been achieved by the users while that of Akilimo is 80.4%, and 84.5% for Airtel 4-2-1 are also being favorable which means that respondents have a favorable attitude toward the apps as a means of obtaining information to improve farm decision-making on cassava production. The knowledge of cassava farmers on agricultural mobile phone application determined their attitude towards it. This is because farmers need a tool that will facilitate access to agriculture information as well as provide information which is applicable or specific in their local environment context [4].

Several literatures on mobile phones technologies have reported positive attitude, high level of knowledge and minimal constraints as effective factors promoting adoption of technologies [11]. It is important to note that attitudes towards agricultural mobile phone apps can evolve over time as farmers gain more experience, receive training and support, and witness the benefits of using these apps. Engaging farmers in participatory processes, involving them in app development and tailoring the apps to their specific needs can contribute to more positive attitudes among cassava farmer.

Table 4. Distribution of the respondents by their attitude towards agricultural mobile phone applications

Attitudinal Statements	SA %	A %	UD %	D %	SD %
IITA Herbicide calculator					
I embrace the use of IITA Herbicide calculator apps	46.6	53.4			
I don't need IITA Herbicide calculator app before applying herbicides on my farm	-	-	18.9	50.0	31.1
<u>Contin. Table 4.</u>					
I will use IITA Herbicide Calculator app to help forestall incidents of under-dosing or overdosing of herbicides.	47.1	32.3	-	8.8	14.5
I use the app because it enables me to calculate right and prevent environmental pollution	69.5	20.5	-	6.8	4.1

Contin. Table 4.

<i>I use Herbicide calculator app because it works offline and can be use as much as I want</i>	54.1	45.9			
<i>I use IITA Herbicide calculator app because of its accuracy</i>	27.0	35.1	20.3	14.9	2.7
<b>Akilimo App</b>					
<i>Akilimo App has no impact on cassava productivity</i>	6.9	8.2	19.1	35.6	30.2
<i>Akilimo App does not detect production problem for prompt response</i>	16.8	22.9	11.6	24.7	24.0
<i>The advice from the app on land preparation methods, weed management, planting densities and fertilizer application for intercropped Cassava fields as well as planting and harvest dates for high cassava root starch quality is easy to use.</i>	17.0	26.3	14.4	20.6	21.7
<i>I do not use the app because I can't inter-crop and blend fertilizer of my choice</i>	26.3	22.7	14.7	22.7	13.6
<i>It drained my battery a lot when in use</i>	17.2	17.0	14.2	25.8	25.8
<i>I become confuse when using the app</i>	11.3	19.3	26.8	18.1	24.5
<i>I do not use the app because of several interface</i>	14.2	15.7	21.1	7.3	31.7
<i>The best planting practices are not available on the app</i>	8.0	10.3	39.4	19.6	22.7
<i>It predicts the yield of cassava root and compare with the net income for the farmer from the sale of the roots to provide recommendations that help the farmer optimize his/her income</i>	10.6	17.2	22.2	26.0	24.0
<i>Fertilizer recommendations are expensive</i>	20.6	20.9	18.3	17.5	22.7
<i>Intercropping Cassava with Maize recommendations is not available on the app</i>	31.7	22.7	14.4	11.6	19.6
<i>I can use the app to calculate tailored fertilizer recommendation</i>	26.3	22.7	11.1	19.1	20.8
<i>The schedule planting helps me to calculate the investment</i>	14.9	24.0	13.4	18.0	29.7
<i>I use the app because it provides decision support on high cassava starch production.</i>	22.9	22.7	18.3	21.7	14.4
<i>I do not use the app because of poor internet connectivity on my farm location</i>	22.6	17.2	25.0	26.0	9.0
<b>Airtel 4-2-1 call App</b>					
<i>I use the 4-2-1 Interactive Voice Recording (IVR) service on AIRTEL network to access information because it is available in three major Nigeria languages.</i>	82.3	17.7			
<i>It is easier to for me to use IITA Interactive Voice Recording (IVR) service when i have any challenge in Cassava farming.</i>	20.5	30.9	10.5	14.5	23.6
<i>I use the call app often because it is free</i>	55.0	25.5	10.0	8.6	0.9
<i>Health information available on the call app do not met my health needs</i>	21.8	14.5	25.5	22.3	14.9
<i>I use the app because I can listen to drama programs related to cassava farming.</i>	40.0	25.5	20.0	6.8	7.7
<i>It is a good app because it provides information on other crops</i>	25.5	28.2	20.4	14.5	11.4
<i>I do not use the app because I do not get advice/ recommendations</i>	10.5	14.5	9.1	35.5	30.4
<i>I can dial the 4-2-1 number for weather information</i>	22.7	19.1	13.2	19.1	25.9
<i>The app is not effective</i>		0.5	19.5	80.0	



Table 5. Distribution of the respondents by the categorization of their attitude towards IITA Herbicide Calculator, Akilimo and Airtel 4-2-1 call App.

Apps	Category	Frequency	Percentage (%)
IITA Herbicide Calculator	Favorable	111	75.0
	Unfavorable	37	25.0
	Total	148	100
Akilimo	Favorable	312	80.4
	Unfavorable	76	19.6
	Total	388	100
Airtel 4-2-1 call App	Favorable	186	84.5
	Unfavorable	34	15.5
	Total	220	100

Source: Field survey, 2023.

