

Full Length Research Paper

The Impact of Education on Small-scale Farmers' Use of ICT in Abuja, Nigeria

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The study examined the impact of farmers' level of education on the use of Information Communication Technologies (ICT) – radio, television, GSM phone video, agricultural books, camera and computer. A multi-stage technique was adopted for sampling while questionnaire was used for data collection. A total of 320 farmers made up of those who had primary, secondary, post-secondary and no formal school education were interviewed. Data were analyzed using two-way mixed analysis of variance (ANOVA). Results showed that, on average, farmers with post-secondary education significantly ($p < .05$) used all the types ICT more than those who had at most secondary education. There was no significant difference ($p > .05$) between farmers who had secondary and primary education in the use of all types of ICT but farmers who had secondary education significantly ($p < .05$) used ICT more than those with no formal school education. On the contrary, there was no significant difference ($p > .05$) between farmers who had primary school education and those with no formal school education in the use of all types of ICT. Generally, GSM phone and radio were significantly ($p < .05$) used more than the other ICT while the least used were camera and computer. The paper concluded that the farmers' level of education significantly affected their use of ICT in agriculture.

Keywords: Education, Information Communication Technologies, Agriculture, Small-scale farmers

INTRODUCTION

The importance of formal school education in every society cannot be overemphasized. According to Nigerian National Gender Policy (2006), education improves the individual's quality of life and offers him/her access to employment, income and political power. It does not only provide a favourable mental atmosphere for the acceptance of innovations but positively changes individual's attitude towards change (Anthony, 2007). In other words, education is a powerful instrument that helps to shape life and makes the essence of living meaningful. Education is an important factor in the development of any economy as it determines the quality of skills of an individual, his/her abilities and how well the individual manipulates things around him. This is easily achieved because education provides people with opportunities to acquire knowledge and skills necessary to cope with environmental and other challenges of life

(Adeyanju, 1993). Not only does education changes the attitude, perceptions, actions/reactions and the orientation of individuals for the better, it also equips them with the necessary skills and capacity to perform more roles (Obasi, 2005). As an institution, Agbarevo and Obinne (2010) stated that education is very vital in the society because it is a means of transmitting knowledge, skills and social values.

Specifically in agriculture, Nwaru (2007) stated that education and training help to unlock the natural talents and inherent enterprising qualities of farmers. It also enhances their abilities to understand and evaluate new production techniques. Exposure to education according to Otunaiya and Akinleye (2008) has the potential to increase farmers' ability to obtain, process and use information relevant to the adoption of improved agricultural technologies. Also, Mareila (1991) added

that education helps people to acquire knowledge, make better use of natural resources and protect the environment. In other words, it facilitates a change in attitude that encourages increased production and conservation of resources. To corroborate the importance of education in agriculture, Imonikhe (2010), stated that it enhances farmers' ability to make accurate and meaningful management decisions. This is a fact because Pârgaru, Gherghina and Duca (2009) argued that education is not only about putting individuals in contact with values but also raising them to the level of the values. Empirical evidence attests to the fact that education has impact on agriculture. For example, Mareila (1991), observed that four years of primary school education increased productivity by 7.4 percent with additional benefits in the form of increased modernization of agricultural production incentives among other things. This implies that farmers' level of education is an important factor that determines their ability to understand policies and programmes that affect farming activities. Also, Ezeibe (2011) showed that formal school education had positive and significant effect on the output of a broiler enterprise.

In adoption and use of Information Communication Technologies (ICT) in agriculture, education has also been pinpointed as an important factor. The findings by Derso, Mamo and Haji (2014); Aphunu and Atoma, (2011); Batte (2005); Mishra and Park (2005); Gloy and Akridge (2000) indicated that education is a strong factor that affects the adoption and use of ICT in agricultural production. Although their findings indicated that the higher the level of education of a farmer, the higher his/her ability to adopt and use ICT in the production process but there are some questions that need further clarifications. First, given the fact that the adoption and use of ICT according to their reports depend on the farmers' level of education, do small-scale farmers who have higher school education significantly use all types of ICT more than those with lower education including those with no formal school education? In other words, do small-scale farmers who have post-secondary school education significantly use all types of ICT more than those who have at most secondary education? Similarly, do small-scale farmers who have secondary school education significantly use all types of ICT more than those who have at most primary school education? Again, do small-scale farmers who have primary school education significantly use all types of ICT more than those who do not have any formal school education? Second, does the use of ICT by the small-scale farmers depend on the type of ICT? Irrespective of the farmers' level of education, which ICT is used more than the other in the study area? Providing answers to the questions formed the basis for this research hence the objectives are to:

1. determine if small-scale farmers' use of ICT depends of their level of education.
2. determine if small-scale farmers who have higher

education significantly use all types of ICT more than those in lower educational categories.

3. determine if small-scale farmers' use of ICT depends on the type of ICT (ICT-Type).
4. Identify the most and least utilized ICT by the farmers in each educational category.

The study deserves attention in view of the fact that ICT have the potential to increase the amount of information provided to all stakeholders in the agricultural sector and to lower the cost of disseminating information (Kurtenbach and Thompson, 1999). This is possible because ICT act as a bridge that connects people in different nations, towns, cities, communities and villages irrespective of distance. Globally, ICT have contributed immensely to sustainable development hence understanding the factors limiting the adoption and use of ICT in agriculture shall result in the development of educational strategies and programmes that will boost knowledge sharing among small-scale farmers in rural communities. This will favour the small-scale farmers because Hall et al. (2003) observed that the cost of obtaining, producing and delivering information has decreased because of ICT while the quality and speed of information flow has increased. This benefit can be attributed to the ability of ICT to facilitate knowledge sharing within and among a variety of agricultural networks including researchers, extension workers, input agencies and farmers. In terms of information dissemination, it will assist agricultural extension agents in the choice of contact farmers. In this regard, the more educated and hardworking farmers should be trained in the use of ICT and used as contact farmers in rural communities.

