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## Comparison of use of Information and Communication Technologies between Agricultural Researchers and Extension Personnel in Nigeria

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### Abstract

*The study compared the use of ICTs between researchers and extension personnel. Agricultural researchers and extension personnel constituted the study population. Multistage random sampling was adopted to select the respondents. Proportionate random sampling technique was used to select three, two and two of the research stations in the South-West, Central and North-West agricultural zones respectively while the only research stations in each of South-East and North-East zones were selected. Ten percent of the researchers at the selected stations were randomly sampled. Then, 10% of the extension personnel in the 6 state ADPs, where the research stations are located were randomly selected. Structured questionnaire was used to collect information from the respondents. Descriptive and inferential statistics were used to analyse the variables of the study at  $p=0.05$ . Most researchers (75.3%) and few extension personnel (34.1%) had high ICT knowledge score. Mean ICT use score was  $33.0\pm 15.8$  for researchers and  $25.8\pm 15.0$  for extension personnel. The log likelihood of researchers' use of ICTs was significantly reduced by grade level ( $\beta=-0.729$ ), increased by access to ICTs ( $\beta=1.807$ ) and increased by perception of use of ICTs ( $\beta=0.303$ ). The log likelihood of extension personnel's use was significantly increased by available ICT facilities ( $\beta=0.343$ ), access to ICTs ( $\beta=1.410$ ), and constraint assessment ( $\beta=0.182$ ). The disparity in ICT availability to agricultural researchers and extension personnel presents a serious challenge to agricultural information management in Nigeria. Hence, availability and accessibility were the major determinants of Information and Communication Technologies used by researchers and extension personnel.*

**Keywords:** Researchers, extension personnel, ICTs use

### Introduction

Information and Communication Technology (ICT) is an umbrella term that includes anything ranging from radio to satellite imagery to mobile phones or electronic money transfers (Mcnamara, Belden, Kelly, Pehu, and Donovan, 2011). They are the set of tools, equipment, applications and services that are used to produce, store, process, distribute and exchange information. The ICTs include the previously known facilities like radio, television, telephone, video, over-head projectors among others, as well as other digital facilities such as computer, CD-ROM technology, digital networking, satellite and other wireless technologies (like GSM and the Internet). The combination of the various ICTs (old and new) "are now able to work together to form our 'networked world' – a massive infrastructure of interconnected computers, telephone services, the Internet, radio and TV, which reaches into every corner of the globe" (UNDP, 2001). ICT is one of the solutions,

which has recently unleashed incredible potential to improve agriculture in developing countries specifically. The technology has taken an enormous leap beyond the costly, bulky, energy-consuming equipment once available to the very few to what is now used to store and analyse agricultural and scientific data (Mcnamara *et al.*, 2011).

Research in agriculture is widely recognised as one of the most significant tools for sustainable agricultural productivity and economic development in the developing countries, including Nigeria. The research activities are required to fulfil the essence of agriculture; meeting the food and economic needs of the nation, provide employment for the populace, as well as preserve the natural resources (Islam, 2007). Moreover, the policy makers, researchers and other stakeholders in agriculture acknowledge that information services provision and utilisation are key components of research and development efforts in agriculture, thus the need for effective information service provision (Rivera, Qamar, and Mwandemere, 2005).

The agricultural extension system is an important actor in agricultural and rural development efforts in Nigeria. Extension activities are implemented by the Agricultural Development Programmes (ADP) and other civil societies, private and university-based extension service providers. The ADP, which basically used extension approaches, has impacted in so many ways on the target populace and has been adopted by all state governments in the country. Several dissemination methods have been used in the history of the institution's activities, which include the ministry-based conventional system, commodity-based system, university extension system and the current integrated agricultural development approach.

Effective information dissemination for agricultural research and development in the developing countries is not optimal between the national and international research institutions. There is also a great problem in the transfer of information from research institutions to the national extension systems, and a greater one in disseminating to the information users (farmers among others). The research and development institutional infrastructure may be in place, but there are substantial blocks to information in the hierarchy of information and knowledge dissemination which makes information inaccessible to farmers. Thus, a situation of knowledge divide exists between the more affluent research institutions and the less affluent delivery (extension) institutions. The trend led to a situation in which the critical information required for agricultural development remains largely unavailable and the farmers have to resort to seeking information from whatever source is available to them and hence, a reflection of the sub-optimal agricultural development level (George, Morin, and Quito, 2002).

