Access of Rural Farmers to Information and Communication Technologies (ICTs) for Development of Agriculture in Bauchi Local Government Area, Bauchi State, Nigeria

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Abstract

The study examines the access of farmers to Information and Communication Technologies (ICTs) in Bauchi Local Government Area of Bauchi state, Nigeria. A total of 120 respondents were randomly selected in the study area. Data were collected using pre-tested questionnaires and analyzed using percentages, means, chi-square and other parametric statistical tools. For the purpose of the research, ICTs were divided into two categories: conventional (Radio/Television) and contemporary or modern (computer/internet and GSM). Results showed that radio was the most widely accessible ICT by the respondents (98.33%) it was followed by television (41.67%), GSM (40.00%) and the least computer/internet (5.00%). Chi-square analysis revealed that age, background and educational level of respondents were significant (P ≤ 0.05) with access to modern ICTs. Kruskal-Willis rank test on reception of ICT services was not significant because on the average, at least the service of one of the categories of ICTs was received by respondents in all the villages studied. Mann-Whitney rank test on the problems confronting the respondents was significant (P ≤ 0.05) with access to ICTs. Thus, it is recommended that widespread education on the use of modern ICTs especially computer/internet and intensification of the use of existing conventional ICTs particularly the radio will bring a turning point in ICTs access and reception in the study area.

Introduction:

The emphasis being placed on the development of information and communication technologies (ICTs), particularly its use in extension to farmers in the rural areas cannot be over emphasized. These days it is often said there can be no development without access to ICTs. It is certainly true that farmers with access to new farming technologies fare better. But they are few and far between (CTA spore, 2004). Among others ICTs in use in Nigeria today include, but not limited to Radio, Television, Computer/internet, Global System of Mobile Telecommunication (GSM) and the Fixed Telephone Network. Research information on improved farm technologies and its effects on productivity and income of rural farmers need to be assessed. However, rural areas by their nature are
devoid of such facilities as such, the rural dwellers cannot access such technologies thereby making them vulnerable and removed in terms of effective communication. Apart from government efforts in turning the trend around, research findings on improved farm technologies have not been substantially extended to rural farmers. This is due, basically to the fact that several extension methods adopted were not sufficiently successful in reaching the rural communities because of obvious socio-economic problems of the rural dwellers. Adoption by farmers remained low due basically to the fact that the research and extension organizations seem not fully “ICT ready”.

Other problems associated to poor access to ICTs by rural dwellers include: erratic network coverage, poor infrastructures of the service providers, especially in the rural areas, high cost of tariffs, and lack of power supply, illiteracy level and inconsistent government policies (Arokoyo 2003). It is widely recorded in most developing countries that minimal attention is being given to reception and retention of information accessed through ICTs as compared to advanced countries, which several conferences and declarations made to correct the imbalance. The recent launch of GSM in Nigeria and information and communication support for agricultural growth (ICSAG) website – www.icsnigeria.org are classical examples to correct the imbalance but are yet to make impact in the rural areas, because of high level of illiteracy and vicious cycle of poverty that pervade the rural dwellers (CTA, 2005). To achieve wide spread access and utilization of ICTs as enunciated by globalization campaigns such as the Millennium Development Goals (MDGs), this study was set to determine the impact of selected ICTs in the study area. This is aimed at determining the ICTs potentials in transforming agricultural production behind the backdrop of variety of problems inhibiting its impact in the rural areas.

Access of Information and Communication Technologies for Extension Delivery:

Agricultural innovation/technologies and other mass awareness programs will remain passive unless they are diffused through the appropriate channels to the people that need them in the rural areas. The modern ICTs in the delivery of information on new farming technologies to farmers have by no means broadened the communication channels, which has brought wider scope in exchange of ideas, skills or simply information diffusion (Adekoya, et al 2005). Thus, while modern ICTs have tended to improve channels of
communication generally, the extent of reaching the target audience and the response/feedback mechanism to the various sources of information has also greatly been improved through the adoption of the modern ICTs. With the effective adoption of ICTs as channels of extension communication, which enhances diffusion of the information content to the right audience, at the right time the much needed development in agriculture especially in the developing countries of Africa would be achieved (Adejo, 2007). The priority therefore today is to ensure access to information and communication technologies (ICTs) among all stakeholders in agricultural production. CTA Spore (2004) has reported the objective of a World summit on information society (WSIS) held in Geneva, December 2003 which was to link people to each other through a global village ICT installation process; but in rural Africa the objective still remain elusive as the traditional radio and television are still the most widely used.

