



## **Access and Utilization of Information and Communication Technologies (ICTs) Among Agricultural Researchers and Extension Workers in Selected Institutions in Nasarawa State of Nigeria**

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### **ABSTRACT**

Information technology is a key to agricultural development. Consequently agricultural researchers, trainers, extension workers, farmers and students must have easy and uninterrupted access to ICT facilities in their immediate environment. This study was conducted in 3 tertiary institutions and the ADP in Nasarawa State in 2006 to determine the accessibility and level of utilization of ICTs by agricultural scientists and extension workers. A sample of 45 Agricultural researchers and 45 extension workers was randomly selected for the study using a set of questionnaire. Data analysis was through the use of descriptive statistics, and linear regression model. The findings revealed that researchers had 87% access to ICT facilities while extension workers had 66% access. On the level of utilization of ICTs for agricultural communication the researchers scored 84% while extension workers scored 70.3%. The regression analysis further revealed that level of education positively influenced the level of utilization of ICTs while years of working experience had negative influence. The key problems militating against the use of ICTs in the area were, poor access to ICT facilities, lack of computer knowledge, low income and poor power supply. It was recommended that agricultural organizations should install all necessary ICT facilities in their establishments and provide training opportunities for their staff. Constant power supply to both urban and rural communities should be considered a fundamental human right and treated as such.

**Keywords:** Access, Utilization, Information and Communication Technologies, Researchers and Extension workers

### **INTRODUCTION**

The role of public agricultural extension service has traditionally been to provide the important link between agricultural research and farming communities, especially for technology transfer in support of agricultural and rural development. However, strong criticism of public agricultural extension services has circulated in recent years (FAO, 2004). According to Qamar (2002), this criticism is due to its top-down approach, which has been supply-driven, technically weak, catering only for large farmers (progressive farmers) and providing insufficient coverage of the small-scale farmers. This implies that proven agricultural technologies, which are needed to ensure higher productivity and food security, are not able to reach the millions of small-scale farmers scattered in the rural areas. Consequently, these farmers have

managed to obtain information from other sources such as other farmers, inputs dealers, produce buyers and NGOs.

Given the urgent need for current agricultural knowledge and information system (AKIS) by farmers the use of conventional communication channels such as farm/home visit, personal letters, and use of contact farmers, for disseminating agricultural information is counter productive. This calls for the adoption of Information and Communication Technologies (ICTs) by both researchers and extension workers to transmit relevant information to farmers in a most efficient way.

#### **Meaning of ICTs and its application in Agricultural Extension.**

ICT is an acronym that stands for Information and Communication Technologies, which can be broadly interpreted as technologies that facilitate communication and the processing and transition of information by electronic means (CTA, 2003). This definition encompasses the full range of ICTs from Radio and Television to Telephones (fixed and mobile), computers and the internet. FAO (1993) defined ICT as technologies involved in collecting, processing, storing, retrieving, disseminating and implementing data and information using microelectronics, optics and telecommunications and computers.

Agricultural Extension, which depends largely on information exchange between and among farmers and a broad range of other actors, is an area in which ICT can have significant impact. Research Scientists can relate directly with the farmers through ICTs. Frontline extension workers, who are the direct link between farmers and other actors in the agricultural knowledge and information system, are well positioned to make use of ICT to access expert knowledge or other types of information that could be beneficial to the farmers.

Arokoyo (2005) listed the potential applications of ICTs in agricultural extension to include:

- Capacity to reach a large audience, e.g. the use of radio, TV and Internet
- Can be effectively used for training and demonstrations e.g T.V., Video, VCD, and CD-ROM.
- Can be used to make the extension systems and structures more efficient through better management of information and scarce resources e.g the use of Data bases for MIS and Networking soft wares
- For the search and packaging of information on demand and for exploring of alternative production options and technologies e.g the use of search engines, the web and data bases
- ICT may be used for normal weather forecasts and as a warning system for disease/pests outbreaks and other disasters before they occur and also for the provision of timely and sensitive market information e.g. with the use of Radio, TV, and SMS.

- ICTs are important for networking among and between the key stakeholders in the Research-Extension-Farmers-Inputs-Linkage System (REFILS) e.g. with the use of Telephone, Video, SMS, and;
- ICTs can also be effectively used for community mobilization, learning and action e.g Radio, TV, public address systems and the Web.