There has been tremendous improvement in the Nigerian digital ICTs, where teledensity rose from 0.73% in 2001 to 53.23% by the end of 2009 (NCC, 2010); it is thus important to assess the potential application of the tools for agricultural information dissemination. It is

also relevant to find out the extent to which agricultural information system in Nigeria has adopted the technology in their activities.

Given the foregoing, this study did a comparative assessment of the use of ICTs by researchers and extension personnel in Nigeria; it specifically aimed to:

1. Identify the available ICTs to the research and extension personnel
2. Assess the level of their knowledge in the use of ICTs
3. Ascertain their attitudes to the use of ICTs in their activities
4. Highlight the constraints they encountered in the use of ICTs in their activities
5. Determine the factors that influenced their use of ICTs

## **Methodology**

The study was carried out throughout the five agricultural zones in Nigeria. Agricultural researchers and extension personnel constituted the study population. Multistage random sampling was adopted to select the respondents. The first stage involved the use of proportionate random sampling technique to select three research stations in the South-West, two from Central and two from the North-West agricultural zones while the only research stations in each of South-East and North-East zones were selected. The second stage involved a random selection of 10% of the researchers at the selected stations giving 73 researchers. For the ADPs, 10% of the extension personnel in the 6 states, where the research stations have been selected were randomly selected, which gives 135 extension respondents. Structured questionnaire was used to collect information from the respondents according to the objectives of the study. Descriptive and inferential statistics such as frequencies and percentages were used to analyse the data collected, while binomial logit regression model and t-test were the inferential statistics used for the study. All tests were carried out at  $p=0.05$ .

## **Results and Discussion**

### **Available ICTs**

The extent to which the ICT tools were available to the practitioners was pursued and the result is as given in Table 1.

The responses of the research practitioners indicated that radio was available to 57.5 percent of them and 52.1 percent indicated that television was available to them. Result also shows that telephone was available to 50.7 percent of them; multimedia projector to 45.2 percent of them and 34.2 percent indicated that internet was available to them.

The responses of the extension practitioners showed that 63.7 percent of them indicated that radio was available and television was available to 57.0 percent of them. It also showed that telephone was available to 56.3 percent of them, multimedia projector to 14.1 percent of them and 8.1 percent of the extension personnel indicated that the internet was available.

This showed that radio and TV were the mostly available ICTs to the research/extension practitioners, followed by telephone. This is in consonance with the finding of Arokoyo (2003) that radio and TV have been the major ICTs used in agricultural extension delivery in Nigeria.

**Table 1: Distribution research and extension personnel by the available ICT facilities**

| Available facilities | Researchers | Extension personnel |
|----------------------|-------------|---------------------|
| Radio                | 57.5        | 63.7                |
| TV                   | 52.1        | 57.0                |
| Video                | 30.1        | 15.6                |
| Video CD             | 9.6         | 7.4                 |
| Telephone            | 50.7        | 56.3                |
| Multimedia Projector | 45.2        | 14.1                |
| CD-ROM Technology    | 6.8         | 2.2                 |
| Internet             | 34.2        | 8.1                 |
| Total                | 73 (100.0)  | 135 (100.0)         |

Figures in parentheses are percentages

\* Multiple responses

Source: Field survey (2007)

### **Knowledge about the use of ICTs**

This objective was pursued by conducting a knowledge test for the research and extension personnel. Their responses were assessed and rated; their knowledge scores had mean of 28.73 and standard deviation of 22.20. Those who scored between 0 and just below the mean were categorised as having low level of ICT knowledge, while those who scored between the mean and the maximum of 75 were categorised as having high level of ICT knowledge.

The distribution of the respondents' ICT knowledge level in Fig 1 showed that 75.3 percent of the researchers had high level of ICT knowledge while 34.1 percent of the extension personnel had high level of ICT knowledge. The finding revealed a disparity between the levels of ICT knowledge among the research and extension practitioners in the country, with more researchers having high knowledge of ICT than the extension personnel. This can be explained by the fact that the researchers had better access to the digital ICT facilities than the extension personnel as shown in Table 1. The implication of this finding is that even if the facilities were provided, without the knowledge of use, the benefits will not be realised. Hence, information on access to ICTs are not enough to explain the extent or willingness to use ICTs; as this will likely be significantly influenced by the users' knowledge/skills (Schmidt and Stork, 2008).