METHODOLOGY

The study was carried out in Abuja, Nigeria located between latitudes $8^{\circ} 25'$ and $9^{\circ} 25'$ North of the equator and longitudes $6^{\circ} 45'$ and $7^{\circ} 45'$ East of Greenwich. The population for the study comprised small-scale farmers who had primary school education, secondary school education, post-secondary school education and those with no formal school education. A multi-stage technique was adopted for sampling while semi-structured questionnaires were used for data collection. In the first stage, four (4) Area Councils (Abaji, Gwagwalada, Kuje, Kwali) were purposively selected out of six (6) because they have farming communities. In the second stage, four (4) communities were purposively selected from each of the 4 Area Councils giving a total of 16 communities. From each of the 16 communities (third stage) 20 farmers (5 from each educational category) were purposively selected and interviewed giving a total of 320 respondents ($4 \times 4 \times 20 = 320$). Agricultural Extension Agents were used as enumerators but they were adequately trained and mobilized for the job. In the questionnaires, the farmers were asked to rate some

ICT (radio, television (TV), GSM phone, agricultural books, camera, video and computer) based on their usefulness using a 4-point scale - *very useful* (3), *moderately useful* (2), *fairly useful* (1) and *not useful at all* (0). The responses from the farmers on the above rating scale were used to run the analysis in line with the method adopted by Ajah (2015, 2014), Robert (2011), Gray and Kinnear (2011) and Field (2005) and Shah and Madden 2004. SPSS 18.00 was used to run the analysis and it was tested at 5% probability level. The model for data analysis is expressed mathematically as:

$$Y_{ijk} = \mu + E_i + I_j + EI_{ij} + e_{ijk} \dots\dots\dots 1$$

Where:

Y_{ijk} = Individual farmers' response regarding his/her level of ICT use in agriculture.

μ = General mean

E_i = Refers to impact of education on farmers' use of ICT (main effect of education). I_j = Refers to impact of

ICT-Type. That is, impact due to differences in the nature of the ICT (main effect of ICT-Type).

EI_{ij} = Interaction effect of farmers' level of education and ICT-Type.

e_{ij} = error term

Model 1 is a two-way mixed analysis of variance (Field, 2005) and the dependent factor is farmers' use of ICT. Education is an independent factor and has four levels (no formal school education, primary school education, secondary school education and post-secondary education) while ICT-Type has seven levels (radio, television (TV), GSM phone, agricultural books, camera, video and computer). By interpretation, the model states that farmers' use of ICT (Y_{ijk}) depends on their level of education (E_i), the nature of the ICT (ICT-Type) and the interaction effect of education and ICT-Type (EI_{ij}). The μ is a constant value and it does not contribute to any variation in the observed differences (Aggarwal, 2002) while e_{ijk} is the error term.

RESULTS AND DISCUSSION

Table 1: ANOVA results on the impact of education on farmers' use of ICT

Sources of variation	Df	SS	MS	F-cal	P-value
ICT-Type	6	1620.97	270.16	450.26	.00
Education*ICT-Type	18	60.67	3.37	5.62	.00
Error (ICT-Type)	1896	1128.94	0.60		
Education	3	234.52	7.84	49.00	.00
Error (Education)	316	50.97	0.16		

Table 1 shows the results of the two-way mixed analysis of variance (ANOVA) done to determine the impact of farmers' level of education on the use of ICT (radio, agricultural books, television (TV), GSM phone, video, camera and computer) in agriculture. The results indicated that the use of ICT in agriculture significantly ($p < .05$) depended on the nature of the ICT (ICT-Type), farmers' level of education and the interaction effect of education and ICT-Type. Based on the results, mean separation was done and the results are presented in charts (Figure.1-13).

The result showing how the farmers generally rated the usage of each ICT (the main effect of ICT-Type) is shown in Table 1. Here, emphasis is not on farmers' educational status but on the type (nature) of ICT used. The question is: Irrespective of educational status or category, do farmers' use of ICT depends on the nature of the ICT (ICT-Type)? It tests the hypothesis which states that farmers' use of ICT does not significantly depend on the type of ICT. That is, $\mu_{Radio} = \mu_{Television} = \mu_{GSM\ phone} = \mu_{Camera} = \mu_{Video} = \mu_{Agric-books} = \mu_{Ccomputer}$. The result, $F(6, 1896) = 450.26, p = 0.00$, indicated that the farmers' use of ICT significantly depended on the type of ICT hence the null hypothesis was rejected. Mean separation (Figure 1) indicated that the most useful ICT was GSM phone. In other words, whether a farmer has any form of formal education or not, GSM phone was the

most utilized ICT while computer was the least used by the farmers. The use of GSM phone was significantly ($p < .05$) more than the use of radio and the use of radio was significantly higher ($p < .05$) than the use of television. The uses of agricultural books and camera were not significantly different from each other but significantly higher ($p < .05$) than the use of video and computer. Also, the use of camera was significantly higher ($p < .05$) than the use of computer. The predominant use of GSM phone is an evidence of its multiple uses and wide application in all aspects of life. This agrees with the findings of Franklyn, Mohammed and Obidi (2012) and it can be attributed to the existence or coverage of different GSM phone networks in most rural communities in Abuja. Again, apart from being cost-effective, GSM phone is among the contemporary ICT that can easily be manipulated by the farmers. That computer was the least used is in line with the apriori expectation because of the cost and technicalities involved in its operations.