In rural areas of Africa, radio, television and telephone have remained the most frequently accessed ICTs. They are used to relay information available to most people in the rural areas. Adedo and Ewuola (2005) confirmed that several years of research have revealed that market information is the service most welcomed by farmers; when they are better informed, they are most able to sell their produce for higher profits. Further, it was shown in many developing countries that the initiatives of adoption of ICTs in agricultural and rural development are receiving a boost, for instance in Uganda, bold developmental steps have been taken by the government, development agencies and non-governmental organizations (NGOs) (Omotayo, 2005). The objective of agricultural extension is to transfer knowledge, skills and favourable attitudes to farmer, his entire household and community for overall improvement of production capacity and the socio-economic well being. Agricultural Extension is also a process that enables farmers to benefit from research with ultimate target of raising his agricultural efficiency and effectiveness (Onweagba, 1992). In most developing countries the farming family is closely linked to the farm, as such, farm family is an integral component the farming system in the rural set-up. The issues that relate to gender, age, and other socio-economic problems of the family most often are the issues that militate against the effective adoption and utilization of ICTs in the rural communities, as observed by Onweagba (1992). Women provide valuable services in production, distribution and marketing while
youth that have not migrated to cities for greener pastures, complement the efforts of the old and ageing adults (Adedo et al, 2005).

An assessment of various ICTs currently in use to disseminate information to rural communities in sub-Saharan Africa shows that ICTs are yet to make a meaningful impact on the provision of extension services. For example, the ICTs in used in providing extension information to rural communities in Kenya are mostly radio and television while in South Africa, a relatively more advanced country, an integrated approach of telecenters, or multipurpose community centres (MPCCS) and citizens post office (CPOS) are being used (Kiplanga, 2003). Like in the case of Kenya, Nigeria’s main ICT models in use in extension to farmers are radio and television. However, in the Caribbean region today the relevance and benefits of ICTs for agricultural extension is being characterized by various approaches that are relationship oriented, task focused and participatory to extension in rural communities, Campbell (2003). Thus in more advanced countries, demand-driven approaches are more in use than the traditional face-to-face meetings and radio/television that are often in use developing worlds. The fall out of globalization, with its attendant rules and regulations has suddenly thrown to the developing world competition at the world market stage with little or no protection, as a result of various regional trade liberalizations. Such transformations are not easy to come by in the developing countries like Nigeria and may never be achieved unless the end users have a clear understanding of the information continuum and synchronize their efforts to become more supportive of what is happening in the global ICT campaign. Therefore, new and improved information communication technologies are required to meet such information needs especially rural farming families in Nigeria.

In several developing countries the initiatives of ICTs adoption in agricultural and rural development are receiving a boost. This is because the uses of ICTs in rural development have been taken by the government, development agencies and non-governmental organizations. A classical example of this is the establishment of Jamaican Agricultural Marketing Exchange (JAMEX), a trade agency that link farmers’ storage facilities, truckers and local buyer groups. JAMEX goal is to improve effectiveness and efficiency in the market value chain, to respond to globalization and expanding export market potentials. JAMEX is currently being tested in Jamaica, with special attention to ensuring
the integrity of its information transformation platform, non-discriminating access to its facilities, and the effectiveness of its capacity building initiatives and satisfaction of its stakeholders, (CTA, 2003). The Nigerian extension delivery is however, based on the T&V system, traditionally supported by mobile video, television and radio. Since mid 1990s there has been an explosive growth in the number of NGOs involved in agricultural development (Arokoyo, 2003). Typical among them are SHELL Petroleum Company, which mostly is involved in community development. Others are British American Tobacco (BAT) and African Cotton (AFCOT) both of which are interested in the mass production of commodity for their companies’ raw materials. The agricultural information comes from research institutions, which generate new technologies to farmers. Thus, it follows that the agricultural research information service centre is the custodian of several information resources, including CD-ROM databases (which carries researches factual bibliography), multimedia knowledge bases, and in-house publications. Other sources also include, the agricultural information providers, such as international organizations and community based organizations (Omotayo, 2005).