The low level of ICT knowledge of the extension practitioners is an indication of their limitation to disseminate information using the robust facilities enabled by the ICTs. Given the fact that they have primary responsibility for information dissemination, it is important that these practitioners be adequately enabled with knowledge of ICTs as advocated by UNDP (2001) such that their institutions can act as important identifiers and promoters of

new initiatives, especially when they have a good understanding of the potentials of the facilities.

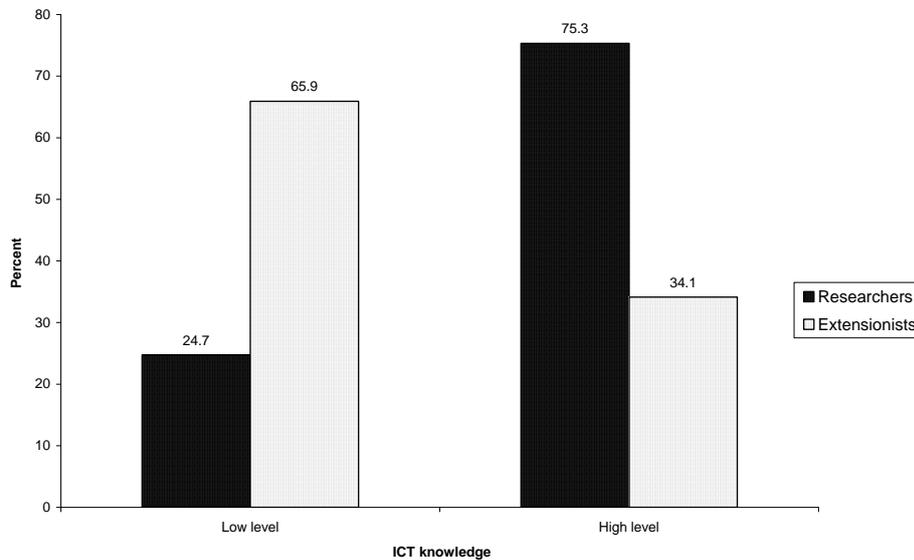


Fig 1: Distribution of research and extension practitioners by level of ICT knowledge

### Perception of use of ICTs

The categorisation of the responses on the perception scale as given in Fig 2 shows that 69.9 percent of the research practitioners had favourable perception, while 43.7 percent of the extension practitioners had favourable perception of the use of ICTs in their activities.

This infers that more of the researchers had favourable perception while most of the extension personnel had unfavourable perception about the use of the ICT facilities in their activities. Their knowledge about use and extent of interaction with the facilities may inform their disposition to their use. This is consistent with the finding of Sampath-Kumar and Kumar (2010), who reported that university faculty members in India have favourable perceptions to the use of ICTs on the basis of consistent use of the facilities.