The result showing how small-scale farmers in different educational categories rated the use of all types of ICT - the main effect of education - is shown in Table 1. Here, emphasis is placed on the farmers' level of education and not on ICT-Type. The question is: Do farmers' in different educational categories significantly

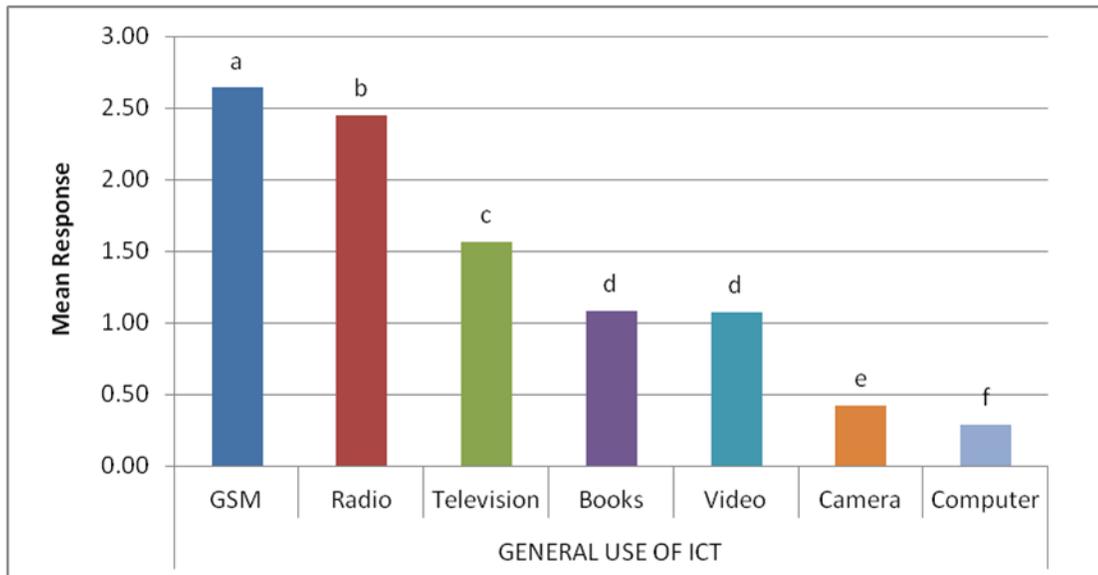


Figure 1: Farmers' rating of the use of ICT irrespective of educational status

Note: Means with the same alphabet do not significantly differ from each other.

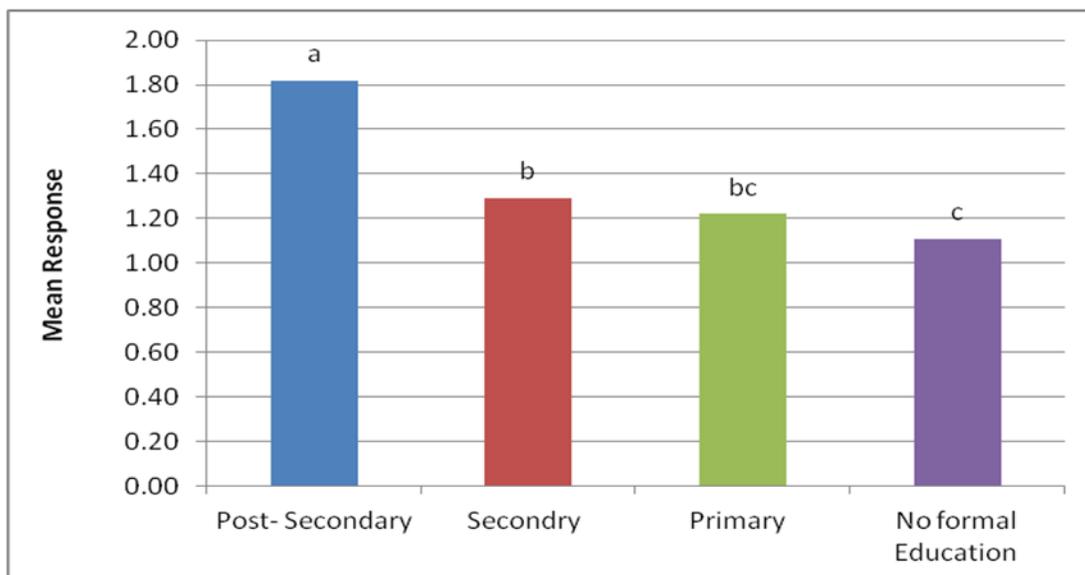


Figure 2: Farmers' rating of the use of ICT irrespective of ICT-Type

Note: Means with the same alphabet do not significantly differ from each other

differ in their use of all types of ICT? It tests the hypothesis which states that farmers' use of all types of ICT does not depend on farmers' educational status ($\mu_{\text{No formal Education}} = \mu_{\text{Primary Education}} = \mu_{\text{Secondary Education}} = \mu_{\text{Post-Secondary Education}}$). The result, $F(3, 316) = 49.00$, $p = 0.00$, shows that there was a significant ($p < .05$) relationship between farmers level of education (educational status) and use of ICT, hence the null hypothesis was rejected. Mean separation (Figure. 2) revealed that farmers with post-secondary school education significantly ($p < .05$)

used all types of ICT more than farmers who had, at most, secondary school education. This agrees with the findings of Simonyan, Olukosi and Omolehin (2010) and Okwuekenye and Onemolease (2010) which showed that education enhances farmers' capacity to appreciate and comprehend the use of modern farm technologies that enhance output and income. On the other hand, there was no significant difference ($p > .05$) between farmers who had secondary school education and those with primary school education in the use of all types ICT