Meera *et al* (2004) noted that ICT can bring new information services to rural areas where farmers (end users) will have much greater control, than ever before, over current information channels. Access to such new information source is a crucial requirement for the sustainable development of the farming systems. They added that ICT can be of immense help by enabling extension workers to gather, store, retrieve and disseminate a broad range of information needed by farmers, thus transforming them from extension workers into knowledge workers (KW). The emergence of such knowledge workers will result in the realization of the much talked about bottom-up, demand-driven technology generation, assessment, refinement and transfers.

Agricultural extension is an educational service which brings information and new technologies to farming communities to enable them improve their production, incomes and standards of living. With the problem that extension agents face in facilitating direct contact with farmer clients and with researchers due to the physical distances involved and lack of transportation needed for their mobility, the application of ICT offers excellent possibilities, for strengthening research – extension systems and beyond the urban focus. Thus, for effective and efficient service delivery, the extension services and research organizations need to be appropriately supported with the use of ICTs. Van den Ban and Hawkins (1998) have even argued that in many countries the costs of maintaining full complement of extension agents are increasing progressively while the price of computers in the global market has decreased rapidly. This, therefore, makes the use of ICTs for information dissemination more economical. The questions to be addressed in this study therefore are:

- (a) What are the socio-economic characteristics of agricultural researchers and extension workers in the study area?
- (b) What modern ICTs infrastructures are available for agricultural research and extension in Nasarawa State?
- (c) What is the accessibility and level of utilization of these facilities by researchers and extension workers in the state?
- (d) What are the possible factors militating against effective use of ICTs in agricultural research and extension in the study area?
- (e) What are the effects of selected socioeconomic characteristics of the respondents on their level of utilization of ICTs?

### **Purpose of the Study**

The overall purpose of the study was to examine the accessibility and level of utilization of ICTs among researchers and extension workers in Nasarawa State. The specific objectives were to:

- (i) Describe the socio-economic characteristics of the respondents;
- (ii) Identify the types of ICT infrastructure available in the state
- (iii) Ascertain the accessibility and level of utilization of ICTs by Agricultural Researchers and Extension workers
- (iv) Identify perceived constraints to effective use of ICTs by the respondents
- (v) Determine the effects of selected socio-economic characteristics of the respondents on their level of utilization of ICT.

### **METHODOLOGY**

#### **(i) Description of the Study Area**

The study was conducted in Nasarawa State of north-central Nigeria. Nasarawa State is an agrarian state with an average temperature of 34°C and annual rainfall 1300-1450mm. major crops grown in the state include cassava, yam, sorghum, sesame, sugar cane, and a variety of tree crops (Nasarawa State, 2001).

In Nasarawa State, apart from the National Institute for Oil palm Research (NIFOR) sub-station located at Gbode in Wamba LGA, the bulk of agricultural researches are conducted by lecturers in tertiary institution such as the Faculty of Agriculture of the State University (Lafia Campus), College of Agriculture, Lafia and the Department of Agriculture, College of Education Akwanga. Nasarawa Agricultural Development Programme (NADP) is the major extension outfit in the state. It has three administrative Zones- Western Zone (Keffi), Central Zone (Akwanga) and Southern Zone (Obi).

#### **Population and sample size**

The target population of this study include agriculture researchers in 3 selected tertiary institutions in Nasarawa State and the State Agricultural Development Programme (ADP). The tertiary institutions include the Faculty of Agriculture, Nasarawa State University, Lafia Campus (40 Lecturers) Department of Agriculture, College of Education, Akwanga (10 Lecturers) and the College of Agriculture Lafia (50 Lecturers)

A sample of 15 extension staff (comprising 2 SMS, 3 BES and 10 VEA) from each of the 3 Agricultural Zones was randomly selected, giving a total of 45 extension personnel. Also a sample of 45 lecturers was randomly selected (20 from Faculty of Agriculture NSUK, 20 from College of Agriculture Lafia and 5 from College of Education, Akwanga). This gave an over all sample size of Ninety (90) respondents (45 researchers and 45 extension workers. Data collection was through a structured questionnaire administered to the respondents, using interview method.

### Method of data analysis

Data analysis was through the use of simple descriptive statistics such as frequency counts, mean and percentages to satisfy Objectives 1 – 4. A simple regression model was used to satisfy objective 5.

Regression model:

$$Y_i = a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6$$

Where

$Y_i$  = Level of ICT utilization (in percentage),  $X_1$  = Age of respondents (in years)

$X_2$  = Educational level (years of schooling),  $X_3$  = Working experience (in years)

$X_4$  = Income level (in Naira),  $X_5$  = Computer literacy (yes = 1, No = 0)

$X_6$  = Sex (male = 1, female = 0),  $a$  = Constant,  $u$  = Error term.

## RESULTS AND DISCUSSION

### Socio-economic characteristics of respondents

**Age:** Table 1 shows that the mean age for the Researchers and Extension workers were 44.83 and 41.06 years respectively. This implies that agricultural researchers and extension workers in the study area were in their middle ages. This trend has significant implication for ICTs utilization as elderly people might be less interested in the use of hi-tech innovations.

**Sex:** Majority of the respondents (86.66%) for researchers and (66.66%) for extension workers were males. This means that males dominated agricultural research and extension in Nasarawa State. This finding agrees with that of Adedoyin *et al* (1999) who reported that males dominated the agricultural workforce in Nigeria. It further implies that technology development and transfer will be gender bias.

**Educational level:** Table 1 shows that majority (71.10%) of the researchers had post graduate degrees, while majority (51.11%) of the extension workers had National Diploma as their highest qualifications. In the overall, all the researchers and extension workers had one educational qualification or the other. This implies that they were all literates and should be able to appreciate the use of ICTs in their agricultural research and extension. Arokoyo (2005) identified high level of illiteracy as a serious constraint to ICT utilization by extension workers and farmers.

**Working experience:** Table 1 shows that majority (55.55%) of the researchers had 1 – 20 years working experience while most (71.11%) of the extension workers had put in over 20 years in service. This means that the extension workers had longer working experience than the researchers. Younger officers are expected to have higher level of ICT awareness and utilization.

**Computer literacy:** Most (68.88%) of the researchers had computer education, while majority (64.44%) of the extension workers were not computer literate. It implies that the researchers would be better able to use ICTs than the extension workers. Arokoyo (2005) and Orokoyo (2003) reported that the constraints that severely restrict the use of ICTs in agricultural extension are poor ICT infrastructure,

erratic power supply, high illiteracy among information users (farmers) and low computer literacy of information providers (researchers and extensionists).

**Income level:** Majority (53.33%) of the researchers had monthly income above N80,000 while most (66.66%) of the extension workers had average monthly income below N61,000. This suggests that the researchers can afford ICTs facilities better than the extensionists. This is in line with the finding of Alampay et al (2003) who reported that the cost of buying and using mobile phones in rural areas of Africa is very expensive such that a single call can cost as much as half the daily wage of an agricultural worker. Arokoyo (2005) also listed poverty as a major constraint to ICT utilization.

**Accessibility to Modern ICTs:** Table 2 shows that all 100%) of the researchers in the study area had access to radio, Television, mobile phones, computers, internet service, video films, cameras and projectors. Such access is available either at home, place of work or business centres. On the other hand, all (100%) of the extension workers had access to only radio, television and video films. Very few (49%) had access to computers among the extension workers. A computer is regarded as key to all ICT facilities.

#### **Level of utilization of ICTs**

Table 3 shows that majority (83.61%) of the sampled researchers used ICT items such as telephones, internet, Radio, Television, Video films/Camera and power point for agricultural research and extension activities while only 56.22% of the extension workers use these equipment. More education and awareness is required to improve the level of utilization of ICTs by extension workers.

#### **Constraints to the utilization of ICTs.**

Table 4 shows the factors militating against the use of ICTs by agricultural researchers and extension workers in the study area. Poor/ lack of electricity supply was rated highest 62.22% and 82.21% by researchers and extension workers respectively. Other constraints following the order of magnitude are inability to operate some ICTs, financial problem, poor access to ICTs and lack of interest.

#### **Regress analysis**

Table 5 shows the regression analysis of the effects of selected socioeconomic characteristics on level of utilization of ICTs. Level of education and working experience showed significant effects. However, education level showed positive while years of working experience had a negative effects.