Worthy of mention are some of the international initiatives for development of agriculture extension in the developing nations. These include an initiative of the Canadian government through the international development research centre (IDRC) in supporting Acacia initiative program in Africa. The Acacia initiative is an effort to empower sub-Saharan communities with the ability to apply information and communication technology (ICT) to their own social and economic development. Acacia is testing the proposition that ICTs can also have significant transformation effects on the developing world as it did in developing countries. IDRC selected Uganda to support under this program through the funding of the centres in selected towns and villages, in some cases in a joint effort with International Trade Union (ITU), United Nations Educational and Scientific Commission (UNESCO) and the Ugandan government, stressed the need to increase farmers’ access to the information, knowledge and technologies through the integrated use of ICTs. The Ugandan government is reacting along these lines of such policies initiated by Nigeria, such as decentralization, privatization, liberalization and a plan for modernization of agriculture (PMA) as reported by Omotayo (2005).
**Constraints of ICT Use in Agricultural Extension Service Delivery:**

Agricultural Extension System (AES) in most developing countries is under-funded and this has had variety of effects. Much of the extension information have been found to be out of date, irrelevant and not applicable to small farmer needs, leaving such farmers with little information or resources to improve productivity (Omotayo, 2005). Further, Arokoya (2003) identified the problems and constraints of ICTs use in agricultural extension service delivery to farmers in Nigeria as follows:

1. Despite ICTs world wide explosion, most of the research and extension organizations seem not to be fully “ICT ready” or have low rating.
2. Poor and erratic funding of Nigerian Agricultural Research and Extension System (NARES).
3. Poor ICT infrastructural development as clearly seen in the few and poor telephone lines compounded by erratic; limited and unstable power supply and low capacities of gateways to international networks/satellite systems.
4. High cost of power either through the national grid or by stand-by generators.
5. High cost of telecommunication services either landline or GSM. It has been estimated that Nigeria has the highest rate for GSM calls in the world and the only country that was charging per “minute” until 2005 with explosion of other service providers and government intervention.
6. Limited access to computer and less access to internet, thus little or no inter or intra organizational networks for information exchange.
7. Policy inconsistencies by government in both telecommunication and agricultural sectors resulting in low level of private sector participation and investment for development.
8. High level of rural poverty.
9. High level of illiteracy of the farmers, scientists and extensionists on computer and specifically internet usage.
10. Limited access to world wide database on CD-ROM due to financial/foreign exchange constraints.
11. Limited coverage of states and national FM/AM radio stations and their poor reception in the rural areas.
12. Commercialization of government radio and television stations resulting in exorbitant costs of farm broadcasting.

**Objectives of the Study:**
The main objective of this study is to determine the access of farmers to ICTs available in the study area. However, the specific objectives of the study are to:

i) Determine the level of farmers’ possession/accessibility and reception of ICT components in the study area.

ii) Determine the extent of agricultural information received by the respondents from the ICTs in the study area.

iii) Examine the farmers’ problems on ICTs possession/accessibility for agricultural development.

**The Study Area:**
Bauchi Local Government Area (LGA) is the area of study, which comprises of about 200 villages and hamlets that are scattered in a land mass of 3540 square kilometers, outside the Bauchi metropolis. According to 2006 census the LGA has a total population of 493,810 of which over 75% are rural dwellers. The major economic activity in the area is agriculture with major crops grown including maize, sorghum, rice, millet, sugarcane, groundnut, cowpeas and vegetables. They also rear animals like cattle, sheep, goats and poultry. Vegetation in the area is described as open savannah woodland with trees growing singly or in clusters (BSADP, 1997). April is the hottest month of the year, while humidity is highest in August (66.5%) and lowest in February (16.5%). The mean annual rainfall ranges between 800-900mm characterizing the climate with two distinct seasons; wet and dry. While the wet (rainy) lasts for maximum of 5 months (May-September), the dry season prevails in the remaining 7 months of the year.