#### Factors Influencing farmers' Knowledge on Agricultural Mobile Phone Applications

Results from table 5 shows the relationship between socioeconomic characteristics of the respondents and their knowledge level on agricultural mobile application in the study area, it was observed that age ( $\beta = -0.278$ ,  $p=0.021$ ) have negative significance on their knowledge. This implies that the older the age of the farmers, the lesser their knowledge to agricultural apps. The negative value of the coefficient indicates a decrease in use of agricultural mobile apps with the increase in age of the farmer. Also, young farmers will be vaster and more knowledgeable about agricultural mobile application mobile. Level of education ( $\beta = 0.260$ ,  $p=0.044$ ), and smart phone ( $\beta = 0.278$ ,  $p=0.022$ ) owned were also positively significant to the knowledge level, i.e the higher the level of education of the cassava farmer the more knowledgeable the cassava farmer. Also, cassava farmer using internet and social media as source of information will be more knowledgeable, farmers using smart phone will be more knowledgeable than respondents using basic phone. This is in line with the study of [12] who asserted that farmers with more education are more likely to embrace new technologies like Agricultural apps and increase their productivity. Education also helps to boosts the capacity to obtain, decode, and assess helpful information for agricultural production. From this study, it appeared that the higher a person's level of education of farmers, the higher the likelihood they owned and used agricultural mobile apps for their farm activities.

Table 6. Regression analysis showing the relationship between the socio-economic characteristics of the respondents and the cassava farmers' knowledge level of agricultural mobile application

Predictors	Unstandardized coefficient		Standardized coefficient	T	Sig.
	B	Std error	Beta		
Constant	5.297	0.900		2.321	0.026
Age	0.157	-0.154	-0.278	-1.020	0.021
Sex	2.468	1.273	0.397	1.939	0.060
Marital status	0.563	2.125	0.118	0.265	0.793
Level of education	1.315	0.977	0.269	1.247	0.044
Religion	0.033	0.136	0.213	0.067	0.923
Average land cultivated	0.201	0.125	0.090	1.616	0.104
Income	-5.751E-08	0.018	0.231	0.322	0.332
Membership of association	-0.581	1.003	0.095	0.579	0.566
Farming experience	0.977	-2.136	0.061	-0.401	0.103
Smart phone owned	0.123	0.113	0.451	0.101	0.022

Source: Field survey, 2023.  $R^2 = 0.764$  Adjusted  $R^2 = 0.723$

## CONCLUSIONS

Based on the findings of this study, it can be inferred that Cassava farmers have good knowledge about agricultural apps. The attitude of the cassava farmers was favourable to the usage of agricultural mobile app. The study suggests that designing user interfaces that cater to the preferences and usability needs of different age groups is important. Younger users may navigate complex interfaces, while older users may prefer simpler and more intuitive designs. Considering age-related factors during the application's design process can enhance usability and user experience. Policy makers can design incentive programs that encourage cassava farmers to use mobile apps. This can include subsidies for app subscriptions or access to affordable smartphones which may help reduce the observed gap between the basic phone and smartphone ownership. Efforts to inform the farmers in general about the benefits of smartphone ownership should target young people in particular.

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## ZNANJE I STAV FARMERA KOD UPOTREBE MOBILNIH TELEFONA I APLIKACIJA ZA POLJOPRIVREDU U NIGERIJU

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**Apstrakt:** Da bi se poboljšalo širenje agronomskih informacija za farmere su razvijene brojne aplikacije za mobilne telefone u poljoprivredi (AMPA) kako bi se premostile prepreke u znanju između stručnjaka i poljoprivrednika. Međutim, u kojoj meri su farmeri svesni upotrebe ovih aplikacija je neizvesno.

Studija je zato imala za cilj da ispita znanje i stav prema aplikacija AMPAs među farmerima oblasti gajenja korena Cassava (*Manihot esculenta*), na jugozapadu Nigerije. Primenjena je trostepena procedura uzorkovanja i odabir 410 ispitanika za istraživanje. Podaci su analizirani korišćenjem deskriptivnih i inferencijalnih statistika, uključujući brojanje učestalosti, procenete, srednje vrednosti i regresionu analizu.

Nalazi studije su bili: farmeri su pokazali visok nivo znanja za IITA kalkulator za herbicide (80,4%), Airtel 4-2-1 call App. (88,6%) i Akilimo aplikaciju (75,3%).

Farmeri su imali pozitivan stav prema upotrebi IITA kalkulatora herbicida (75,0%), Airtel 4-2-1 call App (84,5%) i Akilimo aplikacije (80,4%).

Regresiona analiza je pokazala da su nivo obrazovanja ( $\beta = 0.260$ ,  $p=0.044$ ) i posedovanje pametnog telefona ( $\beta= 0.278$ ,  $p=0.022$ ) takođe pozitivno značajni za nivo znanja, dok je starost učesnika ( $\beta= -0.278$ ,  $p=0.021$ ) ima negativan značaj.

Studija je zaključila da farmeri u oblasti ovog istraživanja imaju dobro znanje i povoljan stav o AMPA aplikacijama.

Studija je zato preporučila da je važno dizajniranje korisničkih interfejsa (pristupa) koji zadovoljavaju preferencije i potrebe o upotrebljivosti različitih starosnih grupa, imajući u vidu da mlađi korisnici mogu da koriste složene interfejse, dok stariji korisnici mogu da preferiraju za jednostavnim i intuitivnim dizajnama (rešenjima) aplikacija za mobilne telefone.

**Ključne reči:** Poljoprivredne aplikacije, znanje, stav, obrazovanje i vlasništvo nad telefonom

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