Effect of socio-economic variables on the level of ICT utilization: Result of linear regression analysis on table 4 shows that two variables: educational attainment and years of working experience had significant effect on the level of ICT utilization by researchers and extension workers. Educational level had a positive relationship while years of working experience had a negative relationship. This implies that the higher the level of education the higher the level of ICT utilization and vice versa. On the other hand, the higher the years of working experience the lower the level of

utilization of ICT. This is in view of the fact that older people did not have advantage of the modern trends of ICT facilities.

### **CONCLUSION**

This study investigated the accessibility and utilization of ICTs among Agricultural researchers and Extension Workers in Nasarawa State. It was discovered that the average level of utilization of ICTs among Researchers was 83.63% while it was 70.25% in the case of Extension Workers. There was no significant difference in the level of utilization between Researchers and Extension Workers. Among the main constraints affecting the utilization of ICTs by the respondents include lack of power supply, poor accessibility to ICT facilities and low level of computer literacy.

### **RECOMMENDATIONS**

1. The provision of electricity on a sustainable basis to all rural and urban communities must be a fundamental human right. This can be done using the solar energy technology.
2. All agricultural training institutions, research institutes and extension organizations in Nasarawa State and Nigeria at large must be well equipped with all necessary ICT facilities to increase access by staff.
3. As a matter of policy, all agricultural scientists and extension workers must possess proven skills in the utilization of ICT facilities like computer and Internet. This calls for in-service training on ICTs applications for all staff in agricultural organizations.
4. Agricultural institutions must establish their websites and link up with others for sharing of information.

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**Table1: Distribution of respondents according to their socio-economic characteristics.**

| Variable   | Researchers |               | Extension worker |               |
|--|-------------|---------------|------------------|---------------|
|  | Frequency   | %             | Frequency        | %             |
| <b>i. Age</b>  |             |               |                  |               |
| 21 – 30  | 2           | 4.44          | 5                | 11.11         |
| 31 – 40  | 10          | 22.22         | 16               | 35.56         |
| 41 – 50  | 25          | 55.56         | 18               | 40.00         |
| 51 – 60  | 5           | 11.11         | 6                | 13.33         |
| 61 – 70  | 3           | 6.67          | 0                | 0.00          |
| <b>Total</b>   | <b>45</b>   | <b>100.00</b> | <b>45</b>        | <b>100.00</b> |
| Mean age for researchers = 44.83, for extension worker = 41.06 |             |               |                  |               |
| <b>ii. Sex</b>   |             |               |                  |               |
| Male   | 39          | 86.66         | 30               | 66.66         |
| Female   | 6           | 13.33         | 15               | 33.33         |
| <b>Total</b>   | <b>45</b>   | <b>100.00</b> | <b>45</b>        | <b>100.00</b> |
| <b>iii. Educational level</b>                                  |             |               |                  |               |
| 1. Primary school  | 0           | 0.00          | 2                | 4.44          |
| 2. SSCE/GCE  | 0           | 0.00          | 7                | 15.55         |
| 3. Diploma/NCE   | 0           | 0.00          | 23               | 51.11         |
| 4. HND/B.Sc.   | 13          | 28.89         | 11               | 24.44         |
| 5. M.Sc.   | 27          | 59.99         | 2                | 4.44          |
| 6. Ph.D  | 5           | 11.11         | 0                | 0.00          |
| <b>Total</b>   | <b>45</b>   | <b>100.00</b> | <b>45</b>        | <b>100.00</b> |
| <b>iv. Working Experience (years)</b>                          |             |               |                  |               |
| 1 – 10   | 10          | 22.22         | 3                | 6.67          |
| 11 – 20  | 15          | 33.33         | 10               | 22.22         |
| 21 – 30  | 10          | 22.22         | 19               | 42.22         |
| 31 – 40  | 06          | 13.33         | 05               | 11.11         |
| >40  | 4           | 8.89          | 8                | 17.78         |
| <b>v. Computer literacy</b>                                    |             |               |                  |               |
| Yes  | 31          | 68.88         | 16               | 35.56         |
| No   | 14          | 31.11         | 29               | 64.44         |
| <b>vi. Income level per month (₦)</b>                          |             |               |                  |               |
| 1000-20,000  | 0           | 0.00          | 3                | 06.67         |
| 21,000-40,000  | 0           | 0.00          | 15               | 33.33         |
| 41,000-60,000  | 5           | 11.11         | 12               | 26.66         |
| 61,000-80,000  | 16          | 35.55         | 9                | 20.00         |
| 81,000-100,000   | 20          | 44.44         | 6                | 13.33         |
| >100,000   | 4           | 8.89          | 0                | 0.00          |
| <b>Total</b>   | <b>45</b>   | <b>100.00</b> | <b>45</b>        | <b>100.00</b> |

**Table2: Distribution of Respondents according to Modern ICTs accessibility.**

| Modern ICTs accessible | Researchers |        | Extension workers |        |
|------------------------|-------------|--------|-------------------|--------|
|                        | Frequency   | %      | Frequency         | %      |
| Radio                  | 45          | 100.00 | 45                | 100.00 |
| Television             | 45          | 100.00 | 45                | 100.00 |
| Fixed Phone            | 12          | 26.66  | 08                | 17.78  |
| Mobile phone           | 45          | 100.00 | 30                | 66.66  |
| Computer               | 45          | 100.00 | 22                | 48.88  |
| Satellite dish         | 19          | 42.22  | 19                | 42.22  |
| Internet services      | 45          | 100.00 | 21                | 46.66  |
| Video films            | 45          | 100.00 | 45                | 100.00 |
| Video camera           | 45          | 100.00 | 28                | 62.22  |
| Power point/projector  | 45          | 100.00 | 32                | 71.10  |

\*(Multiple responses)

**Table 3: Distribution of respondents according to level of ICT utilization**

| ICT utilization               | Researchers |        | Extension workers |        |
|-------------------------------|-------------|--------|-------------------|--------|
|                               | Frequency   | %      | Frequency         | %      |
| Use telephones                | 45          | 100.00 | 36                | 79.99  |
| Operate computers             | 31          | 68.88  | 28                | 62.22  |
| Use Internet services         | 36          | 79.99  | 15                | 33.33  |
| Listen to radio               | 45          | 100.00 | 45                | 100.00 |
| Watch Television              | 45          | 100.00 | 45                | 100.00 |
| Watch Video films             | 45          | 100.00 | 45                | 100.00 |
| Use Video camera              | 29          | 64.44  | 26                | 57.77  |
| Operate power point/projector | 25          | 55.55  | 13                | 28.89  |
| Mean score (x)                | 37.63       | 83.61  | 25.32             | 56.22  |

\*(Multiple responses)

**Table 3: Distribution of respondents according to constraints to the ICTs**

| Constraints               | Researchers |       | Extension worker |       |
|---------------------------|-------------|-------|------------------|-------|
|                           | Frequency   | %     | Frequency        | %     |
| Lack of electric power    | 28          | 62.22 | 37               | 82.21 |
| Inaccessible              | 13          | 28.89 | 28               | 62.22 |
| Financial problem         | 16          | 35.55 | 29               | 64.44 |
| Inability to operate ITCs | 21          | 46.66 | 36               | 79.99 |
| Lack of interest          | 07          | 15.55 | 16               | 35.55 |

(\* multiple responses)

Table 5: Regression analysis of the effects of selected socio-economic variables on the level of utilization of ICTs.

| Variable                       | Co-efficient | Standard error | t-value | Significance |
|--------------------------------|--------------|----------------|---------|--------------|
| Constant                       | -.397        | 1.246          | -.319   | 0.751        |
| Age (X <sub>1</sub> )          | 4.399E-02    | 035            | 1.269   | 0.208NS      |
| Education (X <sub>2</sub> )    | 1.103        | 0.223          | 4.952   | 0.000*       |
| Working Exp. X <sub>3</sub>    | -5.572E-02   | 0.032          | -1.721  | 0.089**      |
| Income (X <sub>4</sub> )       | -7.187E-06   | 0.000          | -.667   | 0.506 NS     |
| Computer Lit (X <sub>5</sub> ) | -0.287       | 0.493          | -.581   | 0.563 NS     |
| Gender (X <sub>6</sub> )       | 0.787        | 0.506          | 1.556   | 0.123 NS     |

R<sup>2</sup> = 0.310

\* Significant at 1%

\*\*Significant at 10 % NS = Not significant