**Sampling Procedure and Data Collection Method:**
Two major districts in the area (Zungur and Galambi) were chosen for the study and one hundred and twenty (120) respondents were selected using a stratified random sampling technique. Primary data were collected using a pre-tested, semi-structured questionnaire designed on socio-economic characteristics of the farmers and other relevant information relating to their ICTs access and information utilization.
**Analytical Techniques:**

Basic Analytical tools, such as percentages and means were used to describe the data, in addition to a modified chi-square test. Kruskal-Wallis and Mann-Whitney ranking models were also used to analyze the reception level and the problems associated with each of the ICTs channels. These techniques were further explained as:

1. **Chi-Square:**
   \[ \chi^2 = \sum \frac{(F_o - F_e)^2}{F_e} \]  
   \[ \text{…..(1)} \]
   
   Where,  
   \( F_o = \) Observed frequencies in each cell  
   \( F_e = \) Expected frequencies in each cell  
   \( \Sigma = \) Summation

   To calculate the expected frequency \( (F_e) \)
   \[
   F_e = \frac{R \times C}{N} 
   \]
   \[ \text{…… (2)} \]
   
   Where,  
   \( R = \) Row total  
   \( C = \) Column total  
   \( N = \) Number of cases

   Degree of freedom \((r - 1)(c - 1)\)
   
   Level of significance \((P \leq 0.05)\)

   Decision rule: if calculated \( \chi^2 \) is less than the tabulated \( \chi^2 \), the result of the test supports the null hypothesis \((H_0)\) but if calculated \( \chi^2 \) is greater than the tabulated \( \chi^2 \) the alternative hypothesis \((H_1)\) is accepted.

2. **Mann-Whitney Rank Test:**
   
   \[
   U = N_1N_2 + \frac{N_2+1}{2} - R_2 
   \]
   \[ \text{…….(3)} \]
   
   \[
   U_1 = N_1N_2 + \frac{N_1+1}{2} - R_1 
   \]
   \[ \text{……(4)} \]

   Where,  
   \( N_1 \) and \( N_2 = \) number of cases for samples 1 and 2  
   
   \( R_1 \) and \( R_2 = \) sum of ranks for samples 1 and 2

   In practice, only one of the \( U \)'s need be calculated since the relationship between both \( U \), is given as:  
   \[ U = N_1 \times N_2 - U_1 \]

   Ranking criteria: scores are ranked in ascending order; tied scores are given same rank.

   Decision rule: reject hypothesis if ‘\( U_{\text{calculated}} \leq U_{\text{critical}} \)’, but if ‘\( U_{\text{calculated}} > U_{\text{critical}} \)’ the null hypothesis is rejected instead (Herbert, 1979).
3. Kruskal-Willis Rank Test:

\[
H = \frac{12}{N(N+1)} \sum_{i} \frac{R_i^2}{n_i} - 3(N+1) \quad \text{.....(5)}
\]

Where, \( N \) = Total number observations over all samples

\( R_i^2 \) = Square of the sum of ranks for sample ‘i’

\( \sum R_i \) = Square of the sum of ranks divided by the corresponding number of samples

Ranking criteria: scores are ranked in ascending order; tied scores are given same rank.

Decision rule: the null hypothesis is rejected when \( H > X^2 \); where \( X^2 \) is based on \((K - 1)\) degree of freedom at 0.05 probability level.

Discussion:

1. Possession/accessibility and reception of ICTs among the respondents - possession/accessibility of ICTs as sources of agricultural information in the study area have been examined and the result is presented in Tables 1. Accordingly, it shows a low level of possession or accessibility to the non-conventional ICTs such as internet and GSM (5%). However, majority of the respondents do own radio sets (98%) that can be operated on batteries only, as electricity supply is erratic. This fact was confirmed by Abdulkadir (2003). Also, Onweagba (1992) reported that radio has the highest possession among farmers with 81.71%, followed by television with 47.70%.