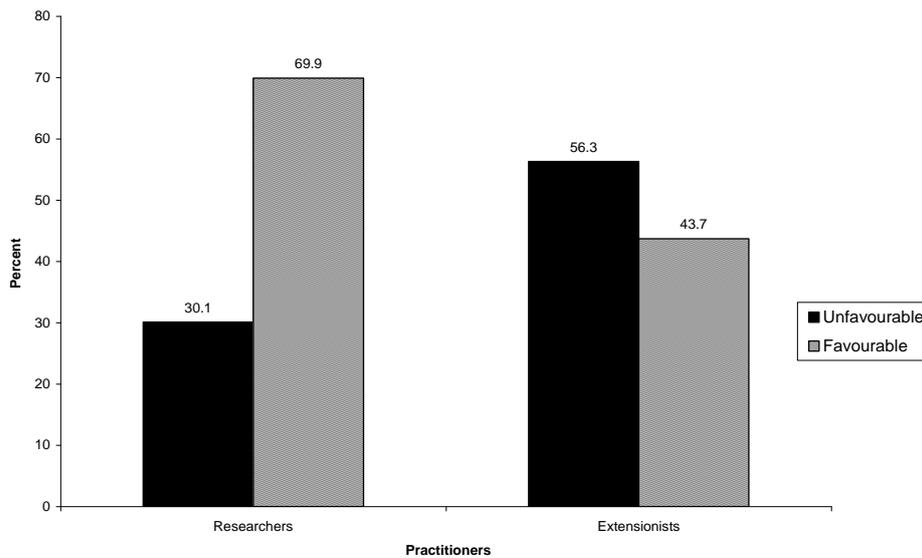
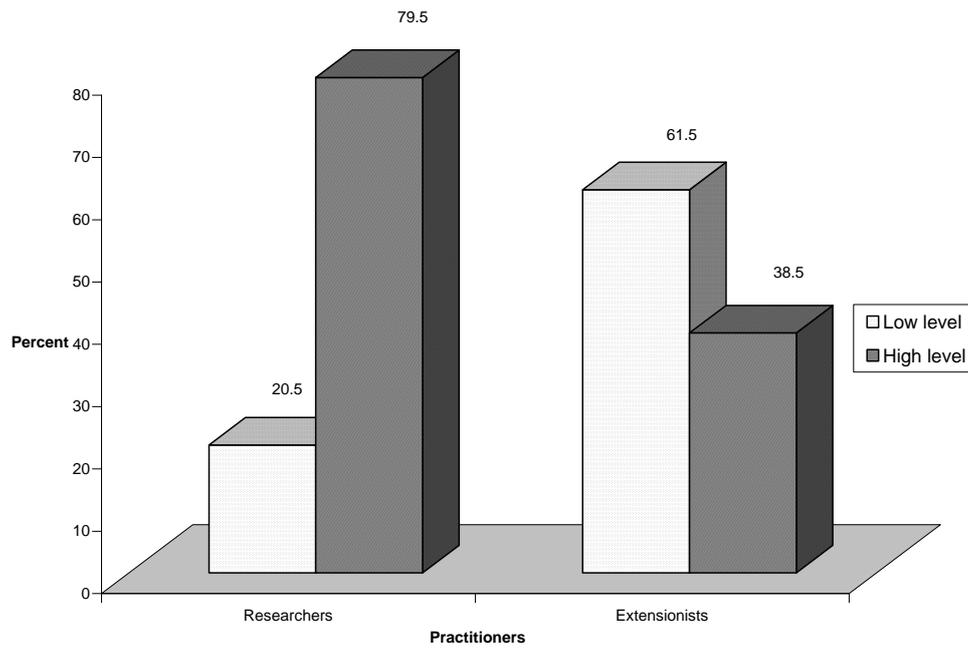


Fig 2: Distribution of researchers/extension personnel by perception to use of ICTs in their activities

### Level of use of ICTs

The index of extent of use of ICTs was categorised into two, based on above and below the mean index of 27.95. Distribution of the respondents according to this categorisation in Fig 3 shows that 79.5 percent of the research practitioners fell within the high level category of ICT users, while 38.5 percent of the extension personnel fell within the high level category of ICT users. This highlights the disparity in the level of use of ICTs by the different set of agricultural information managers in the country. This might be as a result of the fact that the research institutions are better funded by governments than extension institutions. This is alluded to by George *et al.* (2002), who stated that the research institutions are more affluent than the less affluent delivery (extension) institutions in Nigeria.



### Determinants of use of ICTs

Results of the binomial logit regression analysis for researchers as shown in Table 2 indicates that level of ICT use is significantly but negatively ( $t=-2.021$ ;  $p=0.043$ ) influenced by grade level. This implies that being at higher grade level lowers the probability of ICT use. It also shows a significant ( $t=2.938$ ;  $p=0.003$ ) influence between level of use and official access to ICTs; implying that having higher level of official access to ICTs increases the probability of using the ICTs. The analysis also shows that favourable perception about ICT use significantly ( $t=2.477$ ;  $p=0.013$ ) increase the odd of use of the facilities. This implies that having favourable perception about use of ICTs increases the probability of using the facility more than those who have unfavourable perceptions.

**Table 2: Binomial logit estimation of factors determining researchers' use of ICTs**

| <b>Variables</b>                              | <b>Coefficient</b> | <b>t-ratio</b>                      | <b>p-value</b> |
|---|--------------------|-------------------------------------|----------------|
| Constant                                      | -8.630             | -1.664                              | 0.096          |
| Sex   | -1.893             | -1.176                              | 0.240          |
| Grade level                                   | -0.729             | -2.021                              | 0.043*         |
| Years in service                              | 0.443              | 0.656                               | 0.512          |
| Education                                     | 1.323              | 1.893                               | 0.058          |
| Level of computer training                    | 0.107              | 0.030                               | 0.976          |
| ICT facilities availability                   | 0.366              | 1.342                               | 0.180          |
| Official access to ICT facilities             | 1.807              | 2.938                               | 0.003*         |
| Constraints assessment                        | 0.133              | 1.674                               | 0.094          |
| Level of ICT knowledge                        | -0.109             | -0.522                              | 0.602          |
| Perceived importance of ICTs to work schedule | -0.524             | -1.186                              | 0.236          |
| Perception of ICT use                         | 0.303              | 2.477                               | 0.013*         |
| Sample size = 73                              |                    | Log likelihood function = -27.919   |                |
| Chi-squared = 31.770                          |                    | Restricted log likelihood = -43.804 |                |
| Degree of freedom = 12                        |                    | * Level of significance = 0.05      |                |

Source: Computed from Field survey (2007)

Results of analysis for the extension personnel in Table 3 shows that level of ICT use is significantly ( $t=2.043$ ;  $p=0.041$ ) influenced by availability of ICT facilities. This implies that availability of ICT facilities to the practitioners increases probability of its use by them. It also shows a significant ( $t=2.625$ ;  $p=0.009$ ) relationship between level of use and official access to ICTs; implying that more official access to ICTs increases the probability of using the facilities by the practitioners. The analysis also shows that level of ICT use is significantly ( $t=4.021$ ;  $p=0.000$ ) influenced by the perception of severity of constraints to use of the facilities. This implies that adequacy in constraints assessment increases the probability of use of ICTs among the practitioners.

**Table 3: Binomial logit estimation of factors determining extension personnel' use of ICT**

| <b>Variables</b>                              | <b>Coefficient</b>                  | <b>t-ratio</b> | <b>p-value</b> |
|---|-------------------------------------|----------------|----------------|
| Constant                                      | -2.940                              | -0.878         | 0.380          |
| Sex   | -0.552                              | -0.807         | 0.420          |
| Grade level                                   | -0.356                              | -1.489         | 0.137          |
| Years in service                              | -0.636                              | -1.831         | 0.067          |
| Education                                     | -0.283                              | -0.846         | 0.398          |
| Computer training                             | 0.704                               | 0.376          | 0.707          |
| ICT facilities availability                   | 0.343                               | 2.043          | 0.041*         |
| Official Access to ICT facilities             | 1.410                               | 2.625          | 0.009*         |
| Constraints assessment                        | 0.182                               | 4.021          | 0.000*         |
| Knowledge of ICT use                          | 0.881                               | 0.827          | 0.408          |
| Perceived importance of ICTs to work schedule | 0.301                               | 1.704          | 0.088          |
| Perception on ICT use                         | -0.288                              | -0.563         | 0.573          |
| Sample size = 135                             | Log likelihood function = -59.666   |                |                |
| Chi-squared = 61.539                          | Restricted log likelihood = -90.436 |                |                |
| Degree of freedom = 12                        | *Level of significance = 0.05       |                |                |

Source: Computed from field survey (2007)

## Conclusion

The finding that research practitioners had better access to ICT tools than their extension counterpart showed that there is disparity in the provision of the facilities to the institutions. Researchers use more of the digital ICT formats than the extension personnel, who mostly use analogue ICTs. The study's finding that most of the researchers and fewer of the extension personnel have favourable perception to the use of ICTs in their information management activities implies the need for other factors apart from provision of the facilities to engender the use of ICTs for agricultural information delivery in Nigeria. The fact that more of researchers and fewer of extension personnel have appreciable knowledge of use of ICT tools indicated imbalance in the human capital resources required for deployment of ICTs in agricultural information management in the country.

## Recommendations

1. Government funding for agricultural information management must assign appropriate importance to the stakeholder institutions, which should remove disparities in the provision of basic facilities to them.
2. Deployment of ICT facilities for agricultural information management has to give adequate cognisance to the agricultural extension agency in the country being the major source of information to most farmers in the country.
3. The focus on use of ICTs for agricultural information management must consider other aspects such as attitudinal re-orientation of the practitioners in the use of the facilities in order to achieve effective delivery strategy.

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