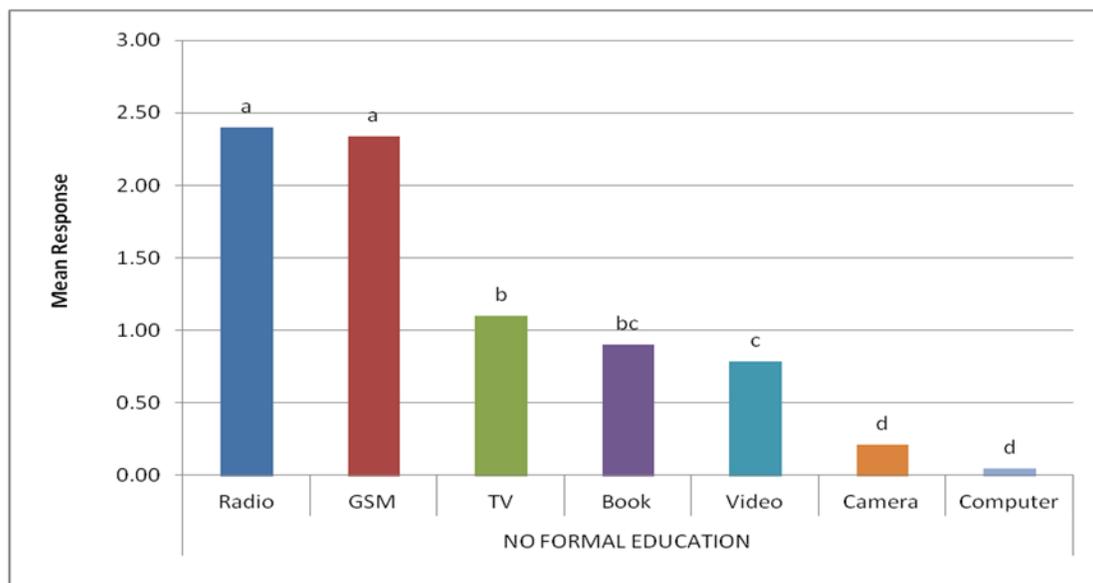


Figure 3: Use of ICT by farmers with no formal education

Note: Means with the same alphabet do not significantly differ from each other

but farmers who had secondary school education used all the types of ICT more than those with no formal school education. Again, there was no significant difference in the use of all types of ICT between farmers who had primary school education and those with no formal school education.

The interaction between education and ICT-Type (Education*ICT-Type) is shown in Table 1. The result shows how the small-scale farmers in each educational category rated their usage of each of the ICT. Here, the question is: Do farmers in any of the four educational categories (post-secondary, secondary, primary and no formal school education) significantly used each of the ICT more than farmers in other categories? It tests the hypothesis which states that there is no significant interaction effect of education and ICT-Type. That is, ($\mu_{\text{Use of Radio by No formal Education}} = \mu_{\text{Use of Radio by Primary Education}} = \mu_{\text{Use of Radio by Secondary Education}} = \mu_{\text{Use of Radio by Post-Secondary Education}} \dots = \mu_{\text{Use of Computer by Post-Secondary Education}}$). The result, $F(18, 1896) 5.62, p = .00$, showed that there was significant ($p < .05$) interaction effect between farmers' level of education and ICT-Type resulting in the rejection of the null hypothesis. The breakdown of the results of the interaction is presented in Figure 3 -13.

First, we look at how farmers who had no formal school education rated their usage of each ICT (Figure 3). The mean responses showed that radio and GSM phone were the most utilized ICT by this category of farmers. There was no significant difference ($p < .05$) in the farmers' use of radio and GSM phone but the two (radio and GSM phone) were significantly ($p < .05$) used more than the other ICT. The least used ICT by this category of farmers were camera and computer. The magnitude of the mean responses suggests that camera

and computer were hardly used by the farmers. This is in line with apriori expectation because farmers with no formal school education may not know the importance of camera and computer in agriculture and even if they know, it may not be relevant considering their scale of operation. Again, camera, computer and video fall under contemporary (modern) ICT that are mostly accessed under hired basis compared to conventional (old) ICT such as radio (Nnenna, 2013). In addition, farmers with no formal school education may not have the skill involved in operating contemporary ICT.

Second, we consider the use of ICT by the farmers who had primary school education (Figure 4). The analysis reflects the impact of primary school education on small-scale farmers' use of each of the ICT. The mean responses indicated that there was no significant difference ($p > .05$) in the farmers' use of GSM phone and radio but the level at which they used radio and GSM phone was significantly higher ($p < .05$) than the way they used TV, video and agricultural books. The least used ICT by farmers were camera and computer and it tallied with the results obtained from farmers in other educational categories (Figures. 3, 5 and 6). Remarkably, the mean responses indicated that GSM phone was relatively used more than radio and this is contrary to what was obtained from farmers with no formal education (Figure 3) where the reverse was the case. Looking at the magnitude of the mean responses, farmers who had primary school education used radio and GSM phone more than farmers who had no formal school education (Figure 3). The third most useful ICT was TV and it is in line with the findings of Adegbidi, et al. (2012) which indicated that radio, GSM phone and TV were used more by rural farmers.

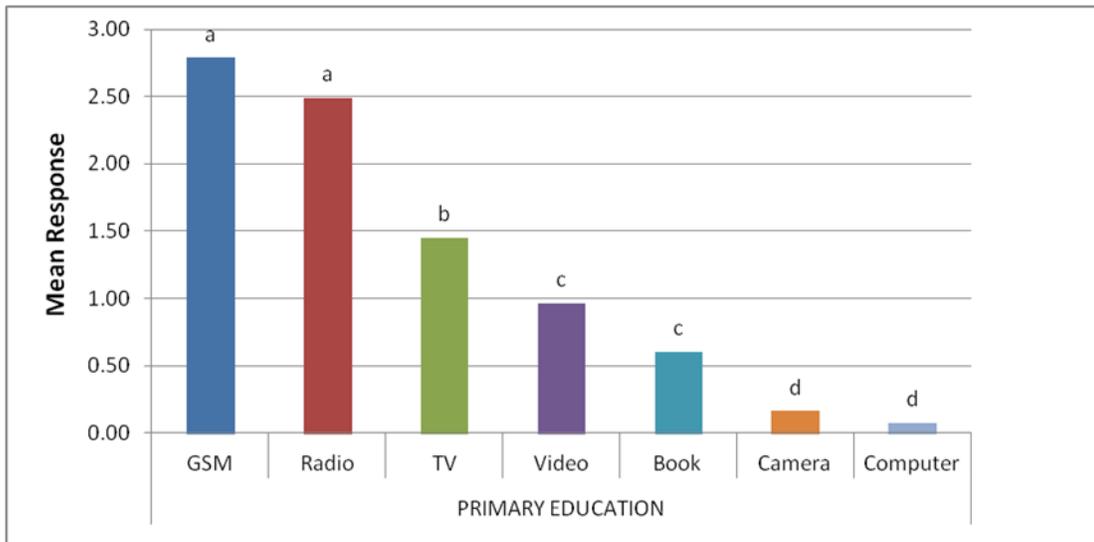


Figure 4: Use of ICT by farmers with primary school education

Note: Means with the same alphabet do not significantly differ from each other

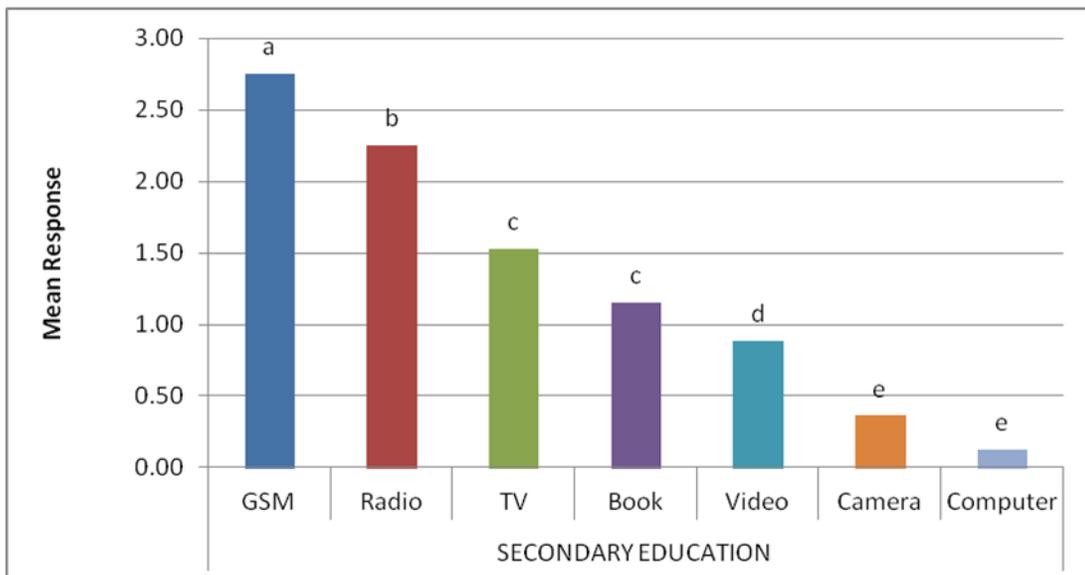


Figure 5: Use of ICT by farmers with secondary school education

Note: Means with the same alphabet do not significantly differ from each other.

Third, the result in Figure 5 shows the level of usage of ICT by farmers who had secondary school education which comes after primary education in Nigeria. The mean response indicated that the most utilized ICT was GSM phone. The use of GSM phone was significantly higher ($p < .05$) than the use of radio and other ICT while the use of radio was significantly ($p < .05$) higher than the use of TV, agricultural books, video, camera and computer. There was no significant difference ($p > .05$) in the use of TV and agricultural books but they (TV and agricultural books) were significantly utilized more than

video, camera and computer. The least used ICT were camera and computer. This also tallied with the results obtained from farmers in other educational categories (Figures. 3, 4 and 6). Although some of the mean responses did not significantly differ ($p > .05$), it should be noted that the magnitude of the mean responses was not the same suggesting that there were marginal differences (variations) in the level of ICT usage by the small-scale farmers.

Fourth, the result in Figure 6 shows the utilization of ICT by farmers that had post-secondary school

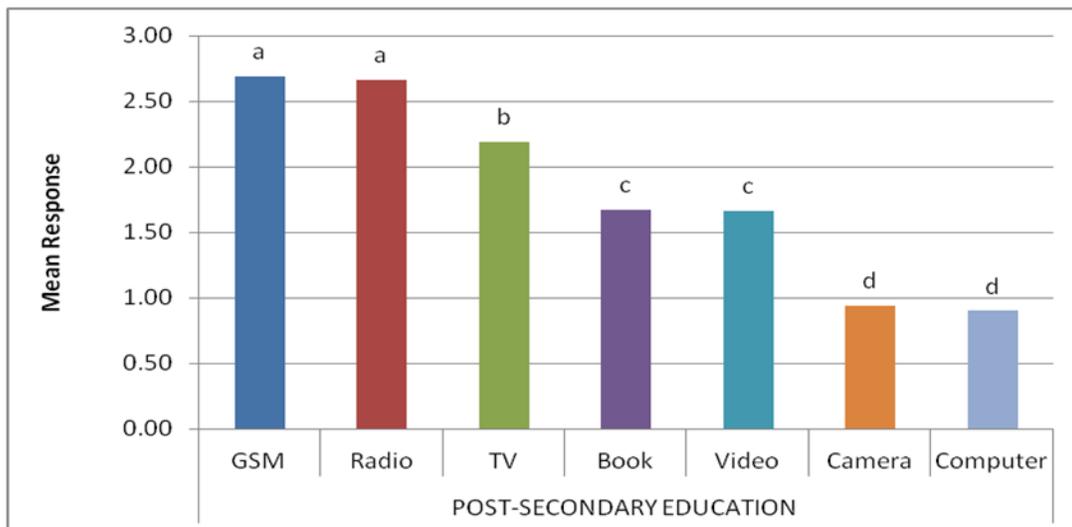


Figure 6: Use of ICT by farmers with post-secondary school education

Note: Means with the same alphabet do not significantly differ from each other.

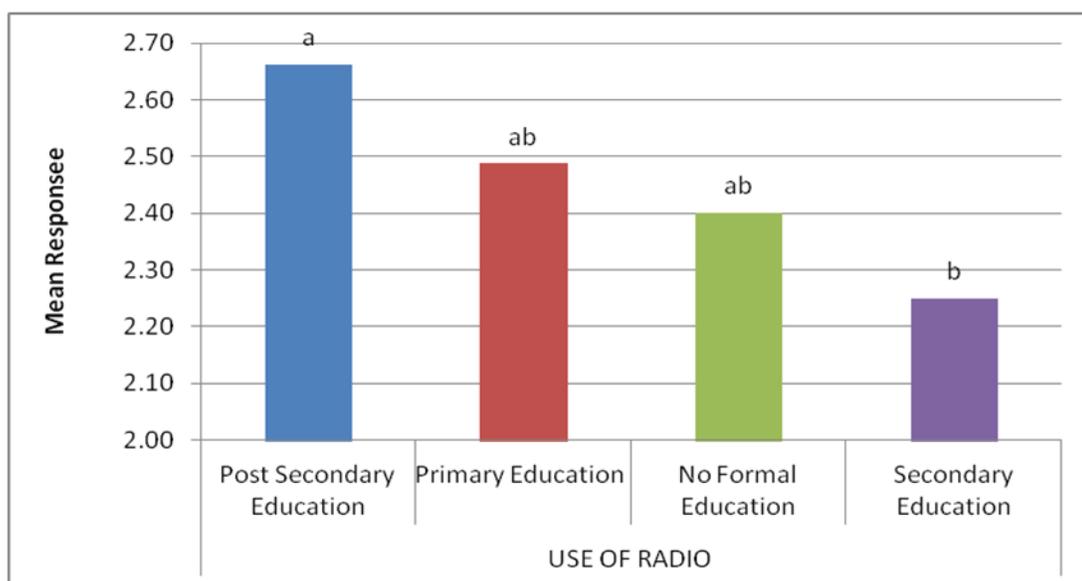


Figure 7: Use of radio by farmers in different educational categories

Note: Means with the same alphabet do not significantly differ from each other

education. The mean responses showed that GSM phone and radio were the most utilized ICT by the farmers. There was no significant difference ($p > .05$) in the use of GSM phone and radio but the two were significantly used ($p < .05$) by the farmers more than other ICT. The third most used ICT was TV and it was significantly ($p < .05$) used more than video and agricultural books. There was no significant difference ($p > .05$) in the use of video and agricultural books but comparatively, they (radio and agricultural books) were significantly ($p < .05$) used more than camera and

computer. Like the results in Figure 3, 4 and 5, the least used ICT by the farmers were camera and computer.

Further analysis was done (Figure 7 – 13) and the mean responses revealed that apart from the use of GSM phone (Figure 8), farmers who had post-secondary school education significantly ($p < .05$) used radio (Figure 7), TV (Figure 9), video (Figure 10), agricultural books (Figure 11), camera (Figure 12) and computer (Figure 13) more than those who had, at most, secondary school education. This supports the result in Figure 2 and also in line with the findings of Adamides,

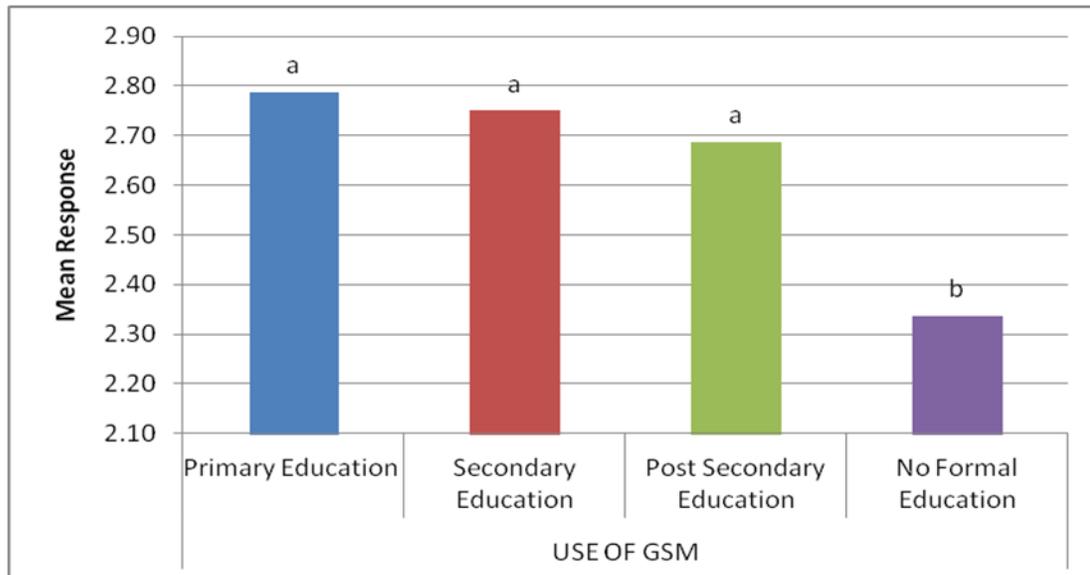


Figure 8: Use of GSM by farmers in different educational categories

Note: Means with the same alphabet do not significantly differ from each other

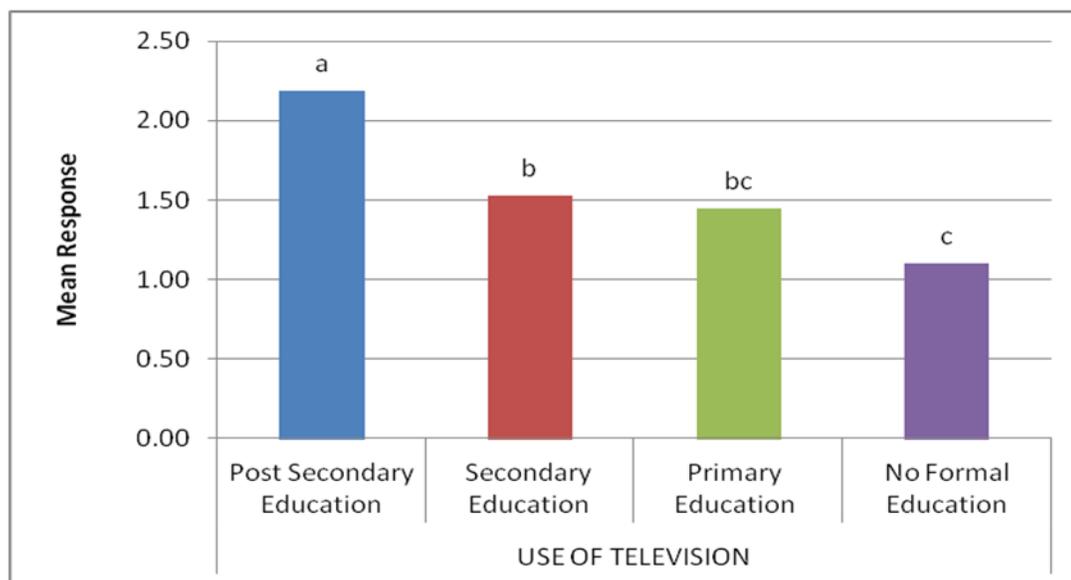


Figure 9: Use of Television by farmers in different educational categories

Note: Means with the same alphabet do not significantly differ from each other

et al. (2013) who observed that educated farmers, especially those who have tertiary school education are more exposed to new technologies and invariably adopt and use them in their farm. In the case of GSM phone usage, there was no significant difference ($p > .05$) between farmers who had primary, secondary and post-secondary school education but farmers in these educational categories significantly ($p < .05$) used GSM phone more than those who had no formal education. Ironically, the magnitude of the mean responses showed

that farmers who had primary school education, used GSM phone (Figure 8) more than farmers who had secondary and post-secondary school education. This is contrary to the apriori expectation and needs further investigation because it was expected that farmers who had post-secondary education would use GSM phone more than farmers in other educational categories.

Again, apart from the use of TV (Figure 9), there was no significant difference ($p < .05$) in the use of radio (Figure 7), computer (Figure 13), video (Figure 10),

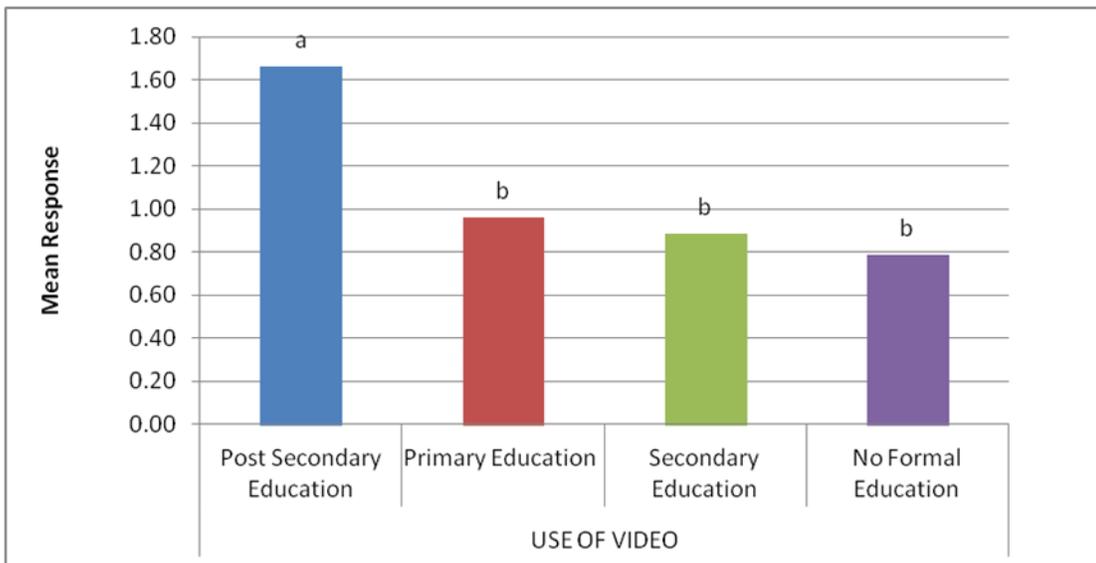


Figure 10: Use of video by farmers in different educational categories
Note: Means with the same alphabet do not significantly differ from each other

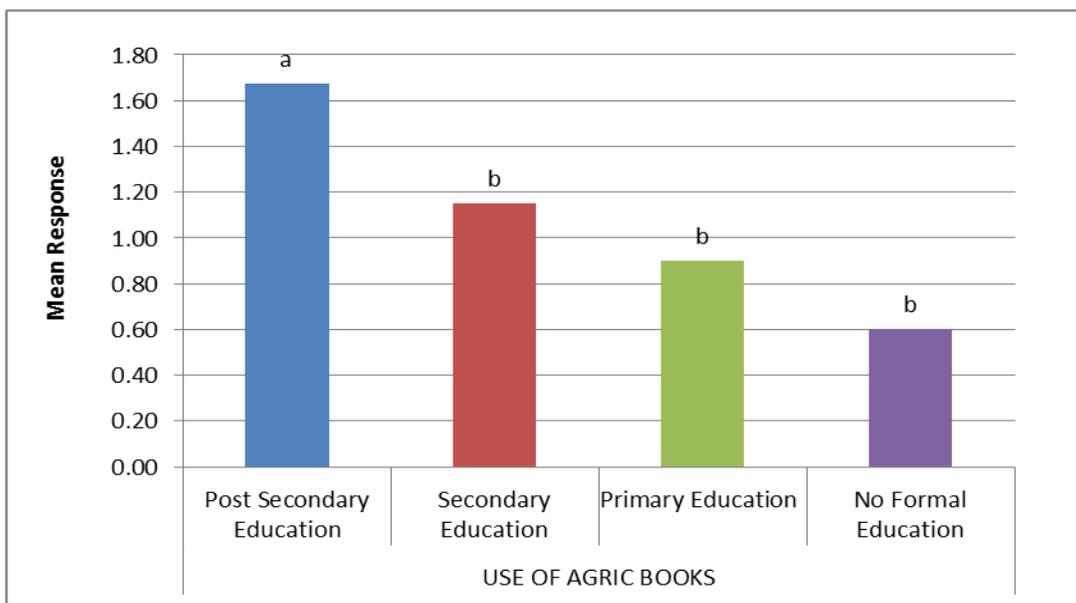


Figure 11: Use of agricultural books by farmers in different educational categories
Note: Means with the same alphabet do not significantly differ from each other

camera (Figure 12) and agricultural books (Figure 11) between farmers who had, at most, secondary school education and no formal education. Farmers who had secondary school education significantly used TV more than those with no formal school education. Although, Figure 2 showed that, on average, farmers who had post-secondary school education used all types of ICT more than farmers who had, at most, secondary school education, Figure 7 – 13 showed that there were variations in the use of each of the ICT. This underscores the importance of using the two-way mixed

ANOVA for the analysis. Based on the findings, there is no strong evidence to conclude that farmers who had post-secondary school education used each of the ICT more than those who had secondary school education. In the same way, there was no evidence to conclude that farmers who had secondary school education used each of the ICT more than those who have primary school education. Also, there was no evidence to affirm that farmers who had primary school education used each of the ICT more than those with no formal school education.

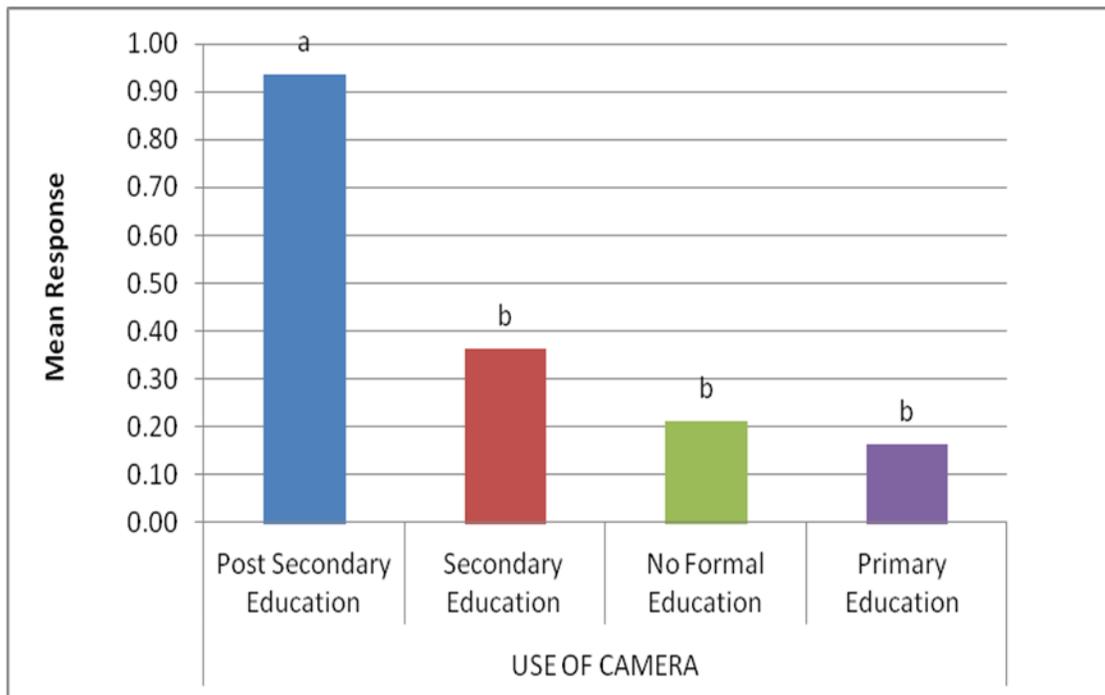


Figure 12: Use of camera by farmers in different educational categories

Note: Means with the same alphabet do not significantly differ from each other

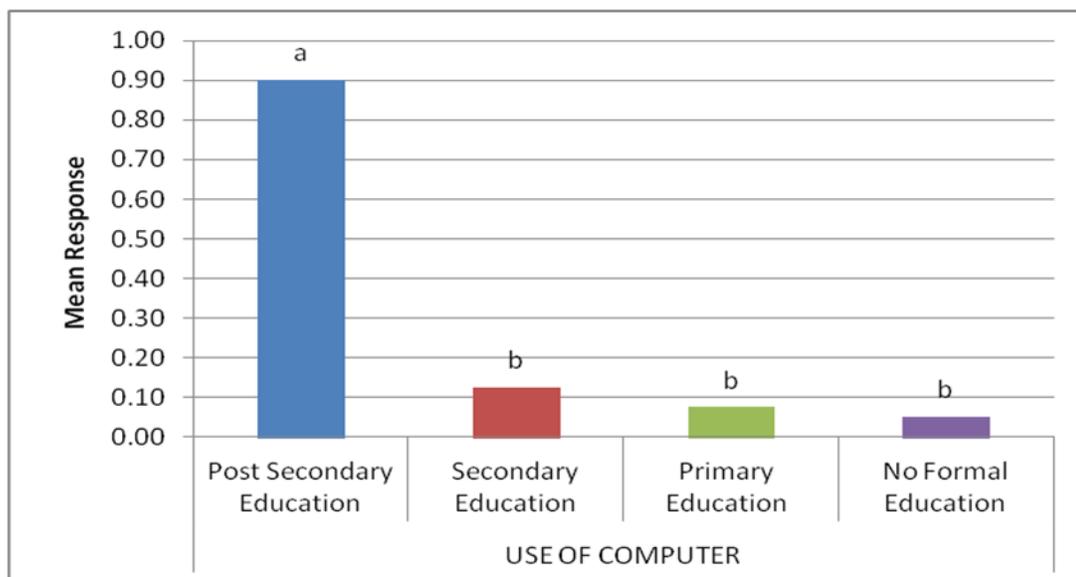


Figure 13: Use of computer by farmers in different educational categories

Note: Means with the same alphabet do not significantly differ from each other

CONCLUSIONS

The importance of education and Information Communication Technologies (ICT) in the global economy especially in agricultural development

necessitated this study. The main objective is to determine if small-scale farmers' level of education affects their use of ICT in Abuja Nigeria. In other words, if differential use of ICT exists among farmers with no formal school education, primary school, secondary school and post-secondary school education. The

outcome of the study has some policy implications. First, the main effect of education was significant resulting in the conclusion that farmers' use of ICT depends on their educational status. On average, the farmers who had post-secondary school education used all types of ICT more than those who had, at most, secondary school education. The policy implication of this is that farmers who have post-secondary education should be used more by extension agents as contact farmers. Second, the main effect of ICT-Type was also significant indicating that irrespective of educational status of the farmers, some ICT were used more than others. For instance, the farmers used GSM phone and radio more than other ICT. In this regard, extension agents and rural development officers should make more use of GSM phone and radio in information dissemination. Third, there was significant interaction of farmers' educational status and ICT-Type suggesting that there were variations in the use of each of the ICT by the farmers who had post-graduate, secondary, primary and no formal school education. It was recommended that more research should be conducted in other to see if similar conditions exist in other locations in Nigeria so that appropriate educational policies and programmes aimed at agricultural development can be based on empirical evidence rather than perception.

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