Table 1: Distribution of Respondents According to ICTs Possession/Accessibility

<table>
<thead>
<tr>
<th>Type of ICTs</th>
<th>Poss/Acc</th>
<th>%</th>
<th>No Poss/Acc</th>
<th>%</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radio set</td>
<td>118</td>
<td>98.33</td>
<td>2</td>
<td>1.67</td>
<td>100</td>
</tr>
<tr>
<td>Television set</td>
<td>50</td>
<td>41.67</td>
<td>70</td>
<td>58.33</td>
<td>100</td>
</tr>
<tr>
<td>Computer/internet</td>
<td>6</td>
<td>5.00</td>
<td>114</td>
<td>95.00</td>
<td>100</td>
</tr>
<tr>
<td>Telephone Fax/GSM</td>
<td>48</td>
<td>40.00</td>
<td>72</td>
<td>60.00</td>
<td>100</td>
</tr>
</tbody>
</table>

\( U_{\text{calculated}} = 42^* \quad U_{\text{critical}} = 27 \)

\* = Significant at \( P < 0.05 \)

Based on the availability of services or reception of the ICTs in various villages surveyed, the result indicates availability/reception of radio, comprising the federal/state FM stations, to be highest (63%), this is followed by GSM (27%) and Television sets (10%) while computer/internet café is zero or non-existent in all villages surveyed (figure 1). The result agrees with Popoola (2003) who reported that most ICT services and infrastructure to be more concentrated in cities and urban centres in most African
2. Accessibility of agricultural information from the ICTs - looking at the reception of agricultural information from the various ICTs examined especially the conventional sources (radio and television) the result in figure 2 reveals that information on fertilizer source and its application techniques is broadcasted/telecasted most (33.33%) followed by seeds and planting techniques (25.00%) as well as chemicals and application techniques (16.67%). Information about produce marketing, which guarantees farmers’ income is lowest (4.17%).
3. The farmers’ problems on ICTs possession/accessibility - subjecting the various respondents’ views to Kruskal-Wallis and Mann-Whitney rank tests, the farmers’ problems on ICTs possession/accessibility as sources of agricultural information, were examined. The most important problem expressed by farmers is the affordability of ICT facilities (92%) followed by lack of education on how to use internet (83%). The problem of lack of power supply and poor government policy came third (77%).

Table 2: Problems of Respondents on ICTs Possession/Accessibility in the Study Area.

<table>
<thead>
<tr>
<th>Problems</th>
<th>Serious (%)</th>
<th>Rank (R₁)</th>
<th>Not Serious (%)</th>
<th>Rank (R₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannot afford ICTs</td>
<td>92</td>
<td>10</td>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>Lack of Western Education</td>
<td>83</td>
<td>9</td>
<td>33</td>
<td>6</td>
</tr>
<tr>
<td>Lack of power supply</td>
<td>77</td>
<td>8</td>
<td>40</td>
<td>7</td>
</tr>
<tr>
<td>Poor government policy</td>
<td>77</td>
<td>8</td>
<td>40</td>
<td>7</td>
</tr>
<tr>
<td>Have never seen computer</td>
<td>11</td>
<td>15</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>No good radio/tv programs</td>
<td>10</td>
<td>14</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Lack of internet café</td>
<td>92</td>
<td>11</td>
<td>28</td>
<td>4</td>
</tr>
<tr>
<td>Poor infrastructure</td>
<td>-</td>
<td>-</td>
<td>97</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>R₁ = 70</td>
<td>R₂ = 50</td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion/Recommendation:**

The result of this study shows that access of ICTs by farmers in the area studied is still conventional that is radio/television. The inability of access to other ICTs especially computer/internet and GSM is due principally to cost, lack of education and lack of power source in the rural areas, which is prevalent nationwide. To overcome the problems and thus improve the extension service delivery through ICTs in the area therefore, the following issues should be addressed:

1. Government and other agencies to intensify their campaign through the conventional means that is radio/television as they are widely accessible in rural areas.

2. The government should liberalise and incorporate policies of improving mass ICT infrastructure in the country to make ICTs accessible, affordable and useful in agricultural extension delivery thus, building capacity in computer and internet accessibility.
3. Level of awareness on usage, skill acquisition and general education of the rural population to better their economic and social standard must be stepped up

4. Government and the private agencies should also assist in the supply of steady power to encourage increased socioeconomic development of the country’s populace in general.